

ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS CIVIL 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 provide quality education embedded with knowledge, ethics and advanced skills and preparing students globally competitive to enrich the civil engineering research and practice.

Mission

- * Aims at imparting integrated knowledge in basic and applied areas of civil engineering to cater the needs of industry, profession and the society at large.

- * To develop faculty and infrastructure making the department a centre of excellence providing knowledge base with ethical values and transforming innovative and extension services to the community and nation.
- * To make the department a collaborative hub with leading industries and organizations, promote research and development and combat the challenging problems in civil engineering which leads for sustenance of its excellence.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- * Exhibit their competence in solving civil engineering problems in practice, employed in industries or undergo higher study.
- * Adapt to changing technologies with societal relevance for sustainable development in the field of their profession.
- * Develop multidisciplinary team work with ethical attitude & social responsibility and engage in life - long learning to promote research and development in the profession.

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

- * Survey, plot and prepare layout plans for buildings, dams, canals and highway alignments and conduct geotechnical and geological investigations of the project.
- * Test, analyze and design various substructures and superstructures by considering the environmental and societal issues.
- * Organize various construction projects considering modern construction techniques, equipment and management issues.

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:

- 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.
- 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.
- 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:

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

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:

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

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 reevaluate 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 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)	15	9.38	10 - 15
3	Engineering Sciences (ES)	26	16.25	10 - 20
4	Professional Core (PC)	54	33.74	25 - 35
5	Professional Electives (PE)	18	11.25	8 - 12
6	Open Electives (OE) & Self Study Course	12	7.50	5 - 10
7	Others (Project, Survey Camp, Internship, etc.)	14	8.75	8 - 10
8	Mandatory Non-Credit Courses	-	-	-

COURSE STRUCTURE & 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	MA2501	Linear Algebra & Differential Equations	4	1	-	4
3	EN2502	Engineer and Society	3	-	-	2
4	CH2501	Engineering Chemistry	3	-	-	2
5	CT2501	Problem Solving Using C *	4	-	2	4
6	ME2501	Engineering Drawing	1	-	4	3
7	EG2502	Functional English Lab	-	-	2	1
8	CH2502	Engineering Chemistry Lab	-	-	2	1
Total			19	1	10	20

* Integrated Course with Theory and Laboratory

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	MA2503	Integral Transforms and Multiple Integrals	3	1	-	3
3	EN2501	Environmental Studies	3	-	-	2
4	PH2501	Engineering Physics	3	1	-	3
5	CE2501	Engineering Mechanics	4	1	-	4
6	EG2504	Professional Communication Lab	-	-	4	2
7	CE2502	Computer Aided Drafting Lab	-	-	4	2
8	PH2503	Engineering Physics Lab	-	-	2	1
9	CE2503	Applied Mechanics Lab and Building Trade Practice	-	-	2	1
Total			16	3	12	20

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	CE2504	Mechanics of Solids	3	1	-	3
2	CE2505	Mechanics of Fluids	3	1	-	3
3	CE2506	Building Materials and Construction	2	1	-	2
4	CE2507	Surveying	3	1	-	3
5	ME2502	Elements of Mechanical and Electrical Engineering	4	-	-	3
6	CE2508	Building Planning and Drawing	2	-	3	3
7	CE2509	Mechanics of Solids Lab	-	-	4	2
8	CE2510	Survey Field Work	-	-	4	2
Total			17	4	11	21
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	MA2509	Numerical and Statistical Methods	3	1	-	3
2	CE2511	Structural Analysis	2	1	-	2
3	CE2512	Hydraulics and Hydraulic Machines	2	1	-	2
4	CE2513	Concrete Technology	4	-	-	3
5	CE2514	Engineering Geology and Geomatics *	3	-	2	3
6		Open Elective-I (see list of Open Electives)	4	-	-	3
7	CE2517	Fluid Mechanics and Hydraulic Machines Lab	-	-	4	2
8	CE2518	Concrete Technology Lab	-	-	4	2
Total			18	3	10	20
9	NS2501	NSS / Fine Arts / Yoga / Self Defense (Mandatory Non-Credit Course)	-	-	2	-
10		Optional Elective - I	-	-	-	3
	CE2519	i) Interior Design				
	CE2520	ii) Building Bye Laws and Scientific Planning				
	CT2505	iii) Data Structures				
11	CE2521	Optional Elective - II (MOOCs) Student shall opt from the list of MOOCs given by the Department)	-	-	-	2

* Integrated Course with Theory and Laboratory

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	CE2522	Theory of Structures	3	1	-	3
2	CE2523	Geotechnical Engineering	2	1	-	2
3	CE2524	Hydrology and Water Resources Engineering	4	-	-	3
4	CE2525	Water and Waste Water Engineering	3	1	-	3
5		Professional Elective - I	4	-	-	3
6		Open Elective-II (see list of Open Electives)	4	-	-	3
7	CE2532	Geotechnical Engineering Lab	-	-	4	2
8	CE2533	Water and Waste Water Engineering Lab	-	-	4	2
Total			20	3	8	21
9		Optional Elective - III	-	-	-	3
	CE2534	i) Infrastructure Development				
	ME2509	ii) Basics of Power Plant Engineering				
	CT2507	iii) Object Oriented Programming through JAVA				
10	CE2535	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	CE2536	Foundation Engineering	3	-	-	2
2	CE2537	Highway Engineering	4	-	-	3
3	CE2538	Design of RC Structures	3	1	-	3
4		Professional Elective - II	4	-	-	3
5		Open Elective-III (see list of Open Electives)	4	-	-	3
6	CE2545	Structural Engineering Lab	-	-	4	2
7	CE2546	Highway Engineering Lab	-	-	4	2
8	CE2547	Mini Project / Survey Camp	-	-	4	2
Total			18	1	12	20
9		Optional Elective - V	-	-	-	3
	CE2548	i) Smart Buildings and Automation				
	CE2549	ii) Building Information Modeling				
	CT2513	iii) Database Management Systems				
10	CE2550	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			No. of Credits
			L	T	P	
1	CE2551	Project Management and Finance	4	-	-	3
2	CE2552	Estimation, Costing and Valuation	3	1	-	3
3	CE2553	Design of Steel Structures	3	1	-	3
4		Professional Elective - III	4	-	-	3
5		Professional Elective - IV	4	-	-	3
6		Open Elective-IV (see list of Open Electives)	4	-	-	3
7	CE2564	Computer Applications in Civil Engineering Lab	-	-	4	2
8	CE2565	Internship / Industrial Training / Practical Training	-	-	-	2
Total			22	2	4	22
9		Optional Elective - VII	-	-	-	3
	CE2566	i) Project Scheduling and Contracts				
	MA2515	ii) Optimization Techniques				
	BA2504	iii) Entrepreneurship				
10	CE2567	Optional Elective - VIII (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

IV Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Professional Elective - V	4	-	-	3
2		Professional Elective - VI	4	-	-	3
3	CE2576	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			No. of Credits
			L	T	P	
		Professional Elective - I	4	-	-	3
	CE2526	i) Advanced Strength of Materials				
	CE2527	ii) GIS and GPS				
	CE2528	iii) Green Buildings				
	CE2529	iv) Construction Management				
		Professional Elective - II	4	-	-	3
	CE2539	i) Advanced Structural Analysis				
	CE2540	ii) Environmental Pollution and Its Control				
	CE2541	iii) Ground Water Development and Management				
	CE2542	iv) Ground Improvement Techniques				
		Professional Elective - III	4	-	-	3
	CE2554	i) Pre-stressed Concrete				
	CE2555	ii) Advanced Foundation Engineering				
	CE2556	iii) Traffic Engineering				
	CE2557	iv) Industrial Wastewater Management				
		Professional Elective - IV	4	-	-	3
	CE2558	i) Advanced Design of RC Structures				
	CE2559	ii) Hydraulic Structures				
	CE2560	iii) Geosynthetics				
	CE2561	iv) Disaster Preparedness and Planning				
		Professional Elective - V	4	-	-	3
	CE2568	i) Earthquake Resistant Design of Structures				
	CE2569	ii) Logistics Infrastructure Engineering				
	CE2570	iii) Finite Element Methods				
	CE2571	iv) Design and Drawing of Irrigation Structures				
		Professional Elective - VI	4	-	-	3
	CE2572	i) Pre-Engineered Buildings				
	CE2573	ii) Urban Transportation Planning				
	CE2574	iii) Soil Dynamics and Machine Foundations				
	CE2575	iv) Environmental Impact Assessment				

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 conversation **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 & DIFFERENTIAL EQUATIONS

(Common to CE, EEE, ME & ECE)

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 know the procedures to find the solutions of first and second order differential equations.
- To understand different procedures to solve first order linear & non-linear partial differential equations.

Learning Outcomes

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

- use the concepts of eigenvalues and eigenvectors in solving engineering problems.
- apply 1st & 2nd order differential equations to solve various engineering problems.
- apply the techniques of partial differentiation to find maxima and minima of two/three variables.
- solve first order linear & non-linear partial differential equations.

Course Content

UNIT- I: System of Linear Equations

Rank of a matrix - Echelon form, Normal form, System of equations - consistence and inconsistency, solving non-homogeneous system of equations by LU-Decomposition.

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: First order ordinary Differential Equations

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

UNIT- IV: Higher Order Linear ordinary Differential Equations

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*, $e^{ax} v(x)$, $xv(x)$.

UNIT- V: Partial Differentiation

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

UNIT- VI: First order P.D.E

Forming PDE by eliminating arbitrary functions. Solutions of linear PDE (by Lagrange's subsidiary equation). Solutions of Non-linear PDE by Charpit's method.

Text Books

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

Reference Books

1. U.M.Swamy, A Text Book of Engineering Mathematics – I & II, 2nd Edition, Excel Books, New Delhi, 2011.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 8th edition, Maitrey Printech Pvt. Ltd, Noida, 2009.

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ENGINEER AND SOCIETY
(Common to CE, EEE & ECE)
I Year – I 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.

Course Content

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” by R.Radha Krishnan, S.Balasubramanian Excel Books, New Delhi.
4. “Intellectual Property Rights” by Prabhuddha Ganguli. Tata McGrawHill, New Delhi.
5. “Fundamentals of Entrepreneurship” by P H.Nandan, PHI Learning, New Delhi.

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ENGINEERING CHEMISTRY

I Year – I Semester

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

Course Objectives

- To impart the knowledge of corrosion, treatment methods of water and green synthesis of products.
- To enable the students to obtain the knowledge of refractories, nano materials and instrumental methods of analysis.

Learning Outcomes

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

- apply a suitable method of corrosion prevention for a given problem.
- explain the properties and engineering applications of polymers, fiber reinforced plastics and refractories.
- explain the methods of synthesis of nano materials, properties and applications of CNTs and quantum dots.
- explain the principles of green chemistry and suitable method for synthesis of green products.
- apply a suitable method of water treatment depending on the quality requirement.
- explain the principles and working of spectrophotometer and flame photometer for the determination of a given ion in a given solution.

Course Content

UNIT-I: Corrosion and Its Prevention

Dry and wet corrosion and their mechanisms. Pitting – Bedworth Rule. Types of Corrosion – galvanic corrosion, concentration cell corrosion, pitting corrosion and stress corrosion. Factors influencing the rate of corrosion – Temperature, pH and dissolved oxygen. Corrosion of Reinforced cement concrete(RCC). Corrosion Prevention methods – Cathodic protection – Sacrificial anodic method and Impressed current method. Metallic coatings –galvanization and tinning methods.

UNIT-II: Polymers and Refractory Materials

Definitions of Polymer and Polymerization - Degree of Polymerization – Functionality.

Plastics – Fibre reinforced plastics - Glass Fibres, Carbon Fibres, Aramid Fibres – Preparation Methods – hand layup method, matched metal die moulding method – properties – applications.

Refractories: Definition of a refractory – classification and properties-refractoriness– RUL test–thermal spalling. Conditions leading to failure of a refractory – applications of refractories.

UNIT–III: Nano Materials

Concept of Nano materials - synthesis of nano materials – Sol-gel, Chemical vapour deposition methods, Carbon Nano Tubes (CNTs) – types, properties, applications of CNTs. Quantum dots – applications.

UNIT–IV: Green Chemistry

Introduction - Principles of Green Chemistry, methods of Green synthesis (supercritical fluid extraction and microwave induced methods), IWM (Integrated Waste Management), ZWT (Zero Waste Technology). Applications of green chemistry.

UNIT–V: Water and its Treatment

Hardness of water – calculation of hardness – disadvantages of hard water-determination of hardness by EDTA method – numerical problems – softening methods - zeolite process – Ion exchange process – desalination by reverse osmosis – quality parameters of drinking water – (WHO standards and BIS standards) - municipal water treatment (Sedimentation, filtration and sterilization by chlorination and bleaching powder).

UNIT–VI: Instrumental Methods of Analysis

Electronic transition in molecules – Absorption Spectra, Beer Lambert's Law, UV spectrophotometer – principle and working – determination of Ferric Iron by spectrophotometry – Flame Photometry – principle and working, estimation of sodium by Flame Photometry.

Text Books

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

Reference Books

1. "Engineering Chemistry" by S.S.Dara. S.Chand&Company Ltd., 12th Edn., 2010.
2. "Engineering Chemistry" by J.C.Kuriacose and J.Rajaram. volumes 1 & 2, Tata Mc Graw-Hill Publishing.

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PROBLEM SOLVING USING C

(Common to CE, EEE & ME)

I Year – I Semester

Lecture : 4 Practical : 2

Internal Marks : 40

Credits : 4

External Marks : 60

Course Objectives

- To emphasize the use of flowcharts and pseudo code in problem solving.
- To gain knowledge in C language
- To develop C Programs to solve problems.
- To familiarize with the discrete components of a computer, MS Office

Learning Outcomes

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

- design flowcharts and pseudo code for solving problems.
- understand C tokens and control statements.
- gain knowledge on arrays, strings, pointers, functions, structures and files.
- use C language for solving problems
- self-learn advanced features of C.
- prepare applications using MS-Office.

Course Content

UNIT-I

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

General form of a C program, C Tokens, basic data types, type conversion, variable declaration, console i/o statements, order of evaluation.

Sample Problems such as evaluating formulae.

Programs :

1. Creating a document using MS Word.
2. Familiarizing with the usage and applications of MS Excel.
3. Creating a presentation using MS PowerPoint.
4. Write a C program to calculate the area of triangle using the formula $\text{area} = (s(s-a)(s-b)(s-c))^{1/2}$ where $s = (a+b+c)/2$
5. Write a C program to find the largest of three numbers using ternary operator

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: Calculate the sum of first N numbers, check the given number is prime or not.

Programs : Implement a C program for the following:

1. Find the roots of a quadratic equation.
2. Read two integer operands and one operator from the user, perform the operation and then print the result. (Consider the operators +, -, *, /, % and use Switch Statement)

3. Display first N natural numbers.
4. Check whether given number is Prime (or) not.

UNIT-III

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

Problem Solving: Perform addition and subtraction of two matrices.

Programs: Implement a C program for the following

1. To search whether the given element is in the array.
2. To perform Addition and multiplication of two matrices.

UNIT-IV

Pointers – Declaration, Initialization and operations.

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

Problem Solving: Develop c program to illustrate string handling functions-strlen(), strcmp(), strcat(), strcpy(), strrev().

Programs: Implement a C program for the following:

1. To find the factorial of a given integer using recursive function.
2. Function to exchange (Swap) values of two integers using call by reference.
3. To Illustrate string handling functions-strlen(), strcmp(), strcat(), strcpy(), strrev()

UNIT-V

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

Problem Solving: Implement a structure to read and display the Name, date of Birth and salary of an Employee.

Programs :

1. Write a C Program to implement a structure to read and display the Name, date of Birth and salary of n Employees.

UNIT-VI

File Handling- Text and binary files, file handling functions, random access to files.

Problem Solving: Implement a C program to copy contents of one file to another.

Programs:

1. Implement a C program to count the number of lines, words and characters in a file.

Text Books

1. Programming in C, Second Edition Pradip Dey and Manas Ghosh, OXFORD Higher Education.
2. C Programming, E Balaguruswamy, 3rd edition, TMH.

Reference Books

1. Programming in C, ReemaThareja, 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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ENGINEERING DRAWING (Common to CE & EEE)

I Year – I Semester

Lecture : 1 Practical : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To highlight the significance of universal language of engineers.
- To introduce the concepts of drawing 3-D objects in 2-D planes and vice versa with proper dimensioning and scaling.

Learning Outcomes

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

- apply principles of drawing in representing dimensions of an object.
- construct polygons and conical curves.
- draw projections of points, lines and planes.
- draw projections of solids in different positions.
- convert orthographic views into isometric views and vice-versa.

Course Content

UNIT–I: Introduction

Geometrical Constructions

Conic Sections: Ellipse, parabola, hyperbola – general method.

UNIT–II: Orthographic Projections

Introduction to Orthographic Projections, Projections of Points, Projections of Straight Lines – Parallel to both planes, Projections of Straight Lines-Parallel to one and inclined to other plane.

UNIT–III: Projections of Straight Lines

Projections of Straight Lines inclined to both planes.

UNIT–IV: Projections of Planes

Regular Planes Perpendicular / parallel to one Reference Plane and inclined to other Reference Plane, inclined to both the Reference Planes.

UNIT–V: Projections of Solids

Regular solids with axis perpendicular to one reference plane, axis inclined to one reference plane and perpendicular to other reference plane.

UNIT–VI: Transformation of Projections

Conversion of Isometric Views to Orthographic Views and orthographic to Isometric Views.

Semester End Examination Pattern

Semester end examination paper consists of eight questions out of which five questions are to be answered. All questions carry equal marks.

Text Books

1. N.D. Bhatt (2014), Engineering Drawing, 53rd edition , Charotar Publications.
2. K.VenuGopal (2016), Engineering Drawing and Graphics, 5th edition , New Age International (p) Ltd Publishers.

Reference Books

1. B.V.R.Gupta and M.Raja Roy(2016),Engineering Drawing with AutoCAD, 3rd edition , I.K. Publishers.
2. M. B. Shah and B. C. Rana(2009),Engineering Drawing , 2nd edition,Pearson Education.
3. Dhanunjay A Jolhe (2014),Engineering Drawing , 2nd edition,Tata Mc GrawHill Publishers.

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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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ENGINEERING CHEMISTRY LAB

I Year – I Semester

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

Course Objectives

- To practice the chemical and instrumental methods of analysis for various parameters that are useful in determination of the quality of water.
- To know the preparation of Bakelite.

Learning outcomes

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

- analyze the quality of a given water sample by volumetric method.
- operate the pH meter, conductivity meter, turbidity meter for studying the water quality.
- operate spectrophotometer and determine the concentration of Ferric Iron in a given solution.
- to determine the corrosion rate of a given metal in a given environment by gravimetric method.
- synthesize phenol – formaldehyde resin (Bakelite).

List of Experiments

Introduction to Chemistry Lab (the teachers are expected to teach fundamentals like Primary, Secondary Standard Solutions, Normality, Molarity, Molality etc and laboratory ware used, error, accuracy, precision, Theory of indicators, use of volumetric titrations).

1. Practice experiment-Determination of the amount of HCl in a given solution using standard Na_2CO_3 .
2. Determination of alkalinity of the given water sample.
3. Determination of acidity of the given water sample.
4. Determination of Ferrous Iron by permanganometric method.
5. Determination of total hardness of the given water sample by EDTA method.
6. (a) Determination of pH of different water samples by using pH meter.
(b) Determination of conductivity of different water samples by using conductivity meter.

7. Determination of concentration of the given acid by using standard base conductometrically.
8. (a) Determination of turbidity of different water samples by using turbidity meter.
(b) Estimation of total dissolved salts in a given water sample.
9. Determination of rate of corrosion of carbon steel metal in acid medium in the absence and presence of Thiourea inhibitor by gravimetric method.
10. Preparation of Phenol - Formaldehyde resin (Bakelite).
11. Determination of concentration of Ferric Iron in a given solution spectrophotometrically.

Lab Manual

1. Vogel's Textbook of Quantitative Chemical Analysis, Fifth edition, John Wiley & Sons, Inc., New York.
2. Engineering Chemistry laboratory manual & record by Srinivasulu D, Parshva publications.
3. Engineering Chemistry Lab Manual by K.Mukkanti, B.S publications, 2009.

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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

- Samson, T. (2010). *Innovate with English*. Hyderabad: Foundation
 - Unit SEVEN and EIGHT only
- Vijayalakshmi, M. et al (2014). *Vocabulary Builder for Students of Engineering and Technology*. Hyderabad: Maruthi Publications.
- 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
- 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-written e-mail message and doing the following task:(Compulsory)

- a. Analyzing the reasons for the 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 them.

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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INTEGRAL TRANSFORMS AND MULTIPLE INTEGRALS

(Common to CE & ME)

I Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To gain the knowledge of Laplace and inverse Laplace transforms.
- To understand the concept of Fourier Transforms.
- To know vector integral theorems such as Green's, Gauss & Stoke's.

Learning Outcomes

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

- apply Laplace transforms to find the solutions of ordinary differential equations.
- find Fourier transforms and inverse transforms for a given function.
- evaluate Areas and Volumes using multiple integrals.
- apply the concepts of vector differentiation and integration to the surface and volume integrals.

Course Content

UNIT-I: Laplace Transforms (Without Proofs)

Laplace transform of standard functions, Properties: Change of scale, Shifting Theorems, Laplace transform of derivatives and integrals, multiplication and division by t . Unit step function, Dirac Delta function.

UNIT-II: Inverse Laplace Transforms

Inverse Laplace transforms - by partial fractions – by Convolution theorem (without proof). **Application:** Solution of ordinary differential equations.

UNIT-III: Fourier Transforms

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

UNIT-IV: Multiple Integrals (only Cartesian form)

Double integrals - areas, triple integrals – volume.

UNIT-V: Vector Differentiation

Vector Differentiation: Gradient- Divergence – Curl- Scalar potential.

UNIT–VI: Vector Integration

Integral theorems: Greens - Stokes - Gauss Divergence Theorems (Without proof) and related problems.

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. Erwin Kreyszig, Advanced Engineering Mathematics : 8th edition, Maitrey Printech Pvt. Ltd, 2009, Noida.
2. U.M.Swamy, A Text Book of Engineering Mathematics – I & II : 2nd Edition, Excel Books, 2011, New Delhi.
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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ENVIRONMENTAL STUDIES
(Common to CE, EEE & ECE)
I Year – II 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)

Course Content

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. Ltd.(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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ENGINEERING PHYSICS

I Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To solve oscillating systems problems.
- To analyse crystal parameters to investigate crystal structures.
- To apply principles of optics for engineering applications.

Learning Outcomes

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

- derive expression for oscillations (SHM).
- assess the main characteristics of sound propagation.
- recognize crystal structures and X-Ray crystallography.
- relate basic knowledge of NDT to carry out inspection in accordance with the established procedures.
- apply principles of interference, diffraction and polarization and LASERS to engineering situations.

Course Content

UNIT- I: Simple Harmonic Oscillations

Characteristics of sound - Simple harmonic motion-Displacement-Amplitude-period-frequency-phase-wavelength - equation for simple harmonic motion - free and forced vibrations - Theoretical analysis (a) Free vibrations, (b) Damped vibrations, (c) Forced vibrations - Resonance

UNIT- II: Acoustics

Reverberation time and absorption coefficient of a hall - Sabine's formula - Acoustics of buildings - factors affecting the Acoustics of Buildings - Principles to be observed in the Acoustical design of an auditorium.

UNIT- III: Crystal Structures

Lattice, basis unit cell - Crystal systems - Miller indices - Crystal planes – inter planar distance - Crystal structures of important engineering materials - SCC,BCC,FCC.-X-Ray diffraction -Laue method - powder method - Bragg's law

UNIT- IV: Non-Destructive Testing using Ultrasonics

Ultrasonic Testing-Basic principles-Transducer- Couplant and inspection standards- Inspection Methods-Pulse Echo Technique-Flaw detector- Different Types of scans- Applications

UNIT- V: Physical Optics

Interference due to thin films - Newton's rings –Fraunhofer diffraction due to single slit-resolving power of grating- Polarization - Double refraction - Half wave and quarter wave plates .

UNIT- VI: LASER

Spontaneous and stimulated emission - Einstein's coefficient and their relations - basic characteristics - Basic requirements - Ruby laser - Helium-Neon Laser - CO₂ Laser - application of LASER.

Text Books

1. RK Gaur & SL Gupta, Engineering Physics (Edition 2011), Dhanapat rai publications.
2. M.N. Avadhanulu, P.G. Kshirsagar , Engineering Physics(9th Edition), S.Chand Publications.

Reference Books

1. Ajoy Ghatak, Optics(5th Edition), Tata McGraw-Hill
2. Charles Kittel, Introduction to Solid State Physics, Wiley India Pvt. Ltd.
3. B.B. Laud, Laser and Non-Linear Optics, New Age international publishers
4. P.K. Palanisamy, Engineering Physics , SciTech publications

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ENGINEERING MECHANICS

(Common to CE & ME)

I Year – II Semester

Lecture : 4 Tutorial : 1

Internal Marks : 40

Credits : 4

External Marks : 60

Pre-Requisites

- Linear Algebra and Differential equations.

Course Objectives

- To impart the basic concepts of force systems, free body diagram and equilibrium conditions
- To familiarize on calculating the geometric properties like centroid, moment of inertia of various sectional areas and masses and introduce the concept of friction and virtual work.
- To develop the knowledge on basic principles of kinematics and kinetics with simple applications.
- To introduce applications on using work-energy principle and Impulse-momentum methods.

Learning Outcomes

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

- explain the concept on resultant and equilibrium of a force system.
- determine centroid, moment of inertia of areas.
- determine center of mass, centre of gravity and moment of inertia of bodies.
- apply the principle of friction to connected bodies, ladders and virtual work principle to simply supported beam and connected systems.
- distinguish between kinematics and kinetics.
- apply the work energy and impulse momentum methods of various engineering problems.

Course Content

UNIT - I : Force systems-Resultant and Equilibrium Conditions, Moment and Couple

Introduction to engineering mechanics –Types of forces-Coplanar, Concurrent and parallel forces – Resultant – Composition and resolution of forces, method of projections – Types of supports, Free Body Diagrams, Equations of Equilibrium of Coplanar Systems. Lami's Theorem – Moment of force systems in plane and its Application – Couples- Equilibrium of Coplanar concurrent force systems – Conditions of equilibrium.

UNIT- II: Friction, Virtual work Principle

Introduction, limiting friction and impending motion - Coefficient of friction, Laws of static friction, cone of static friction, applications of friction- Impending motion of connected bodies between blocks, ladder friction, virtual work – virtual

displacement, Principle of virtual work – Applications to connected systems and reactions of simply supported beam.

UNIT - III: Centroid, Centre of Gravity and Area Moment of Inertia

Centroids of standard figures (from basic principles) – Centroids of Composite Figures, Centre of gravity of standard bodies (from basic principles), centre of gravity of composite bodies, Moment of Inertia - definition, Moment of Inertia of standard figures –Parallel axis theorem- Polar Moment of Inertia, Moment of Inertia of composite figures.

UNIT - IV: Centre of Mass, Moment of Inertia of Bodies

Center of Mass- Definition, Moment of Inertia - definition, Transfer Formula for Mass moment of Inertia, Mass moment of Inertia of standard bodies.

UNIT - V: Kinematics and Kinetics

Kinematics: Rectilinear and Curve linear motions –Time, Displacement, Velocity and Acceleration & their relations – Linear & Angular.

Kinetics: Newton's laws of motion and D'Alembert's principle simple applications -Rotation of a body about a fixed axis- Applications.

UNIT - VI: Work – Energy Method

Work – Energy principles, Law of conservation of energy, Power, Work-Energy Applications to Particle motion, connected bodies.

Impulse and Momentum: Principle of momentum and Impulse, Law of conservation of momentum, Impulse and momentum method, collision of bodies, simple applications.

Text Books

1. Engineering Mechanics, Timoshenko, Young and J.V. Rao, Tata Mc Graw – Hill education (India) Pvt. Ltd.
2. Engineering Mechanics, R.K.Bansal, Laxmi publications Pvt. Ltd.

Reference Books

1. Singer's Engineering Mechanics Statics and Dynamics, K.Vijay Kumar Reddy and J.Suresh Kumar, B.S publications, Hyderabad.
2. Engineering Mechanics statics and dynamics, Nelson e.w, Tata Mc Graw – Hill publishing company limited, New Delhi.
3. Engineering. Mechanics, S.S.Bhavikatti and K.G.Rajashekarappa, New age International Pvt. Ltd., Publishers.
4. Engineering Mechanics, Basudeb Bhattacharya, Oxford University Press.

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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 Andhra Pradesh.

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

I Year – II Semester

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

Course Objectives

- To understand the importance of CAD
- To enable the student learn the fundamentals of computer aided drafting

Learning Outcomes

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

- use various commands of AutoCAD
- apply the knowledge of preparing layouts and layers using CAD software.
- visualize various aspects of 3D views of solids by using software.
- draw a building plan using CAD.

List of Experiments

1. Introduction to Computer Aided Drafting – features and environment.
2. Display Commands: Specification of limits, Drawing Scale & View magnification, zooming and panning Commands, Print Options,
3. Creating and Editing 2D Geometry: Creating LINE, POLYLINE, CIRCLE, ARC, ELLIPSE. Usage of editing and modifying commands
4. Construction Techniques: Tools to assist drafting – Creating Offsets, Trimming and extending of lines, filtering of corners, creating multiple objects through Mirroring and Array Generation.
5. Managing Object Properties: Significance of Layers and its applications in building drawing – Use of different types of lines and their weightages
6. Creating Text and Defining Styles: Exercises in adding text to the drawing. Management of text styles
7. Drawing in layouts: Creation of layout and its application in Civil Engineering
8. Drawing basic plan of single storey building
9. Introduction to 3D commands: Creating Cube, Cylinder, Prism, Sphere, Pyramid
10. Intersection of solids using 3D commands

Text Books

1. “AutoCAD 2016 Beginning and Intermediate” by Mercury Learning, B P B Publications
2. “Learn AutoCAD in a Easy Way” by Sunil K. Pandey, Unitech Books

Reference Books

1. Engineering Drawing by N.D. Bhatt & V.M. Panchal, Charotar Publishing House.
2. Engineering Drawing by Dhananjay A Jolhe, Tata McGraw hill publishers

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ENGINEERING PHYSICS LAB

I Year – II Semester

Practical : 2

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To make the students gain practical knowledge to co-relate with the theoretical studies.
- To impart skills in measurements.
- To design and plan the experimental procedure and to record and process the results

Learning Outcomes

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

- use function generator, spectrometer, travelling microscope for making measurements
- test optical components using principles of interference and diffraction of light
- determine the rigidity ,coupling constant, velocity and fundamental laws pertinent to vibrations
- determine the width of narrow slits, spacing between close rulings using LASERS and appreciate the accuracy in measurements

List of Experiments

S.No.	Name of the Experiment
1	Determine the rigidity modulus of given Wire Torsional Pendulum
2	Determine the velocity of sound - Volume Resonator
3	Determine the coupling constant of Coupled oscillator
4	Verification of laws of vibrations of stretched strings
5	Study of normal modes in string using Forced vibrations in rods-Melde's experiment
6	Draw the frequency response curves of LCR Series and Parallel circuits
7	Determination of lattice constant – lattice dimensions kit.
8	Determine the radius of curvature of plano convex lens-Newton Rings
9	Determine the thickness of thin object-wedge method
10	Laser beam divergence and spot size determination
11	Determination of wave length of source using diffraction grating
12	Determine the dispersive power of a given material of the prism

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 Book links, Vijayawada.
3. R.Jayaraman,V.Umadevi,S.Maruthamuthu,B.Saravana Kumar, Engineering Physics laboratory manual(1st edition) Pearson publishers.

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APPLIED MECHANICS LAB & BUILDING TRADE PRACTICE

I Year – II Semester

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

Course Objectives

- To impart knowledge on basic engineering applications.
- To impart hands-on training on basic engineering trades.

Learning Outcomes

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

- calculate axial forces in trusses, moment of force and angle of deflection
- verify lamys theorem.
- identify the vector quantities
- use various tools to prepare basic carpentry joints.
- make basic house wiring connections.
- join different materials

Practice any six experiments from each of Part A and Part B

PART A (Applied Mechanics Laboratory)

1. Calculation of moment of a force using weight balancing technique and system of pulleys
2. Determination of angle of deflection of T bar due to eccentric loading
3. Calculation of centroid of the plane lamina
4. Determination of axial forces in members of a loaded truss
5. Verification of lamys theorem
6. Analysis of trapezoidal trusses for different loads
7. Understanding the vector and vector quantities

PART B (Building Trade Practice)

Practice any two Experiments from each trade

- 1) **Carpentry** : a. T-Lap Joint b. Cross Lap Joint c. Dovetail Joint.
 - 2) **House Wiring** : a. Parallel / Series Connection b. Stair Case wiring
c. Fluorescent Lamp connection.
 - 3) **Plumbing** : a. Screwed pipe joint – For GI Pipes, Steel Pipes
b. Glued or cemented pipe joint – for PVC pipes
- Demo on** : Fitting, Black Smithy, Tin Smithy, Welding, Foundry and Handling of Power Tools

Reference Books

1. Elements of Workshop Technology vol.-1 & vol.-2 by A. K. Hajra Choudhury, S. K. Hajra Choudhury, Nirjhar Roy
2. Workshop Manual , P.Kannaiyah, K.L. Narayana , Scitech Publishers.

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MECHANICS OF SOLIDS

II Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of stress, strain and elastic constants and their relations for use in elastic design of prismatic bars.
- To familiarize with shear force, bending moment and torsion and to calculate shear stresses and bending stresses developed for different sections of beams and shafts.
- To impart the knowledge on the principal stresses & principal strains and various Energy methods.
- To introduce the methods for obtaining axial forces in the members of pin jointed plane trusses.

Learning Outcomes

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

- explain the behaviour of the bars elastically by stress and strain relationship.
- develop SF and BM diagrams for various beams carrying different types of loads.
- evaluate flexure and shear stresses for different beam sections.
- analyse the shafts and springs using principle of torsion.
- explain the concept of principal stresses and strains and apply energy theorems to simple beams.
- determine the axial forces in members of pin jointed plane trusses.

Course Content

UNIT - I: Simple Stresses and Strains, Elastic Constants

Elasticity and plasticity – Types of stresses and strains – Hooke's Law, Stress – Strain diagram for mild steel – Working stress – Factor of safety – bars of various cross sections-Composite bars – Thermal stresses – Lateral strain, poisson's ratio and volumetric strain. Bulk Modulus – Relation between Young's Modulus(E) and bulk Modulus(K), Principle of complementary shear – Direct tensile or compressive stresses on diagonals – Relationship between Young's Modulus and shear Modulus(C) – E,C,K relation.

UNIT - II: Shear Force and Bending Moment

Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and over hang beams

subjected to point loads, u.d.l s and combination of these loads –Point of contraflexure. Relation between, B.M, S.F and rate of loading at a section.

UNIT - III: Flexure and Direct & Bending Stresses

Flexure Stresses: Theory of simple bending – Assumptions – Derivation of bending equation $M/I = f/y = E/R$ – Neutral axis- Determination of bending stresses – Section Modulus of rectangular, Circular (Solid and hollow), I, T and channel sections– Elastic design of simple beams.

Direct and Bending Stresses: Stresses under the combined action of direct loading and bending moment – Kern of a section Conditions of stability- Application to dams

UNIT - IV: Shear and Torsion

Shear: Shear stress at a section – Derivation for shear stress at a section – Shear stress distribution across various beam sections like rectangular, circular, I, T and Channel Sections.

Torsion: Theory of pure torsion – Derivation of Torsion equation - Assumptions made in theory of pure torsion – Torsional moment of resistance – Polar section Modulus– Power transmitted by shafts.

UNIT - V: Principal Stresses & Strains and Energy Methods

Principal Stresses and Strains: Plane State of stress – Stresses on an inclined plane in a rectangular block under axial loading – compound stresses – Normal and tangential stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circles of stresses – Principal stresses and strains – Analytical and graphical solutions.

Energy Methods: Introduction – Strain Energy expression – Principle of virtual work - Maxwell's reciprocal theorem, Castigliano's first and second theorems – Application to determinate beams using Castigliano's theorem.

UNIT - VI: Forces in members of pin jointed plane and perfect trusses

Determination of forces in members of pin-jointed, plane and perfect trusses using method of joints and method of sections – Simply supported and cantilever type trusses.

Text Books

1. Engineering Mechanics of solids, EGOR.P.Popov, PHI publications, New Delhi
2. Strength of Materials, R.K.Bansal Laxmi Publications (P) Ltd., New Delhi.

Reference Books

1. Strength of Materials, Ramamrutham, Dhanpatrai sons publications, New Delhi.
2. Fundamentals of Solid Mechanics, M.L.Gambhir PHI Learning Private Limited, New Delhi.
3. Strength of Materials, R.Subramanian, Oxford University press, New Delhi.
4. Strength of Materials, Dinesh. P.Mandal, Umesh publications.

MECHANICS OF FLUIDS

II Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with static and dynamic aspects of fluids.
- To impart knowledge on laminar flow, turbulent flow and dimensional analysis.
- To introduce the concept of flow through closed conduits and measurement of flow.

Learning Outcomes

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

- analyse various fluid properties in the fluid flow problems and Compute hydrostatic forces on submerged bodies
- identify the fluid flows and its behaviour
- apply conservation laws to derive governing equations of fluid flow
- analyse the fluid properties using dimensional analysis and conduct model studies.
- analyse the flow in pipes, parallel plates and determine losses in pipes.
- measure the flow in a tanks and canals by using various flow measuring instruments.

Course Content

UNIT - I: Introduction

Physical properties of fluids - Specific Gravity, Viscosity, Surface tension, Vapour pressure and their influence on fluid motion; Hydrostatic law, atmospheric, gauge and vacuum pressure. Measurement of pressure, manometers- differential, inverted manometers.

Hydrostatic forces on submerged plane - horizontal, vertical and inclined surfaces – centre of pressure, buoyancy- Introduction.

UNIT - II: Fluid Kinematics

Methods of describing fluid motion; Classification of flows - Steady, unsteady, uniform, non uniform, laminar, turbulent flows, one, two and three dimensional flows, irrotational and rotational flows; Streamline, Path line, Streak line, Equation

for acceleration - Convective acceleration, Local acceleration; Continuity equation, Velocity potential and stream function, Flow net- Introduction.

UNIT - III: Fluid Dynamics

Surface and body forces Euler's equation of motion; Bernoulli's equation, Applications- Venturimeter and Orifice meter, Momentum principle, Applications of momentum equation- Force exerted on a pipe bend

UNIT - IV: Hydraulic Similitude

Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Hydraulic similitude-dimensionless numbers; Model laws

UNIT - V: Closed Conduit Flow

Reynold's experiment – Characteristics of Laminar and Turbulent flows; flow through circular pipe, flow through parallel plates, laws of fluid friction – Darcy's equation; Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line

UNIT - VI: Measurement of Flow

Pitot tube, orifices-fully submerged and partially submerged orifices; Notches - rectangular, triangular, trapezoidal and stepped notches.

Text Books

1. Hydraulics and Fluid Mechanics Including Hydraulic Machines, P.N. Modi and S.M. Seth, 19th edition, Rajsons publication, 2013.
2. Fluid mechanics and Hydraulic Machines, R.K Bansal, 9th edition, Laxmi publications, New Delhi.

Reference Books

1. Fluid Mechanics and Hydraulic machines, Problems and solutions, K.Subramanya, 1st edition, Tata McGrawhill education Pvt. Ltd., New Delhi, 2010.
2. Fluid Mechanics and Hydraulic machines, R.K. Rajput, 5th edition, S.Chand & Co., 2014.
3. Fluid Mechanics and Machinery by C.S.P. Ojha, P.Berndtsson, P.N. Chandramouli, Oxford University press, 2010.
4. Fluid Mechanics including Hydraulic machines by Dr.A.K Jain, Khanna Publishers.

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BUILDING MATERIALS AND CONSTRUCTION

II Year – I Semester

Lecture : 2	Tutorial : 1	Internal Marks : 40
Credits : 2		External Marks : 60

Course Objectives

- To learn about the nature, properties, classification and manufacturing process of building materials and familiarize with various methods of masonry construction.
- To understand the knowledge of building components, finishings.

Learning Outcomes

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

- explain the importance of building materials and distinguish various types of bonds in construction.
- apply the knowledge of manufacturing process and composition of building materials and concrete.
- enumerate various types of building components', finishing's and water proofing methods.
- evaluate importance and role of alternate materials.

Course Content

UNIT - I: Stones, Bricks and Masonry

Stones and Bricks: Properties of building stones, Relation to their structural requirements; Classification of stones, Stone quarrying, Precautions in blasting; Dressing of stone; Composition of good brick earth, various methods of manufacture of bricks; Comparison between clamp burning and kiln burning; Qualities of a good brick.

Masonry: Types of Masonry, Rubble and Ashlar masonry; English Bond, Flemish Bond and Rat Trap Bond; Cavity walls and Partition walls.

UNIT - II: Wood, Lime and Cement

Wood: Classification of various types of wood used in buildings, Structure of wood, Properties - Seasoning and Defects in timber.

Lime and Cement: Various ingredients of lime, Constituents of lime, Classification of lime, Cement: composition, cement manufacturing process, various types of cements, their properties and uses; Various field and laboratory tests for Cement.

UNIT - III: Aggregates

Classification of aggregate, Coarse and Fine aggregates; Particle shape and Texture, Bond and Strength of Aggregate; Specific gravity; Bulk density; Porosity and Absorption, Moisture content of Aggregate– Bulking of sand.

UNIT - IV: Building Components

Lintels, Arches, Vaults, Types of Stair cases; Different types of floors - Concrete, Mosaic and Terrazzo floors. Pitched, Flat and curved Roofs, Lean-to-Roof ; Coupled roofs, Trussed roofs- King and Queen Post Trusses, RCC flat and Shell roofs.

UNIT - V: Finishings

Damp proofing and Water proofing- materials used; Plastering, Pointing, Whitewashing and Distempering; Painting – Constituents of paints – Types of paints; Painting of new/old Wood Surface – Varnish – Form work and scaffolding.

UNIT - VI: Alternative materials

Properties and applications of Galvanized Iron, Fibre-reinforced plastics, Steel, Aluminium, Glass, Gypsum, ceramics, flyash.

Text books

1. Building materials, S K Duggal, third Edition – New Age International Publishers.
2. Building Construction, B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, third Edition - Laxmi Publications (P) Ltd., New Delhi.

Reference Books

1. Construction Technology, R. Chudly– Volumes I and II 2nd Edition, Longman, UK, 1987.
2. Engineering Materials, S.C. Rangwala, Fourth Edition, Charotar Publications.
3. Building Construction, P.C. Varghese, Second Edition, Prentice-Hall of India private Ltd, New Delhi.
4. The Text Book of Building Construction, S.P. Arora and S.P. Bindra, Dhanapati Rai, second Edition Publishers.
5. SP-7:2016 National Building Code of India 2016 (NBC 2016).

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SURVEYING

II Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To make understand the importance of surveying in civil engineering field
- To create awareness on various types of surveying and their instruments
- To familiarize with different types of curves and curve setting

Learning Outcomes

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

- classify various types of surveying and explain the concept of chain survey.
- determine the included angles using compass.
- illustrate the principles of levelling and develop contours from it.
- apply the principles of theodolite and trigonometric levelling to compute angles and heights of objects.
- identify various features of total station & minor instruments and explain their applications.
- design simple and compound curves for highways.

Course Content

UNIT- I: Introduction and Chain Surveying

Introduction –primary divisions of surveying, classification of surveying, principles of surveying, basic measurements in surveying, plan and map- Brief about linear measurements and instruments-Errors in chaining.

Principles of chain surveying, basic definitions, well-conditioned triangle, selection of survey stations and survey lines, recording measurements, offsets, cross staff survey, obstacles in chaining and ranging, chain traversing.

UNIT - II: Compass Survey

Introduction, types of compass, prismatic compass, included angles, types of bearings, types of meridians, compass traverse, Magnetic declination, local attraction and corrections

UNIT - III: Levelling and Contouring

Levelling principles, basic definitions, Parts of dumpy level, types of eye pieces, types of staves, temporary adjustments, methods of levelling, theory of differential levelling, profile levelling, reciprocal levelling, levelling problems, contouring, contour

interval, characteristics of contours, direct and indirect methods of contouring, uses of contour maps.

UNIT - IV: Theodolite Survey & Trigonometrical Levelling:

Theodolite Survey:

Main parts of a theodolite, basic definitions, temporary adjustments, horizontal angles- repetition and reiteration methods, vertical angles, direct angles, deflection angles

Trigonometrical Levelling: Determination of height of an object when base is accessible and inaccessible

UNIT -V: Tacheometry, Total Station and Minor Instruments

Systems of tacheometric measurements, Stadia methods-fixed hair method, movable hair method- Tangential System, Principle of stadia method.

Total station: Features & functions, uses and applications of total station,

Minor instruments: Hand level, Abney level, Pantagraph, Box sextant

UNIT -VI: Curves

Basic definitions and designation of a curve, relationship between radius and degree of curve, elements of a simple circular curve and location of the tangent points, methods of setting out curves, tape methods, method of offsets from the chords produced, tape & theodolite method, two theodolite method, problems in setting out curves, compound curves & relationship between elements of a compound curves and reverse curves.

Text Books

1. Surveying Vol - I & II, KR Arora, 11th edition, Standard Book House.
2. Surveying Vol – I & II, B.C. Punmia, 16th (Vol I) & 12th (Vol II) edition, Laxmi Publications.

Reference Books

1. Surveying Vol. III, KR Arora, 15th edition, Standard Book House.
2. Fundamentals of Surveying, S K Roy, Eastern Economy Edition, Prentice Hall of India Private Ltd.
3. Surveying and Levelling, T. P. Kanetkar, S.V.Kulkarni Vidyarthi Griha Prakashan, 24th edition, Anuradha Publishers.

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ELEMENTS OF MECHANICAL AND ELECTRICAL ENGINEERING

II Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the basic concepts of transmission systems , machine tools and internal combustion engines
- To introduce the basic concepts of electrical circuits.
- To familiarize with the operation of DC machines and A.C Machines

Learning Outcomes

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

- understand different types of transmission systems and their applications
- understand the principle of operation of different machine tools and operations performed using them
- understand the thermodynamic laws and construction and working of internal combustion engines
- describe the basic concepts of electrical circuits.
- analyze the principle and operation of DC and A.C Machines.

Course Content

UNIT - I: Transmission Systems

Belt drives, types of belt drives , rope and chain drives , shaft couplings and their types , gears and types of gears ,gear trains and types of gear trains , differential

UNIT - II: Machine Tools

Engine lathe, drilling machine, shaping machine, grinding machine -parts,working principle,operations performed

UNIT - III: Thermodynamics

Thermodynamic principles and laws, internal combustion engines -classification, working principle, engine components, four stroke and two stroke petrol and diesel engines

UNIT - IV: Electrical Circuits

Basic definitions, Types of network elements, Ohm's Law, Kirchhoff's Laws, inductive networks, capacitive networks, series, parallel circuits and star-delta and delta-star transformations-simple problems.

(All the above topics are only elementary treatment and simple problems).

UNIT - V: DC Machines

Principle of operation of DC generator – emf equation - types, Principle of operation of DC motor and its types.

(All the above topics are only elementary treatment and simple problems).

UNIT - VI: AC Machines

Principle of operation of alternators – regulation by synchronous impedance method – principle of operation of 3-Phase induction motor – Torque equation-slip torque characteristics - applications.

(All the above topics are only elementary treatment and simple problems).

Text Books

1. Introduction to Machine Design, V.B.Bandari, TMH Publishers
2. Production Technology, R.K. Jain and S.C. Gupta, Khanna Publications.
3. Heat Engineering, V.P. Vasandani and D.S. Kumar, Metropolitan Book Company
4. Basic Electrical Engineering, M.S.Naidu and S. Kamakshiah, 2nd edition, TMH.
5. Principles of Electrical and Electronics Engineering, V.K.Mehta, 3rd edition, S.Chand Publications.

Reference Books

1. Machine design, N.C. Pandya & C. S. Shah, Charotar Publishing House Pvt. Limited.
2. A course in Workshop Technology, B.s.Raghu Vamsi, Vol II, 2nd edition, Dhanapat Rai publications.
3. Thermodynamics and Heat Engines, R.Yadav, Vol.I, central Publishing House
4. Theory and Problems of Basic Electrical Engineering, D.P.Kothari & I.J. Nagrath, 1st edition, PHI.
5. Fundamentals of Electrical Engineering, Ashfaq Husain, Dhanpat Rai & Co.

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BUILDING PLANNING AND DRAWING

II Year – I Semester

Lecture : 2 Practical : 3

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce building fundamentals and familiarize with planning principles of residential and public buildings.
- To familiarise with different sign conventions and draw different views of a building.

Learning Outcomes

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

- apply the fundamentals of building
- make use of principles of planning on buildings and influence of climate
- categorise the site for residential and public buildings based on the requirements.
- classify the different conventional signs used in building plan.
- plan the residential and public buildings
- draw various components of buildings.

Course Content

Section - A

UNIT - I: Fundamentals of Buildings

Building; Classification of buildings based on nature of occupancy & Built environment and neutrality, classification of residential buildings: Detached, semi detached, row house or chawls, duplex type house, blocks of flats or terrace houses.

UNIT - II: Climate and its influence on building planning

Introduction, elements of climate, temperature of air, wind, humidity, precipitation, topography, climatic zones in India, climate and comfort & landscaping.

Principles of planning of buildings: Principles of Aspect, prospect, privacy, roominess, grouping, circulation, sanitation, lighting, ventilation, flexibility, elegance, economy, practical considerations

UNIT - III: Planning of Residential and Public Buildings

Residential Buildings: Selection of site for residential buildings, Guidelines for planning and drawing of residential building.

Public Buildings: Requirements and planning of educational institutions, hospitals, banks, industrial buildings and bus station.

UNIT - IV: Sign Conventions

Building Materials - Stone, Sand filling, Concrete, Glass, Steel, Cast iron, Aluminum, Lead, Earth, Timber and Marble.

Electrical Sign Conventions- Earth Point, Ceiling And Exhaust Fan, Power Outlet, Fuse, Male & Female Connector, Single Pole Single Throw Switch (SPST), SPDT, DPST, Door Bell, Main Fuse Board.

Fitment Symbols: Bath regulator, head shower, drain cock, manhole, wall hung urinal, Indian type W.C., fire extinguisher, vent inlet, vent outlet.

Survey Maps: Contour line, railway single & double track, bridge or culvert, national highway, major road, minor road, power line.

Section - B

UNIT - V: Brick Walls, Doors, Windows, Ventilators, Roofs and Trusses

Brick Walls: English bond & Flemish bond odd & even courses for one, one and half & two brick walls in thickness at the junction of a corner. Door – panelled & glazed door, windows – glazed & panelled. Trusses- North light roof truss, king & queen post trusses.

UNIT - VI: Planning of Building

Drawing plan, Elevation and Cross-section of residential buildings & public buildings (school, bank and hospital buildings) for the given line diagram with specification

Semester End Examination Pattern:

The end examination paper should consist of Part A and Part B. Part A consists of five questions from section A out of which three questions are to be answered. Part B consists of two questions from Section B out of which one is to be answered on drawing sheet. Weightage for Part – A is 60% and Part- B is 40%.

Text Books

1. Building planning and Drawing, Dr. Kumara Swamy & A. Kameswara rao, 7th Edition, Charotar Publications.
2. Civil Engineering Drawing and Design, D. N. Ghose, 2nd Edition, CBS Publications.

Reference Books

1. Building by laws, state and Central Governments and Municipal corporations.
2. Planning, Designing and scheduling, Girescharan Singh & Jagadish Singh, Standard Publishers Distributors
3. Principles of building drawing, M.G Shah, C.M KALE, Macmillan publications India Ltd.
4. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur.
5. Planning and designing, Y. N. Sane, Allies Book Stall, Pune.

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MECHANICS OF SOLIDS LAB

II Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To introduce various stress and strain measuring equipment.
- To familiarize with various physical, mechanical and strength properties of various engineering materials.

Course Outcomes

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

- gain knowledge on engineering properties of the materials in the laboratory.
- conduct laboratory tests to check suitability of the engineering materials for the given purpose.
- obtain the strength and quality of materials through laboratory tests.

List of Experiments

1. To study the stress-strain characteristics of Mild steel/HYSD bars using UTM.
2. To determine young's modulus of the given material (steel or wood) by bending test on simply supported beam
3. To determine young's modulus of the given material (steel or wood) by conducting bending test on Cantilever beam.
4. To calculate modulus of rigidity by conducting torsion test on solid circularshaft.
5. To obtain the hardness of the given material by Brinnel's Hardness tester.
6. To obtain the hardness of the given material by RockwellHardness tester.
7. To determine the modulus of rigidity of the spring.
8. To evaluate Compressive Strength of wood or Brick.
9. To determine impact resistance of the given material by conducting Charpy test on Impact testing machine.
10. To determine impact resistance of the given material by conducting Izod test on Impact testing machine

11. To determine the ultimate shear strength of steel rod in single and doubleshear.
12. To Verify the Maxwell's Reciprocal theorem on beams.

Text Books

1. Strength of Materials, R.K.Bansal Laxmi Publications (P) Ltd., New Delhi.
2. Strength of Materials, Ramamrutham, Dhanpatrai son's publications, New Delhi.
3. Strength of Materials Lab Manual by Faculty of Engineering IIT Madras.
4. Lab manual prepared by faculty of Civil Engineering dept., Gudlavalleru Engineering College.

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SURVEY FIELD WORK

II Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To familiarize with surveying equipments/ instruments like chain, compass, levelling instruments, theodolite and total station
- To impart the knowledge on linear, angular measurement

Learning Outcomes

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

- Apply principle of surveying in carrying out field surveys.
- Handle various survey instruments for obtaining better results
- Handle advanced survey equipments to access remote location survey also.

List of Field Works

Chain & Compass survey

1. Area calculation of closed traverse using chain survey
2. Determination of distance between two inaccessible points using compass.

Levelling

3. Determination of reduced levels using Height of the instrument method
4. Determination of reduced levels using rise and fall method.
5. Determination of Longitudinal Section and Cross sections of a given road profile

Theodolite Survey

6. Determination of horizontal angles by Method of repetition & re-iteration
7. Determination of building height
 - a) When the base is accessible
 - b) When the base is inaccessible
8. Curve setting-Simple
9. Determination of tacheometric constants

Total Station

10. Introduction, leveling and centering

11. Determination of Remote Distance Measurement & Remote Elevation Measurement
12. Determination of given bounded area in the field using total station

Text Books

1. Surveying Vol. 1 & II, Dr. K. R. Arora, Standard Book House.
2. Surveying Vol-I&II, B.C. Punmia, Laxmi Publications.

ReferenceBooks

1. Lab manual prepared by faculty of Civil Engineering dept., Gudlavalleru Engineering College.

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NUMERICAL AND STATISTICAL METHODS

II Year – II Semester

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

Course Objectives

- To understand the various numerical techniques.
- To introduce the concepts of probability and statistics.
- To know the importance of the correlation coefficient & lines of regression
- To know sampling theory and principles of hypothesis testing.

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 polynomial for unequal intervals using Lagrange's interpolation.
- compute probabilities in different situations.
- use probability distribution in appropriate scenario.
- measure of correlation between variables and to obtain lines of regression.
- construct sampling distribution and calculate its mean and standard deviation
- apply the appropriate tests to give valid inference.

Course Content

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, Backward and Central difference operators –Relation between operators, Newton's formulae for interpolation – Lagrange's interpolation.

UNIT - III: Numerical Solutions of First Order Ordinary Differential Equations

Solution by Taylor's series, Euler, Modified Euler methods and Fourth order Runge-Kutta method.

UNIT - IV Probability and Expectation of Random Variable

Introduction to Probability, Additive, conditional and multiplicative laws of probability and their applications, Applications of Baye's Theorem.

Introduction to Random variables (discrete and continuous), Concept of expectations (mean and variance) and properties, Probability distributions and related applications.

UNIT - V: Probability distributions and Correlation & Regression

Review on Binomial and Poisson Distributions; Normal distribution and its properties (statements only); Applications of Uniform and exponential distributions; Introduction to Correlation and Linear Regression.

UNIT - VI: Sampling and Statistical Inference

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

Introduction to statistical inference-Test for means and proportions (one sample and two samples when sample size is large); Exact sample tests- Chi-Square test (goodness of fit) and F-test (Test for population variances), Introduction to t-test.

Text Books

1. Higher Engineering Mathematics, B.S. Grewal, 42nd edition, Khanna Publishers, New Delhi.
2. Mathematical Methods, Ravindranath.V and Vijayalaxmi.A, 2nd edition, Himalaya Publishing House, Bombay.
3. Probability and Statistics, Dr. T. K. V. Iyengar, Dr. B. Krishna Gandhi, S. Ranganatham and Dr. M.V. S. S. N. Prasad, S. Chand & Company Ltd.
4. Probability and Statistics for Engineers, Miller, John E. Freund, PHI.

Reference Books

1. Mathematical Methods, Dr. T. K. V. Iyengar, Dr. B. Krishna Gandhi, S. Ranganatham and Dr. M.V. S. S. N. Prasad, S. Chand & Company Ltd.
2. Engineering Mathematics, B.V. Ramana, 4th Edition, Tata McGraw Hill, New Delhi.
3. Advanced Engineering Mathematics, Erwin Kreyszig, 8th edition, Maitrey Printech Pvt. Ltd, Noida.
4. Fundamentals of Mathematical Statistics, S.C. Gupta & V.K. Kapoor, S. Chand & Company Ltd.

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STRUCTURAL ANALYSIS

II Year – II Semester

Lecture : 2	Tutorial : 1	Internal Marks : 40
Credits : 2		External Marks : 60

Course Objectives

- To familiarize with the procedures of obtaining slopes and deflections of determinate beams.
- To familiarize with the crippling loads in column and struts and slenderness ratio.
- To familiarize the concept of propped cantilevers and fixed beams.
- To describe the analysis of indeterminate beams by using Clayperon's Theorem and Slope-Deflection Method.

Learning Outcomes

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

- calculate the slopes and deflections of determinate beams
- determine critical load for columns for different end conditions.
- analyze the propped cantilever beams for point loads and UDL.
- analyze the fixed beams with and without sinking of supports.
- analyze continuous beams by using Clayperon's Theorem of three moments and slope-deflection method.

Course Content

UNIT - I: Deflection of Determinate Beams

Deflection and slope of a beam subjected to uniform Bending Moment – Relation between slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Determination of slope and deflection for cantilever, simply supported and over hanging beams subjected to point loads and UDLs– by Macaulay's and Moment Area methods.Types of springs in series and parallel-Deflection of closely coiled helical springs under axial pull only

UNIT - II: Columns and Struts

Introduction – Types of columns – short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns – Assumptions – Derivation of Euler's critical load formula – Various end conditions – Equivalent length of column – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory

UNIT - III: Indeterminacy-Propped Cantilevers

Degree of static & Kinematic indeterminacy-Analysis of propped cantilevers for concentrated loads and UDL -Shear force and bending moment diagrams.

UNIT - IV: Fixed Beams

Analysis of fixed beams for concentrated loads and UDLs -Shear force and Bending moment diagrams- with and without sinking of supports.

UNIT - V: Continuous Beams: Theorem of three moments

Introduction-Application of Clayperon's Theorem to continuous beams carrying point loads and udl with and without sinking of supports (moment of inertia may be same and different for different spans.)

UNIT - VI: Continuous Beams: Slope-Deflection Method

Introduction, derivation of slope-deflection equation and application to continuous beams with and without settlements of supports.

Text Books

1. Structural Analysis, T.S. Thandavamoorthy, 2011 Edition, Oxford University press, NewDelhi.
2. Analysis of Structures Vol-I & Vol-II, V.N.Vazirani & M.M.Ratwani, Khanna Publishers, NewDelhi

Reference Books

1. Theory of Structures, Ramamrutham, Dhanapatrai sons publications
2. Strength of Materials, R.K.Bansal, Laxmi Publications (P) Ltd., New Delhi
3. Structural Analysis vol I &II, S.S.Bhavakatti, Fourth edition (2013), Vikas Publishing House
4. Intermediate Structure Analysis, C.K.Wang,2014, Tata McGraw-Hill Education Pvt. Ltd.

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HYDRAULICS AND HYDRAULIC MACHINES

II Year – II Semester

Lecture : 2	Tutorial : 1	Internal Marks : 40
Credits : 2		External Marks : 60

Course Objectives

- To familiarize with the design principles of channels.
- To impart knowledge on Uniform and Non-Uniform flow in open channels.
- To introduce the working principles of hydraulic machines.

Learning Outcomes

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

- design the most economical section of open channel
- determine the hydraulic jump for energy dissipation at the downstream of irrigation structures
- compute the force exerted by the jet on vane under different conditions
- illustrate the functioning of various turbines and their hydraulic designs
- analyse the performance of various turbines under different operating conditions
- analyse the performance of the centrifugal pump under different working conditions

Course Content

UNIT - I: Open Channel Flow-I

Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's and Bazin formulae for uniform flow – Most Economical sections. Critical flow: Specific energy-critical depth – computation of critical depth – critical sub-critical and super critical flows.

UNIT - II: Open Channel Flow-II

Non uniform flow-Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles- Rapidly varied flow, hydraulic jump, energy dissipation, boundary layer introduction

UNIT - III: Basics of Turbo Machines

Hydrodynamic force of jet on stationary and moving -flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet.

UNIT - IV: Hydraulic Turbines – I

Layout of a typical Hydropower installation, Heads and efficiencies, classification of turbines - Pelton wheel - Francis turbine - working, working proportions, velocity diagrams, work done and efficiency, draft tube – theory and efficiency.

UNIT - V: Hydraulic Turbines – II

Surge tanks, unit quantities -unit speed, unit discharge, unit power; specific speed, characteristic curves, geometric similarity, cavitation.

UNIT - VI: Pumps

Introduction to pumps, Centrifugal pump- Components, Working, Types, Work done, Heads, Losses and efficiencies, specific speed; Multi stage pumps- series, parallel; characteristic curves, NPSH, Cavitation.

Text Books

1. Hydraulics and Fluid Mechanics Including Hydraulics Machines, P.N. Modi and S.M.Seth, eighteenth edition, Standard book house.
2. Fluid Mechanics including Hydraulic machines, A.K Jain, twelfth edition, Khanna Publishers

Reference Books

1. Flow in Open channels, K. Subramanya, third edition, Tata McGraw-Hill
2. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, ninth Edition, Laxmi Publications
3. Hydraulic machines, R.K Rajput, sixth edition, S. Chand publishing.

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CONCRETE TECHNOLOGY

II Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce types, properties of cements and admixtures
- To build the knowledge on different types of aggregates.
- To impart setting and hardening characteristics of concretes.
- To familiarize with the method of Mix Design.

Learning Outcomes

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

- explain the properties of ingredients of concrete.
- identify the suitability of different types of aggregates for their use.
- explain about Fresh and Hardened Concrete, Special concretes.
- determine the role of elasticity, creep and shrinkage on concrete.
- design the mix for given grade of concrete.

Course Content

UNIT - I: Cements & Admixtures

Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrated cement – Test for physical properties – Different grades & types of cements. Admixtures – Mineral and chemical admixtures – accelerators, retarders, plasticizers, super plasticizers.

UNIT - II: Aggregates and water

Classification of aggregates – Bond, strength, Specific gravity, Bulk density, Porosity, Absorption & Moisture content of aggregate – Bulking of sand – Soundness of aggregate – Alkali aggregate reaction – Sieve analysis – Fineness modulus — Grading of fine & coarse Aggregates.

Quality of mixing water, Tolerable concentrations of some impurities in mixing water, permissible limit for solids as per IS456-2000, use of sea water for mixing concrete.

UNIT - III: Fresh Concrete & Special Concretes

Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding, Steps in manufacture of concrete.

Special Concretes: Ready mixed concrete-Introduction, advantages and disadvantages

Light weight aggregate concrete – Cellular concrete – No fines concrete– High density concrete – Fibre reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C, Polymer concrete – Types of Polymer concrete – Properties of polymer concrete, High performance concrete – Self compacting concrete.

UNIT - IV: Hardened Concrete & Testing

Hardened Concrete: Water / Cement ratio – Abram’s Law – Gel space ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength.

Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests –Split tensile tests – Non-destructive testing methods - Demo on above tests.

UNIT - V: Elasticity, Creep & Shrinkage

Modulus of elasticity – Dynamic modulus of elasticity – Poisson’s ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage. Factors contributing to cracks in concrete, sulphate attack and methods of controlling sulphate attack, chloride attack, corrosion of steel and its control.

UNIT - VI: Concrete Mix Design

Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by BIS method of mix design

Designing of two or three mix proportions and testing in the laboratory.

Text Books

1. Concrete Technology, M.S.Shetty, Edition -2006, S.Chand & Co
2. Properties of Concrete, A.M.Neville, 5thedition(2012), Pearson

Reference Books

1. Concrete Technology, M.L.Gambhir, 3rd edition TataMc.Graw Hill Publishers, New Delhi
2. Text Book of Concrete Technology, Mahaboob Bhasha,5th edition, Anuradha publications.
3. Concrete Technology by A.R. Santha Kumar, Edition-2013, Oxford University Press, New Delhi.
4. Design of Concrete Mixes by N.Krishnam Raju,2nd edition,CBS Publishers & Distributors
5. IS 456:2000 Plain and Reinforced Concrete - Code of Practice.

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ENGINEERING GEOLOGY AND GEOMATICS

II Year – II Semester

Lecture : 3 Practical : 2

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To relate the importance of Geology to selection of site, materials and design of Civil Engineering Projects.
- To familiarize with the frameworks of GIS and Location Technologies.
- To introduce air-borne and space based imaging technologies and their working principles.

Learning Outcomes

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

- identify the minerals, rocks and classify them.
- explain the types of landforms, structures, strata and their dynamics.
- create geographic information layers and perform overlay operations.
- geo-tag assets using GPS and add attribute & meta-data.
- process satellite images and make them ready for analysis.
- interpret information from aerial photographs.

Course Content

UNIT - I: Rocks and Minerals

Disciplines involved in Engineering Geology, formation of minerals, physical properties of minerals, classification of minerals – Origin and occurrence of Igneous, Sedimentary and Metamorphic rocks – texture, structure, forms of Igneous rocks, Sedimentary rocks and Metamorphic rocks.

UNIT - II: Geomorphology and Structural Geology

Landforms and their classification, Lithology, Folds, Faults, Joints and Unconformities and their classification, Land subsidence, Classification and field identification of folds, faults using Satellite images.

UNIT - III: Geographic Information System (GIS)

Introduction, key components, map projections, data entry & preparation – Spatial data input, Raster Data Model, Vector Data Model, Raster Vs Vector. Basic Overlay operations.

UNIT - IV: Global Positioning System (GPS)

Space, Control and User segments of GPS. Indian Systems (IRNSS, GAGAN) Development of GPS surveying techniques, Navigation with GPS.

UNIT - V: Introduction to Remote Sensing

Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere and target – Sensors and platforms: Introduction, types of sensors, airborne remote sensing, Space-borne remote sensing.

UNIT - VI: Introduction to Photogrammetry

Classification, process of Photogrammetry, flight line, exposure station, block of photographs, central perspective geometry, flying height of a vertical photograph, overlap, side lap, flight planning – Photogrammetric imaging devices, conversion of aerial to digital format.

Text Books

1. Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2016), Laxmi Publications.
2. Remote Sensing and Geographical Information Systems, M.Anji Reddy, 4th Edition, B.S.Publications.
3. Elements of Photogrammetry with Application in GIS, P.R.Wolf and B.A. Dewitt, 4th Edition (2013), McGraw Hill Professional.
4. GPS, B. Hofmann Wellenhopf, H. Lichtenegger, and J. Collins, 5th revised edition, Springer Verlag – Wien

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman, 7th Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5th Edition (2014), Springer.
3. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.

For the Practical Part, 12 experiments, 2 per unit shall be conducted.

UNIT-I

- i) Identification of Minerals
- ii) Identification of Rocks

UNIT-II

- i) Study of geological structures using wooden models
- ii) Demo of Resistivity Meter for geophysical measurements

UNIT-III

- i) Creating layers in a GIS and digitising scanned images
- ii) Adding attribute data in tables and overlaying layers to extract information

UNIT-IV

- i) Finding x,y,z coordinates of given points using hand-held GPS/smartphones.
- ii) Geocaching, retrieving hidden objects using GPS receivers.

UNIT-V

- i) Loading a satellite image and switching the bands on and off.
- ii) Rectification and Referencing of satellite images.

UNIT-VI

- i) Feature identification from Aerial Photographs.
- ii) Observing depth of field in stereo-pairs.

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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

- familiarize with 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 Das and 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, Arunkumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books

1. Surveying Theory and Practice, James M Anderson and Edward, 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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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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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: Dielectric 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, bimetallic 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 Materials, Radioactive Materials, Galvanization 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, Wiley 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, battery ignition system - components, Magneto ignition system, Electronic ignition system.

Electrical System: charging circuit- generator, current-voltage regulator, starting 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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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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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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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 XMLAJAX.

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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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

$\phi(x)$, $d(x)$, $\mu(x)$, $\sigma(x)$, Mobius inversion formula, Linear Diophantine 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 Montgomery 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-concentration and 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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FLUID MECHANICS AND HYDRAULIC MACHINES LAB

II Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To impart the knowledge on flow measurement through closed conduit/tank/channel.
- To familiarize with various losses in closed conduits.
- To familiarize with performance curves for various hydraulic turbines and pumps.

Course Out comes

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

- calculate the discharge in pipes.
- measure the discharge in tanks and channels
- calculate the various losses in pipes
- draw the velocity diagrams due to impact of jets on vanes.
- draw the performance curves for hydraulic turbines i.e Pelton wheel, Francis turbine and Kaplan turbine.
- draw the performance curves for hydraulic pumps i.e Centrifugal and Reciprocating.

List of Experiments

1. Determination of Coefficient of discharge of Venturimeter.
2. Determination of Coefficient of discharge of Orifice meter.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by falling head method.
5. Determination of Coefficient of discharge of contracted Rectangular Notch and/or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Verification of Bernoulli's equation.
8. Determination of Impact of jet on vanes.

9. Determination of Performance of Pelton wheel turbine.
10. Determination of Performance of Francis turbine.
11. Determination of Performance of Kaplan turbine
12. Determination of Performance of Centrifugal pump
13. Determination of Performance of Reciprocating pump

Note: At least 12 of the above experiments are to be conducted

Reference Book

1. Lab Manual prepared by Department of Civil Engineering, Gudlavalleru Engineering College.

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CONCRETE TECHNOLOGY LAB

II Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To develop the skill of testing the building materials like cement & aggregates.
- To impart the knowledge on properties of fresh concrete.
- To familiarize with the strength properties of hardened Concrete.
- To introduce the concepts of non-destructive testing.

Learning Outcomes

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

- conduct tests on cement and aggregates.
- determine the workability of fresh concrete by conducting different tests.
- evaluate the compressive and tensile strengths of the hardened concrete by different testing procedures.
- apply NDT methods to evaluate strength of concrete.

List of Experiments

I. Tests on Cement

1. Normal Consistency and Fineness of Cement. (IS: 4031-PART 4 &1)
2. Initial and Final Setting Times of Cement. (IS: 4031-PART 5)
3. Specific Gravity and Soundness of Cement. (IS: 4031-PART 11 &3).
4. Compressive Strength of Cement. (IS: 4031-PART 6)

II. Tests on Fine Aggregate

5. Specific Gravity and Bulking of Sand (IS: 2386-PART 3)
6. Fineness Modulus and Grading of Fine aggregate (IS: 383)

III. Tests on Coarse Aggregate

7. Specific Gravity of Coarse aggregate. (IS: 2386-PART 3)
8. Fineness Modulus of Coarse aggregate. (IS: 2386-PART 1)
9. Flakiness index of coarse aggregate. (IS: 2386-PART 1)
10. Elongation index of coarse aggregate. (IS: 2386-PART 1)

IV. Tests on Fresh and Hardened Concrete

11. Workability test on concrete by compaction factor, slump and Vee-bee. (IS: 1199)

12. Compressive strength, Split tensile strength and flexural strength of concrete (IS:516)
13. Non-Destructive testing on concrete by Rebound hammer. (IS: 13311-PART 1)

NOTE: At least 12 of the above experiments are to be conducted

Reference Books

1. Concrete Technology Lab Manual prepared by Department of Civil Engineering, Gudlavalleru Engineering College
2. Concrete Technology, M.S.Shetty. 6th edition, S.Chand & Co Properties of Concrete, A.M.Neville, 4th edition, pearson.

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Optional Elective - I

INTERIOR DESIGN

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce with civilisations of Greece, Rome, traditions of Islamic and Asian.
- To impart knowledge on design process, organising space in a building and sustainable design.

Learning Outcomes

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

- determine the attributes of classical civilizations
- compare the traditions of Islamic and Asian countries.
- illustrate different styles of buildings
- make use of design process for professional practice
- organise space and application of construction principles
- apply the knowledge of sustainability design and material use

Course Content

UNIT - I: Classical Civilizations: Greece & Rome

Greece- temples & secular Interiors, Insights: The Growth of Athens. Rome- Arches, vaults & Domes, Amphitheatres and temples, Cost of living in Ancient Rome: Secular Buildings, legacy of Rome: Technology

UNIT - II: Islamic and Asian Traditions:

Islamic influence, Mosques and places, Islamic influence in Spain- the mosque in Spain, India - Buddhist, Hindu and Jain Architecture – Hindu Religious and Secular Buildings Jain Architecture, Northern & Southern Styles of temple

UNIT - III: Renaissance to Georgian in the Low Countries & England

Civic Buildings, Private dwellings, Elizabethan, Jacobean, Colonial & Federal America- Early Colonial houses, Churches & meeting houses, Federal styles

UNIT - IV: Design process

The Design process- professional practice, Understanding the project- the client, briefing, design analysis, building and site research, Understanding the space-spatial relationships, a typology of technical drawing

UNIT - V: Understanding Building & organising the space

Building construction principles, materials for construction, Mechanical and electrical systems.

Design development, human dimensions and scale, proportioning systems, ordering systems, inclusive design.

UNIT - VI: Human interface & Sustainable design

Materials and finishes, the decorative scheme, acoustics, furniture, colour, light, Sustainability & material use, communicating design- information share and client needs, presentation drawings boards& multimedia

Text Books

1. A History of Interior Design, John Pile & Judith Gura, 4th edition, Wiley Publications
2. The fundamentals of Interior design, Simon Dodsworth, AVA publications

Reference Books

1. Time-Saver Standards for Interior Design and Space Planning, Joseph De Chiara, Julius Panero & Martin Zelnik, Mc Graw- Hill Publications
2. Modern architecture, Otto Wagner, The Getty Center Publications.

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Optional Elective - I

BUILDING BYE LAWS AND SCIENTIFIC PLANNING

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with building bye laws and regulations.
- To impart the knowledge of orientation and planning principles for buildings.

Learning Outcomes

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

- apprise the use of Building Byelaws and regulations
- apply the knowledge of building regulations and documentation procedures for buildings.
- make use of building requirements and services.
- choose economy measures in building construction.
- describe anthropometric studies
- define planning principles involved for provision of High rise buildings and structural safety.

Course Content

UNIT - I: Building Bye-Laws

Building byelaws and regulations : Introduction- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements, minimum standard dimensions of building elements, provision of lighting, ventilation, safety for fire, explosives and drainage.

Orientation of Buildings: Orientation, Factors affecting orientation, orientation criteria for Indian conditions, C.B.R.I suggestions for obtaining optimum orientation

UNIT - II: Jurisdiction/ applicability and building documentation procedures

Jurisdiction, applicability of building bye-laws, change of use/ occupancy, reconstruction, existing approved buildings, development, procedure for obtaining building permit, signing of plans, notice for alteration, building permit fees, sanction, procedure during construction work, notice for completion, completion and permission for occupation, occupancy/ part completion certificate.

UNIT - III: General building requirements and services

Requirements for parts of buildings, Habitable rooms, kitchen, Bathrooms and water closets, Ledge or Tand/Loft, store room, Basement, parapet, boundary wall, septic tanks, staircase/ exit requirements, group housing, means of access, plumbing and sanitary services, construction site

UNIT - IV: Economy Measures in Building Construction

Economy of Land, material of construction, judicious use of available materials, locally available low cost materials, utilisation of cost effective materials & waste materials as building materials, economy of labour and time.

UNIT - V: Anthropometric Studies

Introduction, golden section, engineering anthropometry, design criteria-for anthropometric data, types of human body dimensions, design principles, application o anthropometric data and design residential building components- drawing room , dining room, kitchen, bedroom, stair.

UNIT - VI:

Provisions for high rise development: High rise, Peripheral open spaces including setbacks, parking spaces, building components, building services

Provisions for structural safety: Structural design and safety, requirements for low income housing, inspection, alternative materials of design and construction and tests

Text Books

1. Building planning and Drawing, Dr. Kumara Swamy & A. Kameswara rao, 7th Edition , Charotar Publications.
2. Model Building Bye-laws- 2016, Ministry of urban development, government of India, 2016.

Reference Books

1. Planning, Designing and scheduling, Girescharan Singh & Jagadish Singh, Standard Publishers Distributors, 2nd Edition.
2. Building by laws, state and Central Governments and Municipal corporations.

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Optional Elective - I

DATA STRUCTURES

II Year – II Semester

Lecture : -

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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THEORY OF STRUCTURES

III Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concept of analyzing the two hinged and three hinged parabolic arches.
- To impart knowledge on influence lines and moving loads
- To familiarize with lateral load analysis using approximation methods
- To impart knowledge on solving indeterminate structures by Moment distribution, Kani's and matrix methods.

Learning Outcomes

Upon completion of the course, Students will be able to

- analyze three hinged and two hinged Parabolic arches
- construct influence line diagrams for obtaining absolute maximum BM and SF for moving loads
- apply approximate methods for analyzing multi-storey frames subjected to Lateral loads
- analyze statically indeterminate beams by moment distribution and Kani's methods
- analyze continuous beams with a maximum of two degrees of freedom using flexibility and stiffness methods

Course Content

UNIT - I: Arches

Introduction - Eddy's Theorem—Determination of horizontal thrust, bending moment, normal thrust and radial shear for Two & Three Hinged Parabolic Arches.- Temperature Effects.

UNIT - II: Influence Lines and Moving Loads

Influence Lines: Influence line diagram (ILD)- Definition, ILD for reaction , shear force and bending moment – SF and B.M at a given section load position for maximum BM at a section due to single point load, u.d.l longer than the span and shorter than the span.

Moving Loads: Introduction - maximum SF and BM at a given section and absolute maximum SF and BM due to single concentrated load, U.D load longer than the span, U.D load shorter than the span, two points loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length.

UNIT - III: Lateral Load Analysis Using Approximate Methods

Application to building frames by Portal and Cantilever Methods and indicate the BM values on members of the frame.

UNIT - IV: Moment Distribution Method

Stiffness and carry over factors-Distribution factors-Analysis of continuous beams with and without sinking of supports-Storey portal frames with single storey and single bay -Substitute frame analysis by two cycle method.

UNIT - V: Kani's Method

Analysis of continuous beams-including settlement of supports and single bay portal frames with and without side sway.

UNIT - VI: Matrix Methods

Introduction - Application to continuous beams (maximum of two unknowns) including support settlements up to two degree using Stiffness & Flexibility Methods.

Text Books

1. Structural Analysis, T.S. Thandavamoorthy, 2011 Edition, Oxford University Press,
2. Theory of Structures, Ramamrutham, 9th Edition 2015, Dhanapatrai sons publications.

Reference Books

1. Theory of Structures SMTS - II: S.I. Units, B.C. Punmia, Ashok Kumar Jain Laxmi Publications
2. Structural Analysis – A matrix approach, G.S. Pandit- S.P. Gupta. Tata Mc Graw Hill, New Delhi.
3. Structural Analysis vol I & II, S.S.Bhavakatti, S Chand Publishers.

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GEOTECHNICAL ENGINEERING

III Year – I Semester

Lecture : 2 Tutorial : 1

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To familiarize with soil formation and classification of soils.
- To make understand vertical stress distribution in soils.
- To introduce concepts of consolidation settlement and compaction control.
- To impart knowledge on shear strength parameters.

Learning Outcomes

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

- explain the soil formation and volumetric relationships.
- determine the permeability and classify the soils.
- explain the seepage and effective stress of soils.
- calculate stress distribution in soils.
- evaluate consolidation settlement and compaction for soils.
- determine shear strength parameters of soils.

Course Content

UNIT - I: Soil formation and mass volume relationship

Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass volume relationship –Relative density

UNIT - II: Index properties, Permeability of soils and Seepage through soils

Index Properties: Grain size analysis – Sieve and Hydrometer method – consistency limits–I.S. soil Classification and Unified soil classification

Permeability of Soils: Types of soil water– Darcy's law – Factors affecting permeability –laboratory determination of coefficient of permeability

Seepage through Soils – Flow net – Laplace's equation – Characteristics of flow net–Uses of flow net

UNIT - III: Effective stress and Stress distribution in soils

Effective stress: Total, neutral and effective stresses –quick sand condition

Stress distribution in Soils: Geostatic stresses – stresses induced by applied loads –Boussinesq's and Westergaard's theories for point load, line load–vertical stress under a circular load and rectangular load – Newmark's influence chart.

UNIT - IV: Compaction

Mechanism of compaction – factors affecting – effects of compaction on soil properties Methods of compaction used in field

UNIT - V: Consolidation

Spring Analogy mechanism –Terzaghi's theory of one dimensional consolidation – Over consolidated and normally consolidated clay –Determination of void ratio at various load increments –Determination of coefficient of consolidation – pre consolidation pressure.

UNIT - VI: Shear strength of soils

Basic mechanism of shear strength –Mohr Coulomb theories –Liquefaction-Different types of tests and drainage conditions for shear strength determination

Text Books

1. Soil Mechanics and Foundation Engineering, K.R. Arora, 7th Edition, Standard Publishers and Distributors, Delhi.
2. Soil Mechanics and Foundation Engineering, VNS Murthy, 1st Edition, CBS Publishers

Reference Books

1. Geotechnical Engineering, C. Venkataramiah, 4th Edition, New age International Pvt. Ltd,(2002).
2. Geotechnical Engineering, Manoj Dutta & Gulati S.K,1st Edition, Tata Mc.Grawhill Publishers New Delhi.
3. Soil Mechanics, T.W. Lambe and Whitman, 1st Edition, Mc-Graw Hill PublishingCompany, Newyork.
4. Basic and applied soil mechanics, Gopal Ranjan and AS Rao, 2nd Edition, New Age Publishers, New Delhi.

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HYDROLOGY AND WATER RESOURCES ENGINEERING

III Year – I 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 by B.C. Punmia, Pande B.B Lal, Ashok Kumar Jain & Arun Kumar Jain sixteenth edition, Laxmi publications.

Reference Books

1. Engineering Hydrology by K. Subramanya, third edition, Tata McGraw-Hill.
2. Hydrology principles, analysis and design by HM Raghunath, revised second edition, New Age International Publishers.
3. Irrigation Water Resources and Water Power Engineering by P.N.Modi, seventh edition, Standard Book House.

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WATER AND WASTEWATER ENGINEERING

III Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the knowledge of selecting sources of water with reference to quality and quantity in a locality, for domestic application and drinking.
- To introduce various treatment options available and their design principles for water treatment and wastewater treatment at the household and municipal level.
- To elucidate the various collection and disposal options available for water and wastewater, including the networks, layout, construction and maintenance.

Learning Outcomes

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

- analyse water and sewage sample test reports and confirm compliance with code.
- suggest suitable layout for sourcing, treatment, supply and distribution of water.
- suggest suitable layout for sewerage, sewage treatment plants, outfalls.
- design household level water treatment and sewage treatment systems.
- size the individual unit operations in water and wastewater treatment plants.
- propose suitable sludge treatment and disposal methods.

Course Content

UNIT - I: Sourcing Raw Water

Waterborne diseases, control of waterborne diseases – Role of Environmental Engineers – Population forecast, design period – Water demand, factors affecting, fluctuations, fire demand – Storage capacity – Water quality and testing – Drinking water standards as per IS 10500.

UNIT - II: Treating Raw Water

Layout and general outline of water treatment units – Sedimentation, principles, design factors – Coagulation, flocculation – Filtration, theory, working of slow and rapid gravity filters, design of filters, multimedia filters, pressure filters, troubles in operation of filters – Removal methods of colour, odour, temporary hardness – Disinfection practices, theory of chlorination, chlorine demand, other disinfection practices – Miscellaneous treatment methods, reverse osmosis, ozonation, ultra-filtration.

UNIT - III: Supplying Potable Water

Distribution systems, requirements, methods & layouts – Hardy Cross and equivalent pipe methods for pipe network design – Introduction to software tools like EPANet for pipe network design – Types of joints and valves, water meters – Water supply, pipes and fittings, rural water supply

UNIT - IV: Collection of Sewage

House drainage, sanitary fittings, traps, plumbing system of drainage, single stack, one pipe and two pipe systems – Principles governing design of building drainage – Determination of quantity of sanitary sewage, factors affecting sanitary sewage, factors affecting storm water sewage – Determination of quantity of storm water sewage – Systems of sewage collection and disposal – Types of sewers, design of sewers, construction, testing, maintenance of sewers – Sewer appurtenances, Man holes, Drop man holes, Lamp holes, Flushing tanks, Grease & Oil traps, Inverted syphons, Street inlets, Catch basins, Storm water regulators – Sewage pumping.

UNIT - V: Treating Sewage

Characteristics of sewage, examination of sewage, C.O.D, B.O.D equations – Layout and general outline of various units in primary treatment of sewage, design of screens, grit chambers, skimming tanks, sedimentation tanks – Suspended growth process: activated sludge process, aerobic and anaerobic ponds, oxidation ponds, aerated lagoons – Attached growth process, trickling filters, standard and high rate, rotating biological contactors – Rural and peri-urban sanitation (sludge digestion tanks, and soak pits, working principles and design of septic tank).

UNIT - VI: Disposing off Treated Sewage and Sludge

Ultimate disposal of sewage, oxygen sag curve, zones of pollution of river – Characteristics of sewage sludge, stages of sludge digestion, aerobic and anaerobic sludge digestion process, factors affecting sludge digestion, sludge digestion tank, high rate digestion, sludge thickening, sludge conditioning, methods of dewatering the sludge, methods of sludge disposal.

Text Books

1. Environmental Engineering, Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, 1st Indian Edition (2013), McGraw Hill Education.
2. Water Supply Engineering Vol I, B.C.Punmia, Ashok Jain & Arun Jain, 2nd Edition, Laxmi Publications Pvt Ltd.
3. Wastewater Engineering Vol II, B.C.Punmia, Ashok Jain & Arun Jain, 2nd Edition, Laxmi Publications Pvt Ltd.

Reference Books

1. Wastewater Treatment, G.L.Karia, R.A.Christian, 2nd Edition (2013), Prentice Hall India Learning Private Limited.
2. Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy Inc, George Tchobanoglous, 4th Edition, McGraw Hill Education (Indian Edition).
3. Water Supply Engineering : Environmental Engineering - Volume I, Santosh Kumar Garg, 31st Edition (2017), Khanna Publishers.
4. Sewage Disposal & Air Pollution Engineering : Environmental Engineering - Volume II, Santosh Kumar Garg, 37th Edition, Khanna Publishers.
5. Elements of Environmental Engineering, K.N.Duggal, 3rd Edition (1996), S Chand Publishing.

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ADVANCED STRENGTH OF MATERIALS

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the knowledge on classification of cylinders based on their thickness and familiarize the stresses induced in thin and thick cylinders.
- To impart concepts on various theories of failures and unsymmetrical bending in beams.
- To familiarize with principles of analyzing cables, suspension bridges and plastic theory

Course Outcomes

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

- analyze the thin and thick cylinders elastically.
- explain the failure theories.
- determine the stresses due to unsymmetrical bending.
- analyze cable and suspension bridge structures.
- analyze portal frames using slope deflection method.
- determine shape factors and plastic moment of resistance for simple beams and frames

Course Content

UNIT - I: Thin and Thick Cylinders

Thin Cylindrical Shells: Derivation for equations of longitudinal and hoop stresses - Hoop, Longitudinal and Volumetric strains – changes in diameter and volume of thin cylinders – efficiency of a joint.

Thick Cylinders: Stresses in thick cylinders and compound cylinders – Lamé's theory of thick cylinders - Distribution of hoop and radial stresses across thickness of cylinder – Design of thick cylinders – Initial difference of radii for shrinkage.

UNIT - II: Theories of Failures

Introduction – Various Theories of failures like Maximum Principal Stress theory – Maximum Principal Strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

UNIT - III: Unsymmetrical Bending

Introduction – Centroidal principal axes of section — Moment of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis .

UNIT - IV: Cables and Suspension Bridges

Introduction to cables, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cables, temperature effects, analysis of simple suspension bridge, three and two hinged stiffening girders.

UNIT - V: Portal Frames- Slope Deflection Method

Introduction, slope-deflection equations and application to rigid plane portal frames with and without sway subjected to UDL and point loads.

UNIT - VI: Plastic Analysis of Structures

Plastic moment of resistance - Plastic Modulus - Shape factor - Load factor - Plastic Hinge and mechanism – plastic collapse, lower and upper bound theorems, analysis of indeterminate beams and single bay single storey portal frames subjected to point load and UDL.

Text Books

1. Strength of Materials, R.K Bansal, 6th edition 2017, Lakshmi Publications.
2. Analysis of Structures: Theory & Design Vol II, V N Vazirani ,4th edition – 2009, Vikas Publications.

Reference Books

1. Strength of Materials, Ramamrutham, 6th edition 2017, Dhanapatrai son's publications.
2. Structural Analysis-II, S.S. Bhavikatti, 4th Edition -2015, Vikas Publications.
3. "Structural Analysis, A Matrix Approach" Pandit .G.S., Gupta .S.P, 2nd Edition, Tata McGraw-Hill Education, 2010.

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GIS AND GPS

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

- To introduce spatial information technology fundamentals.
- To narrate the progress from analog to digital spatial decision support systems
- To elaborate the applications of GPS in surveying

Learning Outcomes

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

- recall and recite the history of development of mapping.
- outline the structure of Geographic Information Systems and explain the interaction of various elements.
- identify and explain various tasks involved in building a GIS Database.
- analyse the differentiate between Raster and Vector data models and their applications.
- illustrate the general architecture of (SBNS) satellite based navigation systems.
- list the various SBNS platforms such as NAVSTAR, GLONASS, NAVIC, GALILEO, BEIDOU.

Course Content

UNIT - I: Digital Cartography

Maps: basic characteristics of maps, types of maps, classified by scale, function and subject matter – Map scale, representation of scale on maps, geographic coordinates, latitudes & longitudes – Map projections: planar, cylindrical, conical, conformal – Geoids and their representation.

UNIT - II: Structure of GIS

GIS data models & input devices: Raster data models, Vector data models, reference frameworks and transformation – Map preparation and the digitizing process, methods of vector input, methods of raster Input – External Databases – Principles of GIS.

UNIT - III: Data Storage and Editing

Storage formats of GIS Database, editing the GIS database, detecting and editing errors of different types of data, Edge Matching, Conflation and Rubber Sheeting, Templating.

UNIT - IV: Applications of GIS

Components of GIS, Raster & Vector Overlay Analysis – Network Analysis – Three dimensional representations using Digital Terrain Models (DTM) – TIN (Triangulated Irregular Network)

UNIT - V: Structure of GPS

Satellite System: GPS - Different segments – space, control and user segments – Satellite configuration – GPS signal structure – Orbit determination and Orbit representation, Anti spoofing and Selective availability – Task of control segment – GPS receivers – Main receiver components. Introduction to DGPS (Differential GPS) – DGPS vs GPS

UNIT - VI: Applications of GPS

Surveying with GPS: Introduction, planning a GPS Survey, surveying procedure – Engineering applications and monitoring – GPS and GLONASS constellations, configuration comparison – Satellite Laser Ranging & Applications – Concepts of satellite altimetry, Introduction to GALILEO, NAVIC, BEIDOU.

Text Books

1. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.
2. Global Positioning System – Principles and Applications, Santheesh Gopi., (2005), Tata McGraw-Hill Publishing Company Limited, New Delhi.

Reference Books

1. GPS satellite surveying, Alfred Leick, 3rd Edition, 2004. John Wiley & Sons Inc.
2. Remote Sensing and Geographical Information system, A.M. Chandra and S.K. Ghosh, 2nd edition (2015), Narosa Publishing House, New Delhi.
3. GPS, B. HofmannWellenhof, H. Lichtenegger, and J. Collins, 5th revised edition, Springer Wien - New York.

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GREEN BUILDINGS

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce students to the concept of 'Green' Building.
- To familiarize students with the 'voluntary environmental building rating systems' (VERS) operating in India.
- To communicate the logic behind the rating categories in IGBC, GRIHA, LEED, EDGE, and WELL rating systems.

Learning Outcomes

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

- highlight the unique features of green buildings.
- suggest the most appropriate building materials and fittings for green buildings.
- identify opportunities for energy and water savings in building energy and material flows.
- propose renewable energy utilisation options specific to the building project.
- enumerate occupant comfort parameters and suggest suitable electro-mechanical systems.
- guide project proponents to get green certification for buildings.

Course Content

UNIT - I: Suitable Site Selection

Typical features of Green Buildings, benefits of green buildings – Sustainable Site Selection, maximising comfort, integration of daylight, optimising ventilation; rainwater harvesting, recharge, reuse strategies

UNIT - II: Appropriate Materials

Renewable Materials, FSC (Forest Stewardship Council) certification – Rapid Renewal, bamboo, eucalyptus, poplar, rubberwood, linoleum – Low energy walling; rammed earth, stabilised mud, Adobe–Post Consumer, Post Industrial Waste recycling – Hollow blocks, lime, pozzolona cements, agri residues – Ferro cement, Ferro concrete – Alternative roofing systems; Vaults, Domes High albedo paints

UNIT - III: Water & Energy Conservation in Buildings

Need for energy conservation in buildings, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes – Water Conservation systems in Buildings, water harvesting in buildings, waste to energy in residential complexes, Modular wastewater treatment systems

UNIT - IV: Net – Zero Energy Buildings

Wind Energy Concepts, wind energy potential and status in India, wind energy technologies – Solar Energy Concepts, solar energy potential and status in India, solar energy technologies, building scale applications and case studies - Building-scale hybrids.

UNIT - V: Indoor Environment Quality

Weather data collection, temperature, humidity, wind speed, direction–Climate change and Built Environment, how they affect each other – Occupant Comfort, design, codes, thermal comfort, lighting comfort, acoustic comfort - Mechanical Ventilation and Air Conditioning concepts – Energy Efficient Lighting Design – Passive cooling strategies, green roofs – Case studies from actual buildings

UNIT - VI: Measuring Sustainability ‘voluntary environmental building rating Systems’

LEED Introduction, process, rating system, variants and levels–GRIHA Introduction, process, rating system, variants and levels– IGBC Introduction, process, rating system, variants and levels– Building Automation and BMS

Text Books

1. Alternative Building Materials and Technologies, K.S.Jagadish, B.V.Venkatarama Reddy and K.S.Nanjunda Rao, 2nd Edition, New Age International
2. Non-Conventional Energy Resources, G.D.Rai, 6th Edition, Khanna Publishers
3. GRIHA Manual and Reference Guides
4. LEED Reference Guides
5. IGBC Reference Guides

Reference Books

1. Sun, Wind, and Light: Architectural Design Strategies, Mark DeKay, G.Z.Brown, 3rd Edition, John Wiley & Sons
2. National Building Code of India (2016), Bureau of Indian Standards.

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CONSTRUCTION MANAGEMENT

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the importance of management in construction projects.
- To familiarize with quality, safety and material management in construction projects.
- To explore environmental issues in construction project.

Learning Outcomes

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

- illustrate the knowledge of organizing system and importance in business organisation.
- apply the quality control tools in various construction projects
- manage work men and materials in construction project
- adopt the health and safety measures in construction works
- make use of project case studies.

Course Content

UNIT - I: Organizing for Construction

General principles of forming an organization system, Importance of organization, types of organization, Forms of business organization

UNIT - II: Quality Control

Quality Control, Importance of quality; Elements of quality; Organization for quality control; Quality assurance technique; Documentation; Quality control circles; (TQM) Total quality management; ISO – 9000s.

UNIT - III: Managing Projects

Project Review – Project Completion & Handover – Long term Project audit and review – Continuous improvement technique – Bench Marking of Performance and Process – The role of Project Leaders in the World Class Projects.

UNIT - IV: Materials Management

Importance, Objective, Functions of Material Management Department, stores management, Material procurement, Materials Handling

UNIT - V: Health & safety

(H&S) Health & Safety Management , Accident prevention programme; Immediate attention in case of accident; Approaches for safety improvements in construction; Safety benefits to employers, employees and customers; Prevention of fires in construction industries; Fault free analysis; Safety information system; Safety budgeting, case studies of H&S projects.

UNIT - VI: Case Studies

Environmental issues in construction- Hydel Power Projects, Thermal Power Projects, Nuclear Power Projects, and Factors to be considered in planning for big projects.

Text Books

1. Construction Engineering and Management, Dr. S. Seetharaman, Umesh Publications, 5th Edition, NaiSarark, Delhi.
2. Construction Planning, Equipment and Methods, Peurifoy and Schexnayder, Shapira, Tata Mcgrawhill.

Reference Books

1. Construction Project Management - An Integrated Approach, Peter Fewings , Taylor and Francis.
2. Construcion Management Emerging Trends and Technologies, Trefor Williams, Cengage learning.

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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, 4th Edition, B.S.Publications.
2. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman , 7th Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5th 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, Filariasis, 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 assess 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 University, available online, accessed, 7, 2008.
2. David F.Griffiths, October (2012) “An introduction to MATLAB” the University of Dundee, available online, Accessed, 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 overhead 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 gases-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 rods, 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.

Course Content

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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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, fluorescence 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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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.

Web link

www.statlearning.com

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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”, Wiley Publications, 2003.
2. Steve Suchring, “MySQL Bible”, John Wiley, 2002

Reference Books

1. Rasmus Lerdorf 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. Vikram Vaswani, “MYSQL: The Complete Reference”, 2nd Edition, Tata McGraw-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 No Punishment.

UNIT - II: Cyber Crime and Criminal Justice

Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber fraud and Cyber Cheating, Virus on Internet Deformation, Harassment and E- mail Abuse

UNIT - III: Cyber Criminality Strategies and Trends

Network Service Providers, Jurisdiction and Cyber Crimes, 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 Event of Digital Signature compromise, E - Governance in the India. A Warning to Babudom, Are Cyber Consumers Covered under the Consumer Protection, Goods and Services, Consumer Complaint Defect in Goods and Deficiency in Services Restrictive and Unfair Trade Practices

UNIT - V: Traditional Computer Crime

Early Hacker and Theft of Components Traditional problems, Recognizing and Defining Computer Crime, Phreakers: Yesterday's Hackers, Hacking, Computers as Commodities, Theft of intellectual Property.

UNIT - VI: Web Based Criminal Activity

Interference with Lawful Use of Computers, Malware, DoS (Denial of Service) and DDoS (Distributed Denial of Service) Attacks, Spam, Ransomware and Kidnapping of Information, Theft of Information, Data Manipulation, and Web Encroachment Online Gambling Online Fraud, Securities Fraud and stock Manipulation, Ancillary crimes

Text Books

1. Vivek Sood, "Cyber Law Simplified", 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. Degeneracy in TP and resolving it.

UNIT - VI: Assignment and Sequencing Problems

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 and 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: Reliability and Life Testing
3. S. M. Ross: Probability Models, Harcourt India Pvt. Ltd.
4. D. C. Montgomery: Introduction to Statistical Quality Control, Wiley.
5. Hadly: Linear Programming, Addison – Wiley.
6. Taha: Operation Research: An Introduction, Mac Millan.
7. Wayne L. Winston: Operations Research, Thomson, India edition, 4th Edition.

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GEOTECHNICAL ENGINEERING LAB

III Year – I Semester

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

Course Objectives

- To introduce the tests for determining the dry density of soils.
- To familiarize with different test procedures for obtaining shear strength of soils.
- To appraise the soil properties by compaction and consolidation process.
- To familiarize with the tests for finding out the permeability of soils.

Learning Outcomes

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

- conduct index tests and classify the soils.
- determine in-situ density and compaction control of soils.
- determine the compaction and consolidation parameters of soils.
- identify the engineering properties of the soils.

List of Experiments

1. Determine the specific gravity of solids by density bottle or pycnometer method.
2. Determination of Liquid Limit, Plastic Limit and shrinkage limit of the Soil.
3. Determine the Field Density by Core Cutter and Sand Replacement Methods.
4. Determine the compaction characteristics of soil by I. S. Light Compaction.
5. Determine the compaction characteristics of soil by I. S. Heavy Compaction
6. Determination of Free Swell Index (FSI).
7. Determine California Bearing Ratio (CBR) of soil.
8. Determine particle size distribution of soil by sieve analysis.
9. Determine particle size distribution by hydrometer method.
10. Determination of Undrained Shear Strength of Soil By Unconfined Compression (UCC) Test.
11. Determination of Shear Strength Parameters of a Soil Specimen by Triaxial Compression Test.

12. Determination of Shear Strength Parameters of the Soil by Direct Shear Test (Box Shear Test).
13. Determination of Undrained Shear Strength of Soil By Laboratory Vane Shear Test.
14. Determination of Density Index (Relative Density) of Cohesionless Soils.
15. Determination of Coefficient of Permeability of the Soil by Variable (Falling) Head method.

Note: At least 12 of the above experiments are to be conducted.

Reference Books

1. Soil Mechanics and Foundation Engineering, K.R. Arora, 7th Edition, Standard Publishers and Distributors, Delhi.
2. IS: 2720 Code
3. Lab Manual prepared by faculty of Civil Engineering dept., Gudlavalleru Engineering college.

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WATER AND WASTEWATER ENGINEERING LAB

III Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To verify the suitability of water for drinking, based on Indian Standards
- To estimate the strength of sewage in terms of biological parameters
- To identify the vital conditions for survival of aquatic life.

Learning Outcomes

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

- test the quality of water for potability as per IS standards.
- test the strength of sewage based on biochemical parameters.
- determine the optimum coagulant dosage.

List of Experiments on Water

1. Identification of Physical Parameters – Colour, Odour, Taste
2. Estimation of Total, Volatile, Dissolved, Suspended Solids
3. Determination of Chlorides
4. Determination of Optimum Coagulant Dose
5. Determination of Chlorine Demand
6. Estimation of settleable solids using Imhoff Cone
7. Determination of Dissolved Oxygen with D.O. Meter
8. Determination of B.O.D
9. Determination of C.O.D
10. Determination of M.P.N
11. Determination of Fluorides in water
12. Determination of Nitrates
13. Determination of Sulphates
14. Determination of Iron
15. Determination of Phosphorus

Note: At least 12 of the above experiments are to be conducted

Reference Books

1. IS: 3025
2. Lab Manual prepared by faculty of Civil Engineering dept., Gudlavalleru Engineering College.

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Optional Elective - III

INFRASTRUCTURE DEVELOPMENT

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To evaluate infrastructure development.
- To know PPP Procurement Process in India.
- To manage the risks associated with various infrastructure projects.
- To identify the critical issues in infrastructure financing.

Learning Outcomes

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

- PPP as a mechanism to attract private investment for development.
- risk identification, risk sharing and risk mitigation for PPP projects.
- contracting for and contract management of PPP contracts during their lives.
- financing instruments available for PPP projects.

Course Content

UNIT - I: Infrastructure Development – Introduction

Infrastructure Development and Economic Growth - Sources of Financing Infrastructure Projects - Limitations of Traditional Procurement Process.

UNIT - II: PPP – Overview

Infrastructure Development through PPP Route - Stakeholders' Perspectives - Governments Roles in Successful PPP Projects - Bidding Evaluation And Bidding Rules- Value For Money Assessment.

UNIT - III: PPP - Procurement Process

PPP Procurement Process - PPP Contractual Package - PPP Procurement Process in Indi.

UNIT - IV: Structuring a PPP: Available PPP Options

Service Contract - Management Contracts - Affermage or Lease Contracts- Concessions -Build–Operate–Transfer and Similar Arrangements -Joint Venture - Hybrid Arrangements

UNIT - V: Risk Management

Risks Associated With Various Infrastructure Projects - Risk Management - Risk Identification - Risk Assessment - Risk Allocation - Risk Mitigation - Risk Allocation Framework - PPP Road Projects in India

UNIT - VI: Project Finance

Introduction to Project Finance - Project Financing Process - Project Finance - Security Package - Preparing Financing Plan - Lending Institutions in India

Text Books

1. Public-Private Partnerships - Managing risks and opportunities, Akintoye, A., Beck, M., & Hardcastle, C. (Eds.). (2003), Oxford: Blackwell Science Limited.
2. Project financing - Asset-based financial engineering, Finnerty, J. D. (1996), New York: John Wiley & Sons, Inc.
3. Investment project design - A guide to financial and economic analysis with constraints, Kurowski, L., & Sussman, D. (2011), New Jersey: John Wiley & Sons.
4. Project finance for construction and infrastructure: Principles and case studies, Pretorius, F., Lejot, P., McInnis, A., Arner, D., & Hsu, B. F.-C. (2008), Oxford: Blackwell Publishing.

Reference Books

1. Infrastructure as an asset class - Investment strategies, project finance and PPP, Weber, B., & Alfen, H. W. (2010), West Sussex: John Wiley & Sons
2. Project Finance in Asia Pacific: Practical Case Studies, Tinsley, R. (2002). London, UK: Euromoney Books.
3. Guidelines for infrastructure development through Build-Operate-Transfer (BOT) projects, UNIDO. (1996), Vienna: UNIDO.
4. Privatized infrastructure: the Build Operate Transfer approach, Walker, C., & Smith, A. J. (1995), London: Thomas Telford.

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Optional Elective - III

BASICS OF POWER PLANT ENGINEERING

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the working principles of various power plants.

Learning Outcomes

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

- identify the various conventional energy resources.
- explain the working principles of various power plants used in electric power generation.

Course Content

UNIT - I: Introduction

Energy and power, Sources of Energy Types of power plants and Development of Power in India.

UNIT - II: Steam Power Plant

Plant Layout, Components, Working of different Circuits, Coal Handling Systems, Ash handling systems.

UNIT - III: Gas Turbine Plant

Introduction, Types of Gas Turbine Plants, Layout with auxiliaries, Principles of working of Closed and Open Cycle Gas Turbines. Combined cycle Gas Turbine power plants, Cogeneration

UNIT - IV: Diesel power plant

Introduction- Plant layout with auxiliaries, Fuel supply system, Lubrication and Cooling system.

UNIT - V: Nuclear Power Station

Nuclear reactor- Reactor Operation,.Classification of Nuclear Reactors: Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast Breeder Reactor.

UNIT - VI: Hydroelectric Power Plant

Classification of Hydroelectric Power Plants, Typical Layouts, Plant auxiliaries, Classification of dams and spill ways.

Text Books

1. An Introduction to Power Plant Technology, G.D. Rai, 3rd Edition Khanna Publishers, 2004,
2. Power Plant Engineering, P.K.Nag, 4th Edition, Tata McGraw-Hill Education, 2014.

Reference Books

1. A Course in Power Plant Engineering, S.C. Arora and S. Domkundwar, Dhanpat Rai & Co. (P) Limited, 2014
2. Power Plant Engineering, R. K. Rajput, 4th Edition, Laxmi Publications, New Delhi, 2016.
3. Power Plant Technology, M.M.El-Wakil, Revised 2nd edition, Tata McGraw-Hill Education.

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Optional Elective - III

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

III Year – I Semester

Lecture : -

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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FOUNDATION ENGINEERING

III Year – II Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To introduce the stability of earth slopes.
- To familiarize with lateral earth pressure and stability of retaining walls.
- To familiarizewith load carrying capacity of shallow and deep foundations.

Learning Outcomes

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

- choose suitable type of boring and generate soil investigation report.
- verify stability of slopes of an embankment.
- develop pressure distribution diagrams and judge the stability of retaining walls.
- calculate bearing capacity of shallow and deep foundations.
- adopt proper construction and remedial measures of well foundations.

Course Content

UNIT - I: Soil Exploration

Need – Methods of soil exploration – Boring and Sampling methods – Penetration Tests– Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.

UNIT - II: Earth Slope Stability

Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stabilityanalysis by Swedish arc method, Bishop's Simplified method – Taylor'sStability Number.

UNIT - III: Earth Pressure Theories

Rankine's & Coulomb's theory of earth pressure, Culmann's graphical method

Retaining Walls

Types of retaining walls – Design approach of gravity, cantilever retaining walls.

UNIT - IV: Shallow Foundations

Bearing capacity–criteria for determination of bearing capacity– factors influencing bearing capacity– analytical methods to determine bearing capacity– Terzaghi,

Meyerhof and IS code methods. Safe bearing pressure based on N- value –safe bearing capacity.

UNIT - V: Pile Foundation

Classification of piles – Load carrying capacity of piles based on static pile formulae– Dynamic pile formulae– Pile load tests - Load carrying capacity of pile groups in sands and clays.

UNIT - VI: Well Foundation

Different shapes of well foundations –Forces acting on well foundation– Design of individual Components– Construction and sinking of well foundations – Tilts and shifts.

Text Books

1. Soil Mechanics and Foundation Engineering, K.R. Arora, 7th Edition, Standard Publishers and Distributors, Delhi.
2. Geotechnical Engineering Principles and practices of soil mechanics and foundation engineering, VNS Murthy, 2nd Edition, CRC Press.

Reference Books

1. Basic and Applied Soil Mechanics, Gopal Ranjan & ASR Rao, 3rd Edition, New Age International Pvt. Ltd, New Delhi.
2. Geotechnical Engineering, C. Venkataramiah, 6th Edition, New Age International Pvt. Ltd, (2002).
3. Soil Mechanics, T.W. Lambe and Whitman, 2nd Edition, Mc-Graw Hill Publishing Company, New York.
4. Foundation Analysis and Design, Joseph E. Bowles, 5th Edition, McGraw-Hill.

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HIGHWAY ENGINEERING

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with different concepts in the field of Highway Engineering.
- To acquire design principles of Highway geometrics and pavements
- To learn various highway construction and maintenance procedures.

Learning Outcomes

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

- plan the alignment of highway network for the given area.
- design the highway geometrical elements.
- design intersections and prepare traffic management plans.
- identify the suitability of pavement materials and design flexible & rigid pavements.
- understand the principles of construction and maintenance of highways.

Course Content

UNIT - I: Introduction

Types of pavements; Functions and requirements of different components of pavements. Railway Engineering- Permanent Way Components, Cross Section of Permanent way. Airport Engineering: Basic elements of airport-Runway, Taxiway, Apron, Terminal building and Hanger, Aircraft and its characteristics. Harbour Engineering- Classification of ports and harbours, requirement of a good port.

UNIT - II: Highway Development and Planning

Introduction about Roads, Jayakar Committee and its recommendations, Necessity for Highway Planning, Different Road Development plans, Classification of Roads, Road network patterns, Highway Alignment, Factors affecting Alignment, Engineering Surveys.

UNIT - III: Highway Geometric Design

Important of Geometric Design, Design Controls and Criteria, Highway Cross Section Elements, Sight Distance Elements, Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance, Design of Horizontal Alignment, Design of Super elevation, Extra Widening - Widening of pavement on horizontal

curves, Transition Curves – Objectives of providing transition curves, different types of transition curves, Calculation of length of transition curve, Vertical Alignment- Gradients – categories of gradients – compensation in gradient on horizontal curves, Vertical Curves – different types of vertical curves.

UNIT - IV: Highway Materials

Highway materials: aggregate properties and tests: crushing, abrasion and impact test, bitumen properties and tests, penetration, ductility, viscosity, binder content and softening point. Marshall Method of mix design

UNIT - V: Design of Pavements and Pavement Failures

Design of flexible pavement by C B R method as per IRC 37-2012, stresses in rigid pavement by Westergaards and IRC methods. Failures in flexible pavements, Failures in rigid pavements

UNIT - VI: Highway Construction and Maintenance

Highway construction: Earthen roads, WBM roads, bituminous concrete roads and cement concrete roads, Highway maintenance – Maintenance of Earth roads, bituminous surfaces, Cement concrete roads.

Text Books

1. Highway Engineering, S.K Khanna, C.EC Justo and A.Veeraragavan, Revised 10th Edition, Nem Chand and Bros.
2. Highway Railway Airport & Harbour Engineering, K.P Subramanian, Scitech publications.

Reference Books

1. Transportation Engineering and Planning, Papacostas C.S. and PD Prevedouros, 3rd Edition Prentice Hall of India Pvt. Ltd; New Delhi.
2. Transportation Engineering Volume II, C.Venkatramaiah, University Press
3. Transportation Engineering - An Introduction, Jotin Khisty C, Prentice Hall, 3rd Edition, Englewood Cliffs, New Jersey.
4. Highway Engineering, Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi.

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DESIGN OF RC STRUCTURES

III Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the different types of design philosophies and IS:456 - 2000 provisions
- To introduce the concepts of limit state of collapse and serviceability for analysis and design of structural elements along with detailing and drawings
- To impart the knowledge on the design of shear, development length, deflection and cracking.

Learning Outcomes

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

- explain the fundamental behaviour of RCC structures and code provisions of IS 456:2000 and IS 875.
- analyze the beams for flexure in limit state of collapse and serviceability.
- analyze and design the beams subjected to shear, bond and torsion.
- design the beams for flexure in limit state of collapse and serviceability
- design the one-way and two-way slabs for flexure in limit state of collapse and serviceability.
- design the columns and footings.

Course Content

UNIT - I: Limit State Method

Introduction: Materials of reinforced concrete, Loading Standards as per IS 875, grades of concrete and grades of steel used in concrete. Introduction to working stress, Ultimate load and limit state methods. Elastic theory, design constants, modular ratio - Depth of neutral axis and moment of resistance -balanced, under-reinforced and over-reinforced sections. Concepts of limit state design— Characteristic load, Characteristic strength – Partial load and safety factors – representation of stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design, stress-block parameters and limiting moment of Resistance.

UNIT - II: Analysis of Beams

Limit state analysis of singly reinforced, doubly reinforced, rectangular, T and L beam sections.

UNIT - III: Shear and Deflection

Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Limit state design of serviceability for deflection, cracking and code provisions.

UNIT - IV: Design of Beams

Design of singly reinforced, doubly reinforced and flanged beams; simply supported, cantilever and continuous beams- Examples with detailing.

UNIT - V: Design of Slabs

Design of one-way slabs, two-way slabs, continuous slabs using coefficients of IS code. Design of waist slab for staircase and detailing.

UNIT - VI: Design of Columns and Footings.

Short and Long columns - axial loads, uni-axial and bi-axial bending moments- use of IS Code provisions. Design of isolated footings for axial loads.

Note: All designs are to be taught in Limit State method.

Following plates should be prepared by the students.

1. Reinforcement particulars of T-beams and L-beams.
2. Reinforcement detailing of continuous beams.
3. Detailing of one way, two way and continuous slabs
4. Reinforcement particulars of columns

Semester End Examination Pattern

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

Text Books

1. Limit State Design of Reinforced concrete, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, 2007, Laxmi Publications.
2. Design of Reinforced concrete Structures, S.Ramamrutham and R Narayana, Dhanpat Rai publishing Co (P) Ltd.
3. IS Codes: IS 456:2000, IS 875(Part I & II).

Reference Books

1. Fundamentals of Reinforced concrete design, M.L. Gambhir, 3rd edition, Printice Hall of India Private Ltd.
2. Limit state design of reinforced concrete, P.C.Varghese, 2nd edition, Printice Hall of India Private Ltd.
3. Reinforced concrete design, S.Unnikrishna Pillai & Devdas Menon, 3rd edition, Tata Mc.Graw Hill, New Delhi.

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ADVANCED STRUCTURAL ANALYSIS

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with numerical methods of Engineering analysis
- To impart the knowledge on ILDs of three hinged arches.
- To familiarize with basic principles of matrix methods of structural analysis
- To introduce the basics of theory of elasticity

Learning Outcomes

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

- adopt the methods for analysing engineering products.
- draw ILD for three hinged arches.
- analyze indeterminate trusses.
- apply concept of matrix methods for framed structures up to two degree of freedom.
- explain the principle of elasticity and stress strain relationships.

Course Content

UNIT - I: Engineering Analysis

Methods of engineering analysis-Introduction to experimental, Analytical and numerical methods, Variational method-Rayleigh-Ritz method, Concept of potential energy-Constituents of total potential energy, Strain energy, Stationary properties and variation characteristics of total P.E, Weighed residual methods - Point allocation method, Sub domain method, Least squares method, Galerkin's method.

UNIT - II: Three Hinged Arches

Introduction, Influence line diagrams-Three hinged arches - point loads and udl.

UNIT - III: Indeterminate Structural Analysis

Indeterminate Trusses -Determination of static and kinematic indeterminacies-Castiglione's theorem - Solution of trusses up to two degrees of internal and external indeterminacy.

UNIT - IV: Flexibility method of Analysis

Analysis of continuous beams with support settlement and rigid jointed plane frames with static indeterminacy not exceeding two.

UNIT - V: Stiffness method of Analysis

Analysis of continuous beams with support settlement and rigid jointed plane frames with kinematic indeterminacy not exceeding two. Direct formulation of stiffness matrix for plane frames with number of bays and stories not exceeding one.

UNIT - VI: Introduction to Theory of Elasticity

Introduction to theory of elasticity: Notations for forces and stresses, components of stresses and strains, plane stress, plane strain-definitions, differential equations of equilibrium-Hooke's Law

Text Books

1. Structural analysis, T.S. Thandavamoorthy, Oxford University press, New Delhi, 2011.
2. Introduction of finite element analysis by S.Md. Jalaludeen, Anuradha publications, 2011.
3. Theory of Elasticity, Timoshenko and Goodier, McGraw Hill Publishers, 2010.
4. Structural Analysis - A Matrix Approach, G Pandit , S. Gupta, McGraw Hill Publishers, 2008.

Reference Books

1. Theory of Structures, Ramamrutham, Dhanapatraisons publications, 2014.
2. Theory of Elasticity, Sadhu Singh, Khanna Publishers, New Delhi, 1998.
3. Structural analysis-I, S SBhavakatti, Vikas publishing house pvt ltd, 2011.
4. Analysis of structures Vol-I & Vol-II, V.N.Vazirani&M.M.Ratwani, Khanna Publishers New Delhi 1994, 1999.

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Professional Elective - II

ENVIRONMENTAL POLLUTION AND ITS CONTROL

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of Air Pollution and the control methods.
- To impart the knowledge of the Solid Waste generation problem.
- To familiarize the best practices for management of solid wastes adopted at the service provider level.
- To elucidate noise pollution problems and emphasize the necessity to control them.

Learning Outcomes

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

- evaluate the ambient air quality based on the analysis of air pollutants.
- relate the polluting plume behaviour with weather data.
- identify suitable control methods depending on the severity and type of air pollution.
- classify solid wastes and identify suitable collection and transfer mechanisms.
- suggest suitable solid waste management methods based on the nature of solid waste and the quantities to be handled.
- identify the sources of noise pollution and suggest methods for mitigating the problem.

Course Content

UNIT - I: Air Pollution

Definitions, scope, significance and episodes – Types of pollutants, their sources and impacts (on plants, animals, materials) – Classifications, natural & artificial, primary & secondary, point & non point, linear & areal sources, stationary & mobile – Sampling and analysis of air pollutants – Ambient air quality standards by WHO (World Health Organisation) & CPCB (Central Pollution Control Board).

UNIT - II : Air Pollution Meteorology

Properties of atmosphere: heat, pressure, wind forces, moisture and relative humidity – Lapse rates – Influence of terrain and meteorological phenomena on plume behaviour and air quality – Wind rose diagrams, plume rise models.

UNIT - III: Air Pollution Control and Monitoring

Control of particulates: control at sources, process changes, equipment modifications – Design and operation of control equipments, settling chambers, cyclone separators, fabric filters, scrubbers, electrostatic precipitators – Control of gases like SO_x , NO_x , CO and HC, Air-fuel ratio, computation and control of products of combustion – Monitoring of SPM, SO_2 , NO_x and CO, Stack Monitoring for flue gases.

UNIT - IV: Solid Waste Generation and Collection

Characteristics – types, sources, and properties of solid waste – Generation, typical generation rates, estimation of solid waste quantities, factors that affect generation of wastes – Collection services, types of collection systems, determination of vehicle and labour requirement and transportation of solid waste – Transfer stations, transfer means and methods.

UNIT - V: Solid Waste Management and Disposal

Engineered systems for solid waste management (refuse, reduce, reuse, recover, recycle) – Reuse of solid waste materials, processing techniques, materials recovery system, recovery of biological, thermal conversion products and recovery of energy from conversion products – Recycling of segregated waste materials – Ultimate Disposal of solid waste (Land filling, incineration, composting).

UNIT - VI: Noise Pollution and Control

Sources of noise pollution, impacts of noise, measurement of noise and permissible limits of noise, control methods of noise pollution, The Noise Pollution (Regulation and Control) Rules, 2000 as per CPCB.

Text Books

1. Air Pollution, M.N.Rao, H.V.N.Rao, 1st Edition, McGraw Hill Education.
2. Solid and Hazardous Waste Management, M.N.Rao, Razia Sultana, 1st Edition, BS Publications.
3. Noise Pollution and Its Control, H.C.Bhatia, 1st Edition, Atlantic Publisher.

Reference Books

1. Advanced Air and Noise Pollution Control, Lawrence K.Wang, Norman C. Pereira, Yung-Tss Hung, 2005 Edition, Humana Press.
2. Municipal Solid Waste Management, P.Jayarama Reddy, 1st Edition, B.S.Publications.

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Professional Elective - II

GROUND WATER DEVELOPMENT AND MANAGEMENT

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on ground water flow in confined and unconfined aquifers.
- To familiarize with the principles involved in design and construction of wells.
- To provide awareness on improving the groundwater potential using various recharge techniques.
- To introduce the concept of saline water intrusion in coastal aquifers and its control measures.

Course Outcomes

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

- estimate aquifer parameters and yield of wells.
- analyse radial flow towards wells in confined and unconfined aquifers.
- design wells and understand the construction practices.
- select appropriate methods of artificial recharge for increasing groundwater potential.
- Illustrate effective measures for controlling saline water intrusion.

Course Content

UNIT - I: Introduction

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 - II: Well Hydraulics

Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jacob and Chow's methods, Leaky aquifers

UNIT - III: Well Design

Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

UNIT - IV: Well Development

Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open-hole, bail-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT - V: Artificial Recharge

Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies. Groundwater Basin Management: Concepts of conjunction use, Case studies.

UNIT - VI: Saline Water Intrusion

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben-Herzberg relation, Shape of interface, control of seawater intrusion.

Text Books

1. Groundwater, H.M.Raghunath, third edition, New age international publishers
2. Ground water Hydrology by David Keith Todd, second edition, John Wiley & Son.

Reference Books

1. Groundwater, S.Ramakrishnan, second edition, Scitech publications
2. Ground Water Assessment: Development and Management, K. R. Karanth, twelfth reprint, Tata McGraw-Hill.

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GROUND IMPROVEMENT TECHNIQUES

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the need of ground improvement techniques in improving the strength parameters of soils.
- To familiarize with various dewatering methods
- To introduce the applications of reinforced earth, confinement systems and geo-synthetics

Learning Outcomes

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

- select suitable ground improvement techniques according to soil conditions.
- illustrate the concepts of reinforced earth systems.
- enumerate the concepts of soil confinement systems.
- explain the types and functions of geo-synthetics.

Course Content

UNIT - I: Introduction

Introduction – Need and objectives of Ground Improvement techniques, Classification of Ground Improvement techniques

Mechanical Stabilization – Methods of compaction, Shallow Compaction, Deep compaction techniques – Vibro-floatation, Blasting, Dynamic consolidation and Compaction piles

UNIT - II: Hydraulic Stabilization

Methods of dewatering – open sumps and ditches, Well-point system, Electro-osmosis, Vacuum dewatering wells

Drains – Types, Preloading and Design features of Vertical Drains.

UNIT - III: Physical and Chemical Stabilization

Stabilization with admixtures like Cement, Lime, Calcium chloride, Fly ash and Bitumen

UNIT - IV: Reinforced Earth Techniques

Concept of soil reinforcement, Reinforcing materials, Backfill criteria, Design of reinforcement for internal stability, Applications of Reinforced earth structures. Soil Nailing and Its applications

UNIT - V: Grouting and Soil Confinement Systems

Grouting – Objectives of grouting – grouts and their applications – methods of grouting

Soil Confinement Systems – Concept of confinement, Gabion walls, Crib walls, Sand bags

UNIT - VI: Geosynthetics

Geotextiles – types, functions, properties and applications; Geo-grids & Geomembranes - properties and applications

Text Books

1. Ground Improvement Techniques, Purushotham Raj, 2nd Edition, Laxmi Publications, New Delhi
2. An introduction to Soil Reinforcement and Geosynthetics, G.L.Siva Kumar Babu, 1st Edition, Universities Press.

Reference Books

1. Engineering Principles of Ground Modification, Hausmann M.R. (1990), 1st Edition, McGraw-Hill International Edition.

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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 controls 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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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 Resistors

Resistivity, Range of Resistivity- free electron theory - classical theory & quantum theory. Semiconducting materials: Energy gap in solids - intrinsic semi conductors - extrinsic semi conductors - element & compound 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 susceptibility - complex dielectric 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, Reflection, 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 tilted 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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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 novel 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 diagnosis 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), evoked 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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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’Reilly 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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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 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 - 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, 2nd Edition, Dreamtech Press
- Dave Thomas, Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide, 4th Edition, Pragmatic Bookshelf
- Randal L. Schwartz,ý Brian D. Foy ,ý Tom Phoenix, Learning Perl, 6th edition, O'REILLY Publications.

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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 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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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.
- use 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 n th 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 differential 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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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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STRUCTURAL ENGINEERING LAB

III Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To develop the drafting skills of the structural elements by using software
- To introduce various properties of concrete and concepts of Non-destructive testing
- To familiarizewith effect of dynamic forces on a three storied building

Learning Outcomes

Upon susscefull completion of this course, students will be able to

- draw sign conventions of the materials and building drawings using software
- detail various structural elements by using software
- determine the durability properties of concrete like permeability, carbon content, corrosion etc.
- determine the reinforcement cover by profometer.
- determine the compressive strength of hardened concrete by pulse velocity method
- evaluate the effect of dynamics on structure

Students are required to drawusing software AutoCAD or Microstation:

1. Conventional signs of various materials & building components.
2. Draw plan, section and elevation of a residential building
3. Draw plan, section and elevation of a public building
4. Detailing of rectangular/ T beam
5. Detailing of oneway & Two way slabs
6. Detailing of isolated footing

Experimental Investigations:

7. Assessment of quality of concrete by Pulse velocity Method
8. Measurement of Cover and bar diameter by Profometer
9. Evaluation of permeability of concrete by poroscope
10. Measurement of corrosion of reinforcement by half cell potential measurements
11. Measurement of Crack widths of RC beams

12. Determination of carbon content in concrete
13. Determination of chloride content in concrete
14. Measurement of static strain by electrical resistance strain gauge
15. Dynamics of a three storey building frame subjected to harmonic base excitation.

Note: At least 12 of the above experiments are to be conducted.

Text Books

1. M.S.Shetty, Concrete technology, S.Chand Publications
2. S.R. DamodaraSwamy&Kavitha, Basics of Structural Dynamics and A seismic Design, Anuradha Publishers
3. Lab Manual Prepared by Faculty of civil Engineering Dept, Gudlavalleru Engineering College.

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HIGHWAY ENGINEERING LAB

III Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To develop the testing skills of the road aggregates.
- To impart the knowledge on the properties of bitumen.
- To Study the Traffic characteristics.

Learning Outcomes

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

- characterise the highway aggregates.
- conduct tests on suitability of bitumen.
- design the traffic intersection based on traffic surveys.

List of Experiments

1. Determine the strength of the aggregates by using the Aggregate Crushing Value Test.
2. Determine the toughness of the aggregate by using the Aggregate Impact Value Test.
3. Determine the flakiness index of the given aggregate sample.
4. Determine the elongation index of the given aggregate sample.
5. Determine the Attrition value of a given aggregate sample.
6. Determine the Abrasion value of a given aggregate sample.
7. Determine the Specific gravity & Water absorption values for a given aggregate sample.
8. Determine the Penetration value of a given bitumen sample
9. Determine the Softening point value for a given bitumen sample.
10. Determine the Flash & fire point of a given bituminous material sample.
11. Determine the Ductility value of a given bituminous material sample,
12. Determine the Traffic Volume at a given section of the road.
13. Determine the Spot speed value at a given section of the road.
14. To design the bituminous mix by using the Marshall stability test.

NOTE: At least 12 of the above experiments are to be conducted

Reference Books

1. Lab Manual prepared by Department of Civil Engineering, Gudlavalleru Engineering College.

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SMART BUILDING AND AUTOMATION

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concept of building management systems.
- To emphasize the importance of automating the building operations for safety, health and economy.
- To demonstrate current trends in home automation.

Learning Outcomes

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

- explain the concepts of DAQ, M2M, SCADA, BMS and IoT.
- list out the categories of hardware needed for automating the operation of building systems.
- identify the issues of communication standards for integrating systems.
- detail the aspects of human comfort that can be managed automatically.
- emphasize the importance of security and safety and its automation.
- illustrate current developments in the field of home automation.

Course Content

UNIT - I: Building Management Systems

Introduction: data acquisition from devices (DAQ), machine to (2) machine communication (M2M) between devices, Supervisory Control and Data Acquisition (SCADA), Building Management Systems (BMS), Internet of Things (IoT) Structure, components, commissioning – Differences between SCADA, BMS and IoT, dashboards and user interfaces.

UNIT - II : Hardware needed for control

Sensors, actuators, variable speed drives, cameras, network cabling, UPS (uninterrupted power supply), scanners, PLC (Programmable Logic Controller), ethernet, installation, integration, commissioning, retro-commissioning.

UNIT - III: Software needed for DAQ and bus standards.

Proprietary and open standards; MODBUS, Lonworks, Bacnet, KNX, Data Protocols, Data security, legacy systems integration

UNIT - IV: Controlling Occupant Comfort

Lighting, Ventilation, Cooling and Heating, Smoking Areas, Enhanced Ventilation for special areas – Automated control of comfort using BMS.

UNIT - V: Security and Access Control

Fire Safety and Smoke Detection, CCTV, intrusion alarms, parking ventilation, lifts, emergency systems, plumbing – Automated tracking of security and safety using BMS.

UNIT - VI: Smart Homes

Smart Speakers from Amazon (Echo), Google (Home), Microsoft (Invoke by Harman Kardon), Apple (Home Pod) – integration with alarms & sensors – heating & cooling – lights & switches – video Camera.

Text Books

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Hanes David, Salgueiro Gonzalo, Grossetete Patrick, Barton Rob, Henry Jerome, Pearson Education, Cisco Press, Paperback – 16 Aug 2017.
2. Automation Systems In Smart and Green Buildings, V.K. Jain, Khanna Publishers, 2009.

Reference Books

1. Building Automation: Communication systems with EIB/KNX, LON and BACnet, Hermann Merz, Thomas Hanseemann, Christof Hübner, Springer 2nd Edition. 2018.
2. Internet of Things (Smart Sensors, Measurement and Instrumentation), Subhas Chandra Mukhopadhyay, Springer, 2014.

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BUILDING INFORMATION MODELING

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the importance of Building Information Modelling (BIM) in Architecture, Engineering and Construction (AEC) industry
- To familiarise the use of BIM with owners, facility managers, architects, engineers and contractors.

Learning Outcomes

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

- apply the knowledge of inefficiencies with 2D and advantages of 3D modeling
- make use of BIM tools for model designing.
- adopt BIM towards risk identification.
- appraise the advantages and applications of BIM for designers and engineers
- provide the scope and guidance of BIM for contractors and suppliers.
- acknowledge wide use of BIM enabled processes for fabrications.

Course Content

UNIT - I: Introduction

The current (Architecture, Engineering and Construction) AEC business model, Documented inefficiencies of traditional approaches, BIM: New Tools and New Processes.

UNIT - II: BIM Tools & Parametric Modeling

The Evolution of object –based parametric modelling, BIM Environments, platforms and tools, Major BIM Design platforms,

Interoperability- different kinds of exchange formats, the evolution from file-Based exchange to building.

UNIT - III: BIM for Owners and Facility Managers

BIM application areas for owners, tool guide for owners, Owner and Facility Manager's.

Building model, Barriers to Implementing BIM: Risks and Common Myths, Guidelines and Issues for Owners to Consider when Adopting BIM.

UNIT - IV: BIM for Architects and Engineers

Scope of design services, use in design processes, building object models and libraries, considerations in adoption for design practices.

UNIT - V: BIM for Contractors

Types of Construction Firms, Information Contractors Want from BIM, Processes to Develop a Contractor Building Information Model, Reduction of Design Errors Using Clash Detection, Quantity Takeoff and Cost Estimating, Construction Analysis and Planning, Integration with Cost and Schedule Control and Other Management Functions, Use of BIM Onsite: Verification, Guidance and Tracking of Construction Activities.

UNIT - VI: BIM for Subcontractors and Fabricators

Types of Subcontractors and Fabricators, BIM-Enabled Process Change, Generic BIM System Requirements for Fabricators, Major Classes of Fabricators and Their Specific Needs, Adopting BIM in a Fabrication Operation.

Text Books

1. BIM Handbook- A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors, Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, 4nd Edition, John Wiley & sons publications.
2. BIM and Construction Management: Proven Tools, Methods, and Workflows, Brad Hardin & Dave McCool, John Wiley & sons publications.

Reference Books

1. BIM for Construction Clients, Richard Saxon, 1st Edition, RIBA Publishing.
2. BIM Design: Realising the Creative Potential of Building Information Modeling, Richard Garber, John Wiley & sons publications.

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DATABASE MANAGEMENT SYSTEMS

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize the concepts of database systems and different issues involved in the database design.
- To introduce how to write 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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PROJECT MANAGEMENT AND FINANCE

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To define the importance of project management (PM) and causes of failure in construction projects.
- To identify PM network objectives and techniques and basics of network analysis.

Learning Outcomes

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

- apply the principles of project management in construction industry.
- adopt the applications of CPM & PERT techniques in planning & scheduling of engineering projects.
- compare alternative cash flow methods.
- prepare worth analysis and proposals of a project.
- apprise financial management of construction project.
- apply the concept of risk management in construction projects

Course Content

UNIT - I: Planning, Scheduling & Monitoring

Projects; Causes of project failure, Planning, Scheduling and controlling, Steps involved in planning; Objectives; Principles; Advantages; Limitations; Stages of planning; Scheduling, Preparation of construction schedules; Methods of scheduling; Bar charts; Mile stone charts; Controlling; Job layout; Factors affecting job layout; Project work break down structure; Activities involved and its duration.

UNIT - II: Networks

Project Management through Networks Objectives of network techniques; Fundamentals of network analysis; Events; Activities; Dummies; Types of networks; Choice of network type.

PERT & CPM: Time estimates; earliest expected time; Latest allowable occurrence time; Slack; Critical path; Probability of completion time for a project, difference between CPM and PERT; Earliest event time; Latest event time; Activity time; Float; Critical activities and critical path.

Precedence network- simple networks with less than 5 activities

UNIT-III: Comparing Alternatives Proposals

Comparing alternatives-Present worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR) Analysis, Benefit/Cost Analysis, Break Even Analysis.

UNIT - IV: Cash Flows

Time Value of Money –Cash Flow diagram –Nominal and effective interest-continuous interest; Single Payment Compound Amount Factor(P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)–Problem time zero (PTZ)-equation time zero (ETZ). Constant increment to periodic payments –Arithmetic Gradient(G), Geometric Gradient (C).

UNIT - V: Risk Management

Introduction to Risk-management; Risk uncertainties and management decision in capital budgeting- Uncertainties due to improper planning;

UNIT - VI: Financial Management

Introduction to construction finance and control, costs associated with construction facilities, Estimates- Design Estimates, Bid Estimates and Control Estimates, Effect of scale on construction cost, Means of financing, Application of financial assistance, Cost control, Financial accounting systems, financial control.

Text Books

1. Construction Project Management Theory and practice, Kumar Neeraj Jha , Pearson publications.
2. Project Planning and Control with PERT & CPM, Dr. B.C.Punmia &K.K.Khandelwal, 4th edition, Laxmi Publications.
3. Construction economics: A new approach by Danny myers, Taylor and francis publisher.
4. The construction industry aspects of its economics and management, Ofori. G, 2nd edition, Singapore University press.

Reference Books

1. Project Management byHarvey Maylor, edition-2, Mac Millan India Ltd., Delhi.
2. Construction Management & Planning by B. Sengupta& H. Guha, Tata McGraw – Hill Publishing Co. Ltd., New Delhi.
3. Construction Planning, Equipment & Methods, Peurifoy R. L, McGraw – Hill International Book Company.
4. PERT & CPM Principles and applications, L. S. Srinath; Affiliated East West Press.

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ESTIMATION, COSTING AND VALUATION

IV Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concept of estimate, types of estimate and estimating a work.
- To build ability of calculating road and canal work quantities.
- To impart knowledge on different specifications of civil works.
- To familiarize with rate analysis, contracts and valuation.

Learning Outcomes

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

- prepare detailed and abstract estimates for civil engineering works.
- estimate road work quantities.
- distinguish the specifications for civil works and contracts.
- work out rate analysis and prepare valuation reports for roads and buildings.

Course Content

UNIT - I: General items of work in building

Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating. Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Units of measurement; Detailed Estimates of Buildings - Individual wall method, Centre line method for various types of buildings with veranda & different rooms

UNIT - II: Rate analysis

Specifications, Purpose and method of writing specifications; General specifications. Detailed specifications for Brick work, R.C.C, Plastering, Mosaic Flooring, Stone Masonary.

Analysis of Rates: Task or out – turn work; Labour and materials required for different items of work. Rates of materials and labour.

Preparing analysis of rates for items of work like PCC, RCC Works, Brick work in foundation and super structure, Plastering, CC flooring and White washing.

UNIT - III: Earthwork for Roads and Canals

Quantity and cost estimation of a Road– Mid sectional area method, Mean sectional area method and Trapezoidal area method - Vertical drop in ground. Quantity and cost estimation of a Canal – fully in excavation case, fully in embankment case and partially in excavation & in embankment case

UNIT - IV: Reinforcement - Bar Bending and Bar Requirement Schedule

Quantity estimation and bar bending schedule for RCC items like roof slab, beam, column with footing .

UNIT - V: Contracts

Types of contracts – Contract Documents – Conditions of contract, PWD Accounts And Procedure of Works Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor carpet area; Approximate estimate; Plinth area estimate; Revised estimate; Supplementary estimate.

UNIT - VI: Valuation of Buildings

Valuation, Cost, Price & value. Methods of valuation, Depreciation, Methods for estimating cost depreciation, Valuation of building. Miscellaneous Topics Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage. Standard specifications for different items of building construction, first class building, second class building.

Note: students should submit four case studies from units one to four.

Semester End Examination Pattern

The end examination paper should consist of Part A and Part B. Part A consists of two questions in estimation of quantities by centre line method or individual wall method, out of which one question is to be answered. Part B consists of five questions out of which three are to be answered. Weightage for part A is 40% and for part B 60%.

Text Books

1. Estimating and costing in civil engineering, B.N. Dutta, twenty-seventh edition, UBS publishers, 2000.
2. Estimating and Costing, G.S. Birdie, second edition, Dhanapati Rai Publishers.

Reference Books

1. Standard Schedule of rates and standard data book by public works department.
2. I.S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
3. Estimation, Costing and Specifications, M. Chakraborti, sixth edition, Laxmi publications.
4. Valuation of Real properties, S. C. Rangwala, second edition, Charotar Publishing House, Anand.
5. National Building Code-2016(NBC).

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DESIGN OF STEEL STRUCTURES

IV Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the types of structural steel sections, plastic analysis and IS code provisions.
- To introduce the principles for design of tension members, compression members and elements of truss using I.S. code.
- To impart the design aspects of laterally supported beams, unsupported beams and welded plate girder in accordance with I.S. code provisions.

Learning Outcomes

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

- explain various types of structural steel sections and the concepts of plastic analysis.
- analyse the strength of bolted and welded joints for eccentric loads.
- design the members subjected to direct tension and compression using I.S code.
- develop lacing / batten columns and column bases.
- design laterally supported and unsupported beams.
- design elements of welded plate girder, curtailment of plate girder and simple truss elements.

Course Content

UNIT - I: Structural Steel & Plastic Analysis

Structural steel – Rolled steel sections – Convention for member axes – Types of loads – Load combinations- Design philosophies – Partial safety factors - Limit states of strength and serviceability.

Concept of Plastic analysis – Idealized stress –strain curve, behavior of beam in flexure – Plastic hinge, Shape factors of rectangle, circle, triangle, T, channel and I sections – Classification of cross-sections as per IS code.

UNIT - II: Connections

Types of connections - Riveted, Bolted and Welded connections - Bolted - Introduction - Design of ordinary and high strength friction grip bolts - Welded - Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds - Permissible stresses – IS Code requirements – Welded Bracket connections.

UNIT - III: Tension members& Compression members

Tension Members: Introduction - Types of Tension members- Effective Net Area - Shear lag – Slenderness Ratio - Types of Failures – Design strength of Tension Members- Gross Section Yielding - Net Section Rupture – Block Shear - Design of members subjected to direct tension - simple and compound members.

Compression Members: Introduction - Effective length - Slenderness ratio - Types of sections – Types of buckling – Design of axially loaded columns- simple and compound section compression members.

UNIT - IV: Built-up columns & Column bases

Built-up Columns: Introduction - Design of built-up columns, lacing and batteningsystems and column splices

Column Bases: Types - Design of Slab base and Gusset base.

UNIT - V: Beams

Introduction – Lateral Stability – Elastic Critical Moment – Bending Strength – Shear Strength – Web Buckling - Web Crippling - Deflection - Design of laterally supported, unsupported beams, Lintel and Purlins.

UNIT - VI: Plate girder & Roof Trusses

Plate Girder: Introduction – Elements - Design considerations – I.S. Code recommendations – Curtailment of flange plates - Stiffeners - Design of welded plated girder.

Roof Trusses: Introduction - Types of roof trusses – Design loads – Load combinations – I.S. Code recommendations – Structural Details – Design of simple roof trusses involving design of purlins, members and joints.

Note:

1. IS – 800 (2007), IS 875-Part III and Steel tables are permitted to use in examination Hall.
2. Welding connection should be used from Units 3 to 6.

Semester End Examination Pattern:

The end examination paper should consist of part A and part B. Part A consists of two questions in Design and Drawing, out of which one question is to be answered. Part B consists of five questions out of which three are to be answered. Weightage for part A is 40% and for part B 60%.

Text Books

1. Limit state Design of Steel Structures, S.K.Duggal, Second Edition, Tata Mc.Graw Hill Education Pvt. Limited.
2. Design of Steel Structures- Limit State Method, N. Subramanian, First Edition, Oxford University Press.

Reference Books

1. IS 800 : 2007 – General Construction in Steel - Code of Practice.
2. Limit State Design in Structural Steel, M. R. Shiyekar, Edition of 2009, PHI Learning Pvt. Limited.
3. Design of Steel Structures, K.S. Sai Ram, Second Edition, Dorling Kindersley (India) Pvt. Limited.
4. Design of Steel Structures- Limit State Method, S.S.Bhavikatti, Fifth Edition, I.K. International Publishing House Pvt. Limited.

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PRE-STRESSED CONCRETE

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the concept of prestressing and IS code provisions.
- To impart the knowledge on analysis and losses of prestress
- To introduce design procedures of pre-stressed concrete members under flexure and shear

Learning Outcomes

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

- apply concepts & methods for pre stressing systems
- analyze pre-stressed concrete members for flexure
- design pre-stressed concrete beams considering the different losses
- evaluate shear resistance of pre-stressed concrete members
- determine the deflections of pre-stressed concrete members
- analyze and design the end blocks.

Course Content

UNIT - I: Introduction to Prestressed Concrete

Historic development – General principles of pre-stressing, pre-tensioning and post tensioning – Advantages and limitations of pre-stressed concrete – Materials – High strength concrete and high tensile steel their characteristics, Durability, Cover requirements for PSC members. I.S. Code provisions, Methods and Systems of Pre-stressing; Pre-tensioning and post tensioning methods – Different systems of pre-stressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

UNIT - II: Analysis of Prestressed Members

Analysis of sections for flexure: Elastic analysis of concrete beams pre-stressed with straight, concentric, eccentric, bent and parabolic tendons. Pressure Line or Thrust Line, concept of load balancing.

UNIT - III: Losses of Prestress

Losses of pre-stress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete,

Relaxation of steel, slip in anchorage bending of member and frictional losses, total Losses allowed for design

UNIT - IV: Design of Section for Flexure and Shear

Design of Section for Flexure and Shear: Allowable stress, Design criteria as per I.S. Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.

UNIT - V: Deflections of Prestressed Concrete Beams

Importance of control of deflections –factors influencing deflections–short term deflections of un-cracked member's prediction of long term deflections, Deflection of Cracked members.

UNIT - VI: End Blocks

Analysis of End Blocks by Guyon's method and Magnel method, Anchorage zone stresses - Approximate method of design –Anchorage zone reinforcement - Transfer of pre-stress pre-tensioned members.

Text Books

1. Prestressed Concrete by N Krishna Raju, 5thedition, Tata McGraw Hill Publications.
2. Prestressed Concrete by Ramamrutham, 5thedition, Dhanpatrai Publications.

Reference Books

1. Fundamentals of Pre-stressed Concrete by Sinha N.C. and Roy S.K, 3rdedition, S.Chand & Company limited.
2. Pre-stressed concrete structures by N.Rajagopalan, 2nd edition, Alpha Science International Ltd
3. Design of Pre-stressed concrete structures by T.Y. Lin & Ned H.Burns, 3rdedition, John Wiley & Sons
4. IS 1343- 2012 Indian standard code of practice for Pre-stressed concrete.

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ADVANCED FOUNDATION ENGINEERING

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with advanced knowledge of foundations in various practices
- To appreciate the foundation practices in difficult soil conditions under different loading conditions

Learning Outcomes

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

- compute the bearing capacity of foundations at abnormal conditions
- calculate oil settlements for cohesive and cohesion less soils using advanced methods
- explain swelling characteristics of soil
- check various stability conditions for retaining structures

Course Content

UNIT - I: Mat Foundation

Mats/ Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils

UNIT - II: Settlement Analysis

Immediate settlement of footings resting on granular soils – Schmertmann & Hartman method – De Beer and Martens method - Immediate settlement in clays – Janbu's method – Correction for Consolidation settlement using Skempton and Bjerrum's method – Correction for construction period

UNIT - III: Earth Retaining Structures

Cantilever sheet piles – anchored bulkheads – fixed and free earth support methods – design of anchors – braced excavations – function of different components – forces in ties – stability against bottom heave.

UNIT - IV: Laterally Loaded Piles

Negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock Method – laterally loaded piles in cohesive soils – Davisson and Gill method – Broms' analysis.

UNIT - V: Swelling Characteristics

Swelling - factors affecting swelling; Swelling potential - swell pressure - Methods of determination – factors affecting swelling potential and swell pressure; Heave – factors affecting heave- methods of determination of heave

UNIT - VI: Foundation Practices in Expansive Soils

Sand cushion – Belled Piers – Granular pile, Under – reamed pile foundations – Construction techniques – design specifications – Load - carrying capacity in compression and uplift of single and multi – under reamed piles in clays and sands

Text Books

1. Basic and applied soil mechanics, Gopal Ranjan and AS Rao, 2nd Edition, New Age Publishers.
2. Principles of Foundation Engineering, BM Das, 7th Edition, Cengage Learning

Reference Books

1. Foundation Analysis and Design, JE Bowles, 5th Edition, Mc Graw Hill Publications
2. Soil Mechanics and Foundation Engineering, VNS Murthy, 1st Edition, CBS Publishers
3. Foundation Design, WC Teng, 13th Edition, Prentice Hall Publishers.

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TRAFFIC ENGINEERING

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce fundamental knowledge of traffic engineering.
- To acquire design principles of traffic engineering.
- To familiarize with various traffic issues including planning, safety, operation and control.

Learning Outcomes

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

- develop a basic knowledge on the fundamental issues in traffic engineering.
- demonstrate the clear understanding of the factors influencing road vehicle performance.
- define the basic principles in highway geometric design and apply these principles to solve simple problems.
- apply the principles of traffic flow and queuing theory in designing signaling systems.
- explain the critical procedures for highway capacity and level of service analysis.

Course Content

UNIT - I: Traffic Characteristics

Basic traffic characteristics - Speed, volume and concentration, Relationship between Flow, Speed and Concentration Volume Studies- Objectives, Methods, Speed studies - Definition of Spot Speed, time mean speed and space mean speed, Methods of conducting speed studies; Presentation of speed study data;

UNIT - II: Highway Capacity and Level of Service

Head ways and Gaps; Critical Gap; Gap acceptance studies. Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways, multilane highways and freeways.

UNIT - III: Parking Studies and Traffic Accident Studies

Parking Studies and Traffic Safety, Types of parking facilities - on street parking and off-street Parking facilities, Parking studies and analysis, Accident studies

and analysis; Causes of accidents-The Road, The vehicle, The road user and the Environment; Engineering, Enforcement and Education measures for the prevention of accidents.

UNIT - IV: Intersection Design

Type of Intersection, Conflicts at Intersection – At grade intersection – Uncontrolled, Channelization, signalized intersection - Design of Isolated Traffic Signal by Webster method, Types of Grade Separated Intersection and Design of Rotary.

UNIT - V: Traffic Regulation and Signals

Traffic Regulation and Environment: - Traffic Signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram Warrants for signalization, Signal Coordination methods. Detrimental effects of Traffic on Environment; Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic

UNIT - VI: Intelligent Transportation Systems

Components of ITS, Traffic Management - Incident Management, Advanced vehicle control and safety systems, Electronic toll collection, Traveller Information System, Benefits and costs of ITS.

Text Books

1. Traffic Engineering and Transportation Planning, L. R. Kadiyali, 4th Edition, Khanna Publishers, 1991
2. Highway Engineering, S. K. Khanna & C.E.G Justo, 9th Edition, Nem Chand & Bros Publisher, 2012
3. Intelligent Transport Systems Standards, Bob Williams, 2008, Artech House Publishers

Reference Books

1. Traffic Engineering-Theory & Practice, Louis J. Pignataro, 2nd Edition, Prentice Hall Publication, 1973
2. Transportation Engineering-An introduction, C. Jotin Khistry, 3rd Edition, Prentice Hall Publication, 2002
3. Traffic Flow Fundamentals, A.D., Prentice Hall Inc., 1990, New Jersey.

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Professional Elective - III

INDUSTRIAL WASTEWATER MANAGEMENT

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the knowledge of industrial wastes and their pollution potential.
- To introduce manufacturing processes of different types of industries.
- To elucidate the high-level strategies adopted to deal with industrial effluents.

Learning Outcomes

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

- characterise industrial effluents.
- identify relevant pre and primary treatment options for specific effluents.
- relate pollution problems to specific constituents of effluents and their removal.
- suggest pollution control strategies for food processing industries.
- suggest pollution control strategies for material manufacturing industries.
- draw up action plan for setting up a common effluent treatment plant.

Course Content

UNIT - I: Sources of Pollution

Physical, Chemical and Biological properties of Industrial Wastes – Differences between industrial and municipal wastewaters, difficulty to generalise industrial waste characteristics – Discontinuity and seasonality of some wastes) – Direct disposal, combined treatment, dedicated treatment – Effects of industrial effluents on sewers and treatment plants.

UNIT - II: Pre and Primary Treatment

Equalization, objectives, parameters that could be treated by equalisation – Proportioning, dilution with other effluents – Neutralization, mixing wastes – Oil Separation by Floatation, quiescent flotation and mechanically aerated floatation, types of solids that can be removed by floatation.

Waste Reduction – Volume Reduction, conservation of wastewater – Strength Reduction – Recirculation of industrial wastes.

UNIT - III: Waste Treatment Methods

Nitrification and De-nitrification, Aerobic biological methods, algal ponds – Phosphorous removal, chemical precipitation, Aerobic biological methods, algal ponds – Heavy metal removal, chemical precipitation, precipitation reactions – Membrane Separation Process – Air Stripping and Adsorption Processes – Special

Treatment Methods, ion exchange, advanced oxidation, distillation – Disposal of Treated Waste sludge – Disposal of Treated Wastewater.

UNIT - IV: Food Processing Industries

Manufacturing Processes, Characteristics and Composition of wastewater in the following industries; Dairy, Sugar, Fermentation (Brewery, Distillery, Pharmaceutical industry), Fisheries.

Flow diagrams for process and wastewater treatment, byproducts if any from wastewater treatment.

UNIT - V: Material Manufacturing Industries

Manufacturing Processes, Characteristics and Composition of wastewater in the following industries; Metal (Steel, mineral processing), Liquid (Petroleum Refineries), Fibre (Paper and Pulp, Flow diagrams for process and wastewater treatment, byproducts if any from wastewater treatment – Apparel Manufacturing Industries, Manufacturing Processes, Characteristics and Composition of wastewater in the following industries; Textiles, Tanneries – Energy Transformation Industries: Manufacturing Processes, Characteristics and Composition of wastewater in the following industries; Coal based power plants, Atomic Energy Plants, Flow diagrams for process and wastewater treatment, byproducts if any from wastewater treatment.

UNIT - VI: Effluent Treatment Plants

Joint Treatment of Raw Industrial wastewaters and Domestic Sewage – Common Effluent Plants (CETPs) - (Location (Site and Process Selection) planning, plant design, commissioning)

Operation and Maintenance Problems- (fouling of equipment due to industrial wastes)

Economical aspects - (cost considerations and funding of projects, special requirements)

Text Books

1. Industrial Water Pollution Control, W. Wesley Eckenfelder Jr., McGrawHill.
2. Wastewater engineering - Treatment & Reuse, Metcalf and Eddy, TATA McGrawHill.

Reference Books

1. Liquid Waste of Industry - Theories, Practices & Treatment, N.L.Nemerow, Addison Wesley.
2. Environment Engineering, Peavy, Rowe & Tchobanoglous, McGrawHill.
3. Water and Wastewater Engineering Volume 1 (water supply and wastewater removal), Fair, Gayer and Okun, John Wiley and Sons.
4. Water and Wastewater Engineering Volume 2 (water purification and wastewater treatment and disposal, Fair, Gayer and Okun, John Wiley and Sons.

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ADVANCED DESIGN OF RC STRUCTURES

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the design procedure for flat slabs and footings.
- To make understand the loading pattern and design procedure for silos and bunkers.
- To familiarize with I.R.C loads and their application on designing the R.C bridges.
- To introduce the design procedure of R.C water tanks.

Learning Outcomes

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

- design footings
- analyze and design the flat and grid slabs
- analyze and design cantilever and counter fort retaining wall
- design the R.C silos and bunkers.
- design R.C. deck slab bridges using I.R.C loadings.
- design elevated R.C water tanks.

Course Content

UNIT - I: Footings

Different types of footings – Design of isolated footing for axial and bending moments, Rectangular and circular footings subjected to axial loads only.

UNIT - II: Flat slab

Design of Flat slab - Direct design method -reinforcement detailing, Shear - beam shear and punching shear, Reinforcement detailing of flat slab.

UNIT - III: Retaining Walls

Types of retaining wall, Forces on retaining wall, stability requirements, Design of cantilever and design principles of counter fort Retaining walls.

UNIT - IV: Silos and Bunkers

Introduction – Concepts of loading and Design, design of Circular silos and rectangular R.C. bunkers.

UNIT - V: Bridges

Introduction to concrete bridges – IRC loadings, Deck Slab Bridge – Design concepts

UNIT - VI: Water Tanks

Design of R.C elevated circular and rectangular water tanks.

Text Books

1. Advanced Reinforced concrete structures, Varghese, Prentice Hall India Pvt. Ltd.
2. Design and Drawing of concrete structures, N. Krishnam Raju, University press 2005.

Reference Books

1. Reinforced concrete structures Vol.2, B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain. Laxmi publications Pvt.Ltd., New Delhi.
2. Essentials of Bridge engineering, D.Johnson Victor, Oxford and IBM publications Co.Ltd.
3. Reinforced concrete structures, I.C.Syal and Goel, S.Chand publishers.
4. All Relevant I.S. codes for Bridges IRC-6:2010 – Loading specifications IRC-112:2011 Design specifications For Water tanks BIS –IS-3370.

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HYDRAULIC STRUCTURES

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the design principles of hydraulic structures on permeable foundations.
- To impart knowledge on various types of dams and selection of suitable type depending on site conditions
- To familiarize with the design principles of irrigation structures

Course outcomes

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

- select a suitable location for a dam, the criteria for selecting a particular dam type
- analyze stability of gravity dams
- plan and design diversion head works
- design ogee spillways and energy dissipation works
- illustrate the design principles of irrigation canal structures

Course Content

UNIT - I: Reservoirs and Dams

Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve, types of dams, merits and demerits, factors affecting selection of type of dam, factors governing selecting site for dam.

UNIT - II: Gravity Dams

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, stability analysis, drainage galleries

UNIT - III: Diversion Head Works

Diversion Head works: Types of Diversion head works-diversion and storage head works, weirs and barrages, layout of diversion head works, components. causes and failure of hydraulic structures on permeable foundations, Bligh's creep theory,

Khosla's theory, determination of uplift pressure, impervious floors using Bligh's and Khosla's theory, exit gradient, functions of u/s and d/s sheet piles.

UNIT - IV: Spillways

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances

UNIT - V: Canal Regulation Works

Canal regulation works: Head and Cross Regulator, Principles of design of distributary and head regulators, canal outlets, proportionality, sensitivity and flexibility

UNIT - VI: Cross Drainage Works

Cross Drainage works: Types, selection of site, design principles of aqueduct, siphon aqueduct and super passage.

Text Books

1. Irrigation and water power engineering, B.C. Punmia, Pande B.B Lal, Ashok Kumar Jain & Arun Kumar Jain, sixteenth edition, Laxmi publications.
2. Irrigation Water Resources and Water Power Engineering, P.N.Modi, seventh edition, Standard Book House

Reference Books

1. Water resources engineering principles and practice, Satyanarayana Murthy. Challa, revised second edition, New Age International Publishers
2. Irrigation engineering and hydraulic structures, S.K Garg, thirty forth edition, Khanna Publishers.

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Professional Elective - IV

GEOSYNTHETICS

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with geosynthetics.
- To impart knowledge on designing the geosynthetic material for various functions.

Learning Outcomes

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

- explain geosynthetics.
- interpret the test methods of different materials of geosynthetics.
- explain the design considerations for different materials of geosynthetics.

Course Content

UNIT - I: Introduction

Overview of Geosynthetics, types – geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners and geocomposites – their manufacturing

UNIT - II: Geotextiles

Properties and test methods – functions – designing for separation, reinforcement, stabilization, filtration, drainage.

UNIT - III: Geogrids

Properties and test methods – design for geogrid reinforcement for roads, reinforced wall, foundation, slopes and embankments.

UNIT - IV: Geonets and Geosynthetic clay liners (GCL)

Geonets: Properties and test methods – design for geonet drainage in view of environmental and transportation application

Geosynthetic clay liners (GCL): Properties and test methods, designing with GCL as single and composite liners – GCL on slopes

UNIT - V: Geomembranes

Properties and test methods – design considerations of geomembrane in pond, canal, reservoirs and solid liners

UNIT - VI: Geocomposites

Geocomposites in separation, reinforcement, filtration and drainage

Text Books

1. Designing with Geosynthetics, Koerner, R.M, Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. An Introduction to Soil Reinforcement & Geosynthetics, G L Siva Kumar Babu, 1st edition, University press

Reference Books

1. Soil Reinforcement with Geotextiles, Jewell, R.A., Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.
2. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.

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Professional Elective - IV

DISASTER PREPAREDNESS AND PLANNING

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To provide an exposure to disasters, their significance and types.
- To familiarize with impacts of disaster key skills.
- To impart the knowledge on different approaches of Disaster risk reduction.

Learning Outcomes

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

- differentiate the types of disasters, causes and their impact on environment and society.
- analyze relationship between development and disasters.
- explain the process of risk management.
- assess vulnerability and various methods of risk reduction measures as well as mitigation.

Course Content

UNIT - I: Introduction

Concepts and definitions: disaster, disaster Management, hazard, vulnerability, risk, capacity, mitigation. Types of Disasters, five priorities for action, relationship between disaster and human development, Disaster Management cycle,

UNIT - II: Disasters classification

Disasters classification; Natural disasters –floods, Drought, earthquake, cyclone, landslide. Manmade disasters –industrial pollution, nuclear radiation, chemical spills, bio terrorism, transportation accidents. Hazard and vulnerability profile of India.

UNIT - III: Disaster Impacts

Introduction, Life and livestock loss, Habitation, agricultural and livelihood loss, Additional health hazards, Contamination of drinking water sources, impact on children, Environmental loss. Impacts of climate change, greenhouse gases.

UNIT - IV: Disaster risk reduction

Disaster management cycle- its phases, prevention, mitigation, preparedness, relief & recovery; structural and non-structural measures, basic strategies and practices

of disaster risk reduction, global policies and practices, risk management framework, vulnerability and capacity assessment.

UNIT - V: Education and Community Preparedness:

Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience building community capacity for action

UNIT - VI: Role of Technology in Disaster Management

Disaster management for infra structures, mitigation program for earthquakes – flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training- transformable indigenous knowledge in disaster reduction.

Text Books

1. Disaster Management – Global Challenges and Local Solutions, Rajib shah & R R Krishnamurthy, 2009, Universities press.
2. Disaster Science & Management, Tushar Bhattacharya, 2012, Tata McGraw Hill Education Pvt. Ltd., New Delhi.

Reference Books

1. Disaster Management – Future Challenges and Opportunities, Jagbir Singh, 2007, I K International Publishing House Pvt. Ltd.
2. Disaster management, Ghosh G.K, 2006, APH Publishing Corporation.
3. National Disaster Management Plan, Ministry of Home affairs, Government of India (<http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf>).

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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 agencies and 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; skills and strategies; rescue, relief reconstruction. Case Studies: Lessons and Experiences from Various Important Disasters in India

UNIT - III: Flood and Drought Disaster

Raising flood damage, assessing flood risk, flood hazard assessment, flood impact assessment, flood risk reduction options. Drought and development, relief management and prevention, drought mitigation and management-integrating technology and people.

UNIT - IV: Landslide and Earthquake Disaster

Land slide hazards zonation mapping and geo environmental problems associated with the occurrence of landslides. The use of electrical resistivity method in the study 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 safety and 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, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic 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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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 algorithms 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-point, 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 occurred.

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, Earthing – 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. Refrigeration 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
- assess 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.,

Course Content

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 (IoT).
- 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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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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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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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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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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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, lambda 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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COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB

IV Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To familiarise with programming languages to solve the civil engineering problems
- To introduce the concept of designing structures by using software.
- To impart the knowledge on Arc GIS software in solving civil engineering problems

Learning Outcomes

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

- develop a program for solving a simple civil engineering problems.
- design an RC structural element by using software.
- apply Arc GIS techniques to solve civil engineering problems

List of Experiments

Write any Four Programs Using C or C++, JAVA etc

1. Design a Reinforced beam for flexure by Limit state method
2. Design a T beam by Limit state method
3. Design of one way.
4. Design of Two way slab.
5. Design of RCC compression member
6. Determination of bearing capacity of soil by IS code
7. Estimation of Settlement of foundations in Cohesive Soil.
8. Estimation of runoff for a catchment area.

Analyze and Design any four of the following Elements using STAAD

Pro or STRUDS or STRAP

1. Analyze and design any type of determinate structure
2. Analyze and design any continuous beam
3. Analyze and design of a Compression Member.
4. Analyze and design any portal frame without sway

5. Analyze and design any portal frame with sway
6. Analyze a simple truss
7. Design of a frame against Wind loads.
8. Design of a frame against Earthquake loads.

Exercise any four of the following GIS Experiments

1. Creation of AOI, Clip and Mosaic (Satellite Imagery or Toposheet)
2. Digitization of Satellite Map/Toposheet and Creation of thematic maps
3. Calculate Geometry for vector data.
4. Developing Digital Elevation model from contours.
5. Catchment and stream delineation from DEM using QGIS
6. Supervised classification.

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Optional Elective - VII

PROJECT SCHEDULING AND CONTRACTS

IV Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the knowledge on contract documents and specifications.
- To illustrate the Methodology of scheduling for activities and resources.
- To distinguish scheduling methods and contracts.
- To address the need of tender, estimation and bidding process.

Course Outcomes

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

- explain the role of key stake holders in construction projects.
- apply available techniques for scheduling.
- evaluate event time probabilities and activity durations.
- distinguish the scope of construction contracts.
- develop pre-qualification process for construction projects.
- determine the estimation and bidding process from contractor.

Course Content

UNIT - I: Introduction to Contracts

Contract- Study of Construction Drawings & Specifications, details of project- role of project manager and estimator, Schedule of Meetings-Superintendent and Subcontractors, and Meeting with the client, contractor and the Architect.

UNIT - II: Physical Creation of the Schedule

Software tools available – Primavera, Microsoft Project , Division of Project into Subnet works, Develop Responsibility Codes, Information Codes, Specific Subnet works, Draft the Logic Diagram, Number the Activities , Tie the Subnets Together, Computerization, Refinement , Scheduler Refinement, The Circular Path, Float Analysis, Refinement with Superintendent and

UNIT - III: Scheduling Methods

Program Evaluation and Review Technique (PERT) Introduction, PERT Defined, Computing PERT Durations, Calculating PERT Event Times and Probabilities, Advantages and Disadvantages of PERT, Linear Scheduling Method (LSM): Definitions, Elements of LSM Schedules, Preparation of LSM Schedules, Use of LSM Schedules, Advantages of LSM Schedules, advantages of LSM Schedules

UNIT - IV: Construction Contracts

Contract Document, The Contract Drawings, The Specifications, The General Conditions of Contract (GCC), The Special Conditions of Contract (SCC), The Bill of Quantities (BOQ).

Classification of Engineering Contracts: Separated Contract, Management Contract, Integrated Contract, Discretionary Contract.

UNIT - V: Pre-qualification Process

Pre-qualification Process, Notice Inviting Tender, Submission of Bids, Analysis of Submitted Tenders, Basis for Evaluation and Acceptance, Letter of Intent, Work Order, Agreement, CPWD Contract Conditions, FIDIC form of Contract Agreement, Need and Principles of FIDIC Contracts, Salient Features of FIDIC form of Contract, New Engineering Contract (NEC).

UNIT - VI: Contractor's Estimation and Bidding Process

Pre-qualification Process, Study of Tender Document preparation, Drawings and Tender Summary, Decisions to take, Arrange for Site Visit and Investigation, Consultation, Queries and Meetings, and Other Associated Works, Construction Schedule and Other Related Schedules, Collect Information, Determination of Bid Price, Analysis of Rates, Fix Mark-up, Computing Bid Price, Submit Bid, Post-Submission Activities.

Text Books

1. Construction Project Scheduling, Michael T. Callahan, Daniel Quackenbush, James E. Rowings-McGraw-Hill series in construction engineering and project management.
2. Construction Project Management-Theory and Practice, Kumar Neeraj Jha.
3. Project Planning and control with PERT & CPM, B.C. Punmia & K.K. Khandelwal: Laxmi Publications.
4. Construction economics: A new approach, Danny Myers, Taylor and Francis publisher.

Reference Books

1. The Construction industry aspects of its economics and management, Ofori. G. Singapore University press.
2. Estimating and Costing, B.N. Dutta, UBS Publishers, 2000.
3. Construction Management & Planning, B. Sengupta & H. Guha; Tata McGraw-Hill Publishing Co. Ltd. New Delhi.

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OPTIMIZATION TECHNIQUES

IV Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with various methods of optimization, decision making methods and design of civil engineering systems structural members.

Learning Outcomes

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

- formulate objective functions and constraints
- understand intricacies of classical and non-traditional optimization methods
- understand applicability of optimization methods to civil engineering problems

Course Content

UNIT - I: Introduction

Basic theory and elements of optimization Terminology and definitions Basic principles and procedure of optimization. Classical Methods of Optimization: Trial and error method, Monte Carlo method and Lagrangian Multiplier Method.

Linear Programming: Introduction, terminology, standard form of linear programming problem, geometrical interpretation, canonical form of equation graphical and algebraic methods of solving L.P. problems,

UNIT - II: Linear Programming

Simplex, methods, Dual formulations. Network analysis: Introduction to network theory, transportation and assignment models formulation of mathematical models and solutions

UNIT - III: Non Linear programming

Non Linear programming: Unconstrained and constrained methods of optimization on .Univariate search, Steepest Descent Methods, Kuhn Tucker conditions – Penalty functions, slack variables and Lagrangian Multiplier methods

UNIT - IV: Dynamic Programming

Dynamic Programming, Necessity of non-traditional optimization methods, Differential Evolution and Particle Swarm Optimization Methods.

UNIT - V: Role of Multiobjective Optimization

Role of Multiobjective Optimization, Multicriterion criterion Decision Making Methods Compromise Programming, Analytical Hierarchy Process, TOPSIS

UNIT - VI: Structural Optimization

Optimum structural design of reinforced concrete T and L beams Optimization of planner trusses, Optimization of reinforced concrete beams, Optimization of concrete mix proportioning, Optimization of reservoir operation, Optimization of Pavement systems

Text Books

1. Engineering Optimization, S.S. Rao, New Age Internationals (1999)
2. Multicriterion Analysis in Engineering and Management, K.Srinivasa Raju, D. Nagesh Kumar, Prentice Hall of India (PHI) Learning Pvt. Ltd, New Delhi, 2014
3. Vedula, S. and Mujumdar, P. P., (2005) Water Resources Systems: Modeling Techniques and Analysis, Originally Published by Tata-McGraw Hill

Reference Books

1. Introduction to Optimum Design, 2nd Edition, McGraw-Hill Book Company, 2000.
2. Morris A.J., "Foundations of Structural Optimization - A Unified Approach", 3rd Edition, John Wiley and Sons, 2003.

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Optional Elective - VII

ENTREPRENEURSHIP

IV Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand entrepreneurial process and its significance in economic development of a nation.
- To provide awareness about entrepreneurship.
- To develop idea generation, creative and innovative skills.
- To design business plan.

Course Outcomes

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

- Analyse the business environment and identify business opportunities.
- Identify the elements of success of entrepreneurial ventures.
- Statutory legal and financial regulations to start a business.
- Evaluate effectiveness of different entrepreneurial strategies.
- Specify performance indicators of entrepreneurship.

Course Content

UNIT - I: Introduction to Entrepreneurship

Entrepreneur – Characteristics and qualities, Entrepreneurs vs. Intrapreneurs and Managers – Classification of Entrepreneurs; Problems and challenges - Entrepreneurship in Economic Growth, Factors influencing Entrepreneurship. Opportunities for Entrepreneurs in India and Abroad.

UNIT - II: Micro, Small and Medium Enterprises

Small Enterprises – Definition, Classification – Characteristics, – Project Formulation – Steps involved in setting up of a Small Business – Identifying, Selecting a Business. Forms of Business; Women Entrepreneurship; Rural Entrepreneurship.

UNIT - III: Idea Generation and Feasibility Analysis

Sources of Ideas - Methods of idea generation - - Product Identification - Opportunity Selection - What is a Business Plan - Significance - Formulation of

Business Plan - Business Opportunities in Various Sectors - Errors in Business Plan Formulation – Preparation of Project Report.

UNIT - IV: Institutional support for Entrepreneurship

Role of Central and State Government in promoting Entrepreneurship - Introduction to various incentives, subsidies and grants. District Industries Centres (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship and Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB).

UNIT - V: Financial Closure for Start-ups

Need – Sources of Finance, Banking sources; Non banking Institutions and Agencies; Venture Capital – Meaning and Role in Entrepreneurship; Government Schemes for funding business; Pre launch, Launch and Post launch requirements; Procedure for getting License and Registration; Challenges and Difficulties in Starting an Enterprise.

UNIT - VI: Support to Entrepreneurs

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting. Sick Industries Companies Act, 1985.

Text Books

1. Entrepreneurial Development, S.S.Khanka, S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
2. Entrepreneurship – Theory, Process and Practice, Donald F Kuratko, 9th edition, Cengage Learning 2014.
3. The Dynamics of Entrepreneurial Development and Management, Vasanth Desai, Himalaya Publishing House, 2011.

Reference Books

1. Entrepreneurship, Hisrich Robert D, Peters M P, 8th Edition, Tata McGraw-Hill, 2013.
2. Entrepreneurship, Rajeev Roy, 2nd edition, Oxford University Press, 2011.

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EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with basics of structural dynamics and earthquake engineering.
- To impart the knowledge of analyzing and designing earthquake resistant structure
- To introduce the seismic planning concepts and design principles of shear wall

Learning Outcomes

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

- understand the basics of earthquake engineering
- apply the basic concepts of structural dynamics
- analyze and design earthquake resistant structure
- summarize the ductility considerations while designing a structure
- illustrate the seismic planning configurations
- design shear wall and analyze masonry buildings

Course Content

UNIT - I: Engineering Seismology

Seismology –Earthquake Terminology – Causes and effects of earthquakes – Elastic rebound and plate tectonics theories – Classification of earthquakes – Seismic waves – Earthquake size-Magnitude and Intensity – Seismic zones-Seismic zoning map of India.

UNIT - II: Introduction to Structural Dynamics

Theory of vibrations – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Multi-degree of freedom (MDOF) systems: Formulation of equations of motion – Orthogonal properties of normal modes

UNIT - III: Earthquake Analysis

Introduction –Earthquake response analysis of single and multi-storied buildings – Use of seismic coefficient and response spectrum method.

UNIT - IV: Codal Provisions of Ductile Detailing

Ductility considerations in earthquake resistant design of RCC buildings, Ductility factors as per IS13920 and IS: 4326 provisions – Beam, column and joints

UNIT - V: Seismic Planning & Design of Shear Walls

Plan Configurations – Torsion Irregularities – Re-entrant corners – Non-parallel systems– Diaphragm Discontinuity – Vertical Discontinuities in load path – Irregularity in strength and stiffness – Mass Irregularities –Vertical Geometric Irregularity – Proximity of Adjacent Buildings.

shear walls: Types – Design of Shear walls as per IS:13920 – Detailing of reinforcements

UNIT - VI: Lateral Load Analysis of Masonry Buildings

Introduction- Lateral load analysis of Masonry buildings- determination and distribution of lateral forces-determination of rigidity of shear wall-shear and forces due to torsion - increase in axial load.

Text Books

1. Earthquake Resistant Design of Structures, Pankaj Agarwal & Manish Shrikhande, 1stEdition, Prentice Hall of India, New Delhi
2. Earthquake Resistant Design of Structures, S. K. Duggal, 2ndEdition, Oxford University press.

Reference Books

1. Dynamics of Structures, Clough &Penzien, Second Edition, International Edition-McGraw Hill.
2. Dynamics of Structures, A. K. Chopra 4th Edition Pearson Education, Indian Branch, Delhi
3. Earthquake Tips, C.V.R. Murty- I.I.T. Kanpur.
4. Relevant Indian Standard codes: IS-875, IS-4326, IS-13920.

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LOGISTICS INFRASTRUCTURE ENGINEERING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with various components, their functions and design principles of geometry in a railway track.
- To introduce the design principles of airport geometrics and pavements.
- To impart the knowledge of planning, construction and maintenance of Docks and Harbours.

Learning Outcomes

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

- identify the various components of a railway track
- design geometrics in a railway track.
- enumerate the need of turnouts and controllers in transportation network
- choose the area required for the construction of airports as per ICAO and FAA specifications
- design airfield pavements and suggest the methods to eliminate the pavement failures.
- explain the different elements in Docks and Harbours.

Course Content

A) Railway Engineering

UNIT - I: Components of Railway Engineering

Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast – Rail Fastenings – Creep of Rails - Theories related to creep – Adzing of Sleepers - Sleeper density – Rail joints.

UNIT - II: Geometric Design of Railway Track

Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT - III: Turnouts & Controllers

Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing.

Signal Objectives – Classification – Fixed signals – Stop signals – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations.

B) Airport Engineering

UNIT - IV: Airport Planning & Design

Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

UNIT - V: Runway Design

Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements.

C) Docks & Harbours

UNIT - VI: Planning, Layout, Construction & Maintenance of Docks & Harbours

Classification of ports – Requirement of a good port – classification of Harbours – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbours – Navigational aids.

Text books

1. Railway Engineering, Saxena & S. P. Arora, Revised edition 2013 or 2010 , Dhanpat Rai, New Delhi
2. Airport Engineering, S. K. Khanna, M. G Arora & S. S. Jain, 6th edition 2012, Nemchand Bros, New Delhi.
3. Docks and Harbour Engineering, Bindra S.P, edition 2012, Dhanpathi Rai & Sons, New Delhi

Reference Books

1. Railway Engineering, Satish Chandra and Agarwal M.M., publication 2013, Oxford University Press, New Delhi
2. Transportation Engineering Planning Design, Wright P.H. & Ashfort N.J, 4th edition, John Wiley & Sons.
3. Airport Engineering, Virendra Kumar, Edition 1, Galgotia Publishers P.Ltd, New Delhi.
4. Transportation Engineering, Srinivasa Kumar R, publication 2014, University Press, Hyderabad
5. Highway, Railway, Airport and Harbour Engineering, Subramanian KP, publication in 2010, Scitech Publications (India) Pvt. Limited, Chennai.

* * *

FINITE ELEMENT METHODS

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the fundamentals of finite element method.
- To impart knowledge of solving one dimensional and two dimensional problems by FEM.
- To introduce the concepts of axi-symmetric and iso-parametric formulation.

Learning Outcomes

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

- summarize the fundamentals of finite element method.
- develop the shape functions and stiffness matrices for various elements.
- solve the problems of one dimensional and two dimensional by FEM.
- apply the concepts of axi-symmetric and iso-parametric formulation for solving problems.
- evaluate higher order element problems by numerical techniques.

Course Content

UNIT - I: Introduction to FEM

Introduction, Need of FEM, FEM Vs Classical Methods, Advantages & Disadvantages, Applications of FEM, Functional Approximation Methods - Rayleigh – Ritz Method -Weight Residual Techniques, Steps involved in FEM as applicable to structural problems.

UNIT - II: One Dimensional Problems

Finite element modelling, Co-ordinates & shape functions, one dimensional scalar variable problems, Application to structural problems, Element stiffness of bar element due to axial loading, Formulation of stiffness matrix of bar element by direct stiffness method, minimum potential energy principle, Temperature effects.

UNIT - III: Analysis of Beams & Trusses

Derivation of stiffness matrix for beams by strain energy concept & direct stiffness method - problems on these concepts, Moment-curvature relation, Derivation of Stiffness matrix for trusses, stress calculations and problems on these concepts

UNIT - IV: Two Dimensional Problems

Finite element modelling of 2-D elements, Derivation of shape functions for two dimensional linear element(Triangular) by area co-ordinates, problems on these concept. Stress strain relationship matrix formulation for 3D & 2D systems, and stiffness matrix for CST element, Problems on these concepts.

UNIT - V: Axi-Symmetric Problems

Introduction, Axi-symmetric formulation, Derivation of shape function for axisymmetric triangular element, stress –strain relationship matrix, Strain & Stress displacement matrices- Stiffness matrix for Axi-symmetric triangular element & Problems on these concepts.

UNIT - VI: Iso-Parametric Elements & Numerical Integration

Introduction, Iso-parametric formulation, Higher order elements, Derivation of shape functions for a four noded quadrilateral element using natural coordinates, strain displacement matrix, stress-strain relationship matrix, stiffness matrix for Iso-parametric element, Numerical Integration, Gauss quadrature for performing numerical integrations.

Text Books

1. Finite Elements Methods in Engineering by Tirupati R. Chandrapatla and Ashok D. Belgaundu, 4th Revised Edition, 2012, Pearson Higher Education
2. Finite Element Analysis by Sk. Md. Jalaludin, 2012, Anuradha Publishers

Reference Books

1. FEA –Theory & Programming by C.S. Krishna Murthy- Tata Mcgraw Hill, New Delhi.
2. FEA by S.S. Bhavakatti-New age international publishers FEA by David V Hutton, Tata Mcgraw Hill, New Delhi.

* * *

Professional Elective - V

DESIGN AND DRAWING OF IRRIGATION STRUCTURES

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the knowledge and principles of hydraulic structures.
- To impart the knowledge on design principles of irrigation structures.
- To enhance partical design concept.

Learning Outcomes

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

- illustrate the components of surplus weir.
- analyze various elements of tank sluice with tower head.
- design the components of canal drop-notch type.
- design the canal regulator and its components,
- design and draw Syphon Aqueduct type-III,

Course Content

Design and Drawing of

1. Surplus weir
2. Tank sluice with tower head
3. Canal drop-Notch type
4. Canal regulator
5. Syphon Aqueduct type - III

Semester End Examination Pattern:

Any two questions of the above five questions maybe asked out of which the candidate has to answer one question

Text Books

1. Water Resources Engineering Principles and Practice, C.Styanarayana Murthy, New Age International Publishers.

Reference Books

1. Irrigation and Water Power Engineering, Punmia & Lal, Laxmi publications Pvt. Ltd., New Delhi.
2. Irrigation engineering and hydraulic structures, Sk.Garg, standard book house.

* * *

PRE-ENGINEERED BUILDINGS

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the concepts of designing water tanks, bridges, transmission line towers and chimneys.
- To familiarize on plastic behavior, plastic moment and plastic mechanism of steel structures like simple beams and portal frames.

Learning Outcomes

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

- adopt principles of plastic analysis, plastic mechanism and apply to simple beams & frames.
- apply the design principles to gantry girder and elevated steel water tanks.
- identify the configuration of truss bridges and understand the design principles of truss elements.
- develop the methodology of designing transmission line tower structures.
- understand the design concepts of self-supporting chimneys & foundations.

Course Content

UNIT - I: Plastic Analysis

Plastic analysis of steel structures – Plastic bending in beams, collapse mechanism – Fully plastic Moment – Shape factor and Plastic moment – Ultimate load carrying capacity of simple beams and portal frames.

UNIT - II: Gantry girder

Introduction – loads – Fatigue effects – Specifications – Design procedure.

UNIT - III: Pre-engineered buildings

Introduction. Steel building systems: Origin - types - advantages and disadvantages. Prefabricated construction - necessity, advantage, disadvantages. Prefabricates classification - foundation - columns - beams - roof and floor panels, wall panels, box prefabricates, erection and assembly.

UNIT - IV: Bridges

Design of pedestrian Bridge (N-Truss), Design of through type truss bridge members for dead load and equivalent live load including top, bottom bracings.

UNIT - V: Towers

Towers Loading, Analysis & Design of Transmission line towers – simple problems

UNIT - VI: Chimneys

Design of self-supporting steel chimneys including foundation.

Note: Designs are by limit state method as per IS 800-2007.

Text Books

1. Design of Steel Structures Vol. I & II, Ramchandra, 3rd Edition.
2. Design of Steel Structures, A.S.Arya & J.L.Ajmani, Nem chand & Brothers, Roorkee.

Reference Books

1. Comprehensive Design of steel structures, B.C.Punmia, Ashok kumar jain & Arun kumar jain, Laxmi publications, New Delhi.
2. Design of Steel Structures, S.K.Duggal Tata Mc Graw Hill, New Delhi.
3. Design of Steel Structures, P.Dayaratnam, Wheeler publishing, New Delhi.
4. Steel Structures, V.N.Vazirani & M.M.Ratwani, Khanna publications, New Delhi.
5. Plant cast, Precast and Prestressed Concrete, Phillips, W.R. and Sheppard, D.A. (1980), , McGraw Hill, New York.
6. Relevant steel codes of Bureau of Indian standard.

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URBAN TRANSPORTATION PLANNING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the various procedures for travel demand estimation.
- To impart the knowledge on various data collection techniques for origin and destination data.
- To familiarize with various models and techniques for trip generation, trip distribution, mode choice and traffic assignment.
- To introduce alternative urban transport network plans.

Learning Outcomes

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

- estimate travel demand for an urban area.
- plan the transportation network for a city.
- identify the corridor and plan for providing good transportation facilities.
- evaluate various alternative transportation proposals.

Course Content

UNIT - I: Urban Transportation Characteristics and Issues

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, characteristics of transportation system, Evolution of Planning Process, Travel Attributes, Assumptions in Demand Estimation, factors influencing travel demand

UNIT - II: Transport Planning Process

Data Collection And Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Ownership.

UNIT - III: Trip Generation Analysis

Trip Generation: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates;

UNIT - IV: Trip Distribution Analysis

Trip Distribution: Growth Factor Methods, average factor method, furness method, Gravity Models, calibration of gravity model, disadvantages of growth factor method

UNIT - V: Mode Choice Analysis

Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation

UNIT - VI: Traffic Assignment

Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

Text Books

1. Introduction to Urban System Planning by Hutchinson, B.G., 1st edition (1974), McGraw Hill.
2. Transportation Engineering - An Introduction by Khisty C.J., 3rd Edition, Prentice Hall.

Reference Books

1. Urban Transportation Planning: A decision oriented Approach by Mayer M and Miller E, 2nd Edition, McGraw Hill.
2. Fundamentals of Transportation Planning by Papacostas, 3rd Edition, Tata Mc Graw Hill.
3. Traffic Engineering and Transportation Planning by Kadiyali.L.R, 6th Edition, Khanna Publishers, New Delhi.

* * *

SOIL DYNAMICS AND MACHINE FOUNDATIONS

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on free and forced vibrations with and without damping for single degree freedom system.
- To familiarize field and laboratory methods of determination Dynamic Soil Properties.
- To introduce the design considerations of foundations for reciprocating machine, impact type and rotary type.

Learning Outcomes

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

- analyze free and forced vibrations with and without damping for single degree freedom system.
- solve one dimensional wave motion using wave propagation theory.
- understand pressure bulb concept by Pauw's Analogy.
- evaluate dynamic soil properties by field and laboratory tests.
- analyze machine foundations.

Course Content

UNIT - I: Introduction

Theory of vibrations: Basic definitions- free and forced vibrations with and without damping for single degree freedom system- Resonance and its effect – magnification – Logarithmic decrement.

UNIT- II: Soil Dynamics

Natural frequency of foundation – Soil system: Barkan's and IS methods – pressure bulb concept – Pauw's Analogy.

UNIT - III: Wave propagation

One dimensional wave motion – propagation in an elastic infinite medium – wave propagation in an elastic half space – propagation of flexural waves in beams on elastic foundations

UNIT - IV: Dynamic Soil Properties

Field and Laboratory methods of determination – Uphole, Down hole and cross hole methods –Cyclic plate load test – Block vibration test – Determination of Damping factor

UNIT - V: Block foundation

Degrees of freedom - analysis under different modes of vibration – codal provisions for design and construction of foundations for reciprocating machine, impact type and rotary type.

UNIT - VI: Vibration Isolation

Generation and propagation of vibrations – basic concept of vibration isolation – base isolation – shock isolation – seismic isolation of bridges

Text Books

1. Handbook of Machine Foundations, P.Srinivasulu and G.V.Vaidyanathan, 1st edition, Tata McGraw Hill
2. Soil Dynamics, ShamsheerPrakash, 1981 edition, McGraw Hill Publishers.
3. Soil Dynamics and machine foundations, Swami Saran, 1999 edition, Galgotia Publications Pvt Ltd.

Reference Books

1. Dynamics of Bases and Foundations, Barken, McGraw Hill Publishing Co.,New York.
2. Vibration of Soils and Foundations, Richart, Hall and Woods, Prentice Hall, eaglewood Cliffs, New Jersey, USA.

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ENVIRONMENTAL IMPACT ASSESSMENT

IV Year – II Semester

Lecture : 4

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 predic the impacts related to soil and water.
- assess and predic 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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ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

ELECTRICAL AND ELECTRONICS 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 pioneer in electrical and electronics engineering education and research, preparing students for higher levels of intellectual attainment, and making significant contributions to profession and society.

Mission

- * To impart quality education in electrical and electronics engineering in dynamic learning environment and strive continuously for the interest of stake holders, industry and society.
- * To create an environment conducive to student-centered learning and collaborative research.
- * To provide students with knowledge, technical skills, and values to excel as engineers and leaders in their profession.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- * Graduates will have technical knowledge, skills and competence to identify, comprehend and solve problems of industry and society.
- * Graduates learn and adapt themselves to the constantly evolving technology to pursue higher studies and undertake research.
- * Graduates will engage in lifelong learning and work successfully in teams with professional, ethical and administrative acumen to handle critical situations. Graduates are expected to attain.

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

- * Apply the knowledge of circuit design, analog & digital electronics to the field of electrical and electronics systems.
- * Analyze, design and develop control systems, industrial drives and power systems using modern tools.

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 internship / 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:

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

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:

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

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 reevaluate 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)	23	14.37	15 - 20
2	Humanities and Social Sciences (HSS)	14	8.75	10 - 15
3	Engineering Sciences (ES)	20	12.50	10 - 20
4	Professional Core (PC)	59	36.88	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 & 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	MA2501	Linear Algebra & Differential Equations	4	1	-	4
3	EN2502	Engineer and Society	3	-	-	2
4	CH2503	Applied Chemistry	3	-	-	2
5	CT2501	Problem Solving Using C *	4	-	2	4
6	ME2501	Engineering Drawing	1	-	4	3
7	EG2502	Functional English Lab	-	-	2	1
8	CH2504	Applied Chemistry Lab	-	-	2	1
Total			19	1	10	20

* Integrated Course with Theory and Laboratory

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	MA2504	Integral Transforms and Vector Calculus	4	1	-	4
3	EE2507	Elements of Electrical Circuits	3	1	-	3
4	PH2504	Solid State Physics	4	-	-	3
5	EN2501	Environmental Studies	3	-	-	2
6	ME2503	Elements of Mechanical Engineering	3	1	-	3
7	EG2504	Professional Communication Lab	-	-	4	2
8	PH2505	Solid State Physics Lab	-	-	2	1
Total			20	3	6	20

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	EE2508	DC Machines and Transformers	3	1	-	3
2	EE2509	Electric Circuit Analysis	3	1	-	3
3	EC2503	Analog Electronics	3	1	-	3
4	EE2510	Power Systems - I	3	1	-	3
5	MA2507	Numerical Methods with Computer Applications *	3	-	2	3
6	ME2504	Mechanical Engineering Lab	-	-	4	2
7	EE2511	Electric Circuits Lab	-	-	4	2
8	EC2504	Analog Electronics Lab	-	-	4	2
Total			15	4	14	21
9	NS2501	NSS / Fine Arts / Yoga / Self Defense (Mandatory Non-Credit Course)	-	-	2	-

* Integrated Course with Theory and Laboratory

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	EC2505	Digital Circuit Design	3	1	-	3
2	EE2512	Control Systems	3	1	-	3
3	BA2501	Engineering Economics and Project Management	3	-	-	2
4	EE2513	Induction and Synchronous Machines	3	1	-	3
5	EE2514	Electromagnetic Fields	3	1	-	3
6		Open Elective-I (see list of Open Electives)	4	-	-	3
7	EC2506	Digital Circuit Design Lab	-	-	4	2
8	EE2517	Electrical Machines - I Lab	-	-	4	2
Total			19	4	8	21
9	SG2501	Sports and Games / Cultural (Mandatory Non-Credit Course)	-	-	2	-
10		Optional Elective - I	-	-	-	3
	EC2507	i) Biomedical Engineering				
	CT2512	ii) Computer Organisation and Architecture				
	EE2518	iii) Introduction to Quantum Mechanics for Engineers				
11	EE2519	Optional Elective - II (MOOCs)	-	-	-	2
Student 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	EE2520	Electrical Measurements & Instrumentation	4	-	-	3
2	EC2508	Signals and Systems	3	1	-	3
3	EE2521	Power Systems - II	3	1	-	3
4		Professional Elective - I	4	-	-	3
5		Open Elective-II (see list of Open Electives)	4	-	-	3
6	EE2525	Control Systems Lab	-	-	4	2
7	EE2526	Electrical Machines– II Lab	-	-	4	2
8	EE2527	Mini Project	-	-	4	2
Total			18	2	12	21
9		Optional Elective - III	-	-	-	3
	ME2549	i) Mechatronics				
	CT2507	ii) Object Oriented Programming Through Java				
	EE2528	iii) Control System Design				
10	EE2529	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	EE2530	Power Electronics	3	1	-	3
2	MA2511	Probability and Fuzzy Mathematics	3	1	-	3
3	EC2510	Microprocessors, Microcontrollers and Its Applications **	3	1	-	3
4		Professional Elective - II	4	-	-	3
5		Open Elective-III (see list of Open Electives)	4	-	-	3
6	EE2533	Electrical Systems Simulation Lab	-	-	4	2
7	EE2534	Electrical Measurements & Instrumentation Lab	-	-	4	2
8	EC2515	Microprocessors, Microcontrollers and Its Applications Lab	-	-	4	2
Total			17	3	12	21
9		Optional Elective - V	-	-	-	3
	CT2513	i) Data Base Management Systems				
	EC2516	ii) Nano Electronics				
	EE2535	iii) Solar and Wind Energy Systems				
10	EE2536	Optional Elective - VI (MOOCs)	-	-	-	2
Students shall opt from the list of MOOCs given by the Department)						

**** Project Based Theory Course**

L : Lecture

T : Tutorial

P : Practical

IV Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	EE2537	Power System Analysis	3	1	-	3
2		Professional Elective - III	3	1	-	3
3		Professional Elective - IV	3	1	-	3
4		Open Elective-IV (see list of Open Electives)	4	-	-	3
5	MA2512	Engineering Optimization	2	1	-	2
6	EE2544	Power Electronics Lab	-	-	4	2
7	EE2545	Power Systems Lab	-	-	4	2
8	EE2546	Internship / Industrial Training / Practical Training	-	-	4	2
Total			15	4	12	20
9		Optional Elective - VII	-	-	-	3
	EC2519	i) Analog and Digital Communication				
	CS2502	ii) Introduction to Python Programming				
	EE2547	iii) Integration of Renewable Energy Sources				
10	EE2548	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			No. of Credits
			L	T	P	
1		Professional Elective - V	3	1	-	3
2		Professional Elective - VI	3	1	-	3
3	EE2557	Project	-	-	20	10
Total			6	2	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			No. of Credits
			L	T	P	
		Professional Elective - I	4	-	-	3
	EE2522	i) Switch Gear and Protection				
	CT2519	ii) Computer Networks				
	EC2509	iii) Pulse and Integrated Circuits				
	CT2505	iv) Data Structures				
		Professional Elective - II	4	-	-	3
	EC2511	i) Digital Signal Processing				
	EC2512	ii) Embedded System Design				
	EC2513	iii) Principles of VLSI Design				
	EC2514	iv) DSP Processors and Architecture				
		Professional Elective - III	3	1	-	3
	CT2534	i) Big Data Analytics				
	EC2517	ii) CMOS Digital IC Design				
	EE2538	iii) Power Semiconductor Drives				
	EE2539	iv) Flexible AC Transmission Systems				
		Professional Elective - IV	3	1	-	3
	CS2513	i) Cyber Security				
	EC2518	ii) Digital Image Processing				
	EE2540	iii) Power System Operation & Control				
	EE2541	iv) High Voltage Engineering				
		Professional Elective - V	-	-	-	3
	EE2549	i) Electrical Distribution System	3	1	-	
	EE2550	ii) Artificial Intelligence Techniques	4	-	-	
	EE2551	iii) Advanced Control Systems	3	1	-	
	EE2552	iv) Energy Audit, Conservation and Management	3	1	-	
		Professional Elective - VI	3	1	-	3
	EE2553	i) Special Electrical Machines				
	EE2554	ii) Digital Control Systems				
	EE2555	iii) Utilization of Electrical Energy				
	EE2556	iv) HVDC Transmission Systems				

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 conversation **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 & DIFFERENTIAL EQUATIONS

(Common to CE, EEE, ME & ECE)

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 know the procedures to find the solutions of first and second order differential equations.
- To understand different procedures to solve first order linear & non-linear partial differential equations.

Learning Outcomes

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

- use the concepts of eigenvalues and eigenvectors in solving engineering problems.
- apply 1st & 2nd order differential equations to solve various engineering problems.
- apply the techniques of partial differentiation to find maxima and minima of two/three variables.
- solve first order linear & non-linear partial differential equations.

Course Content

UNIT- I: System of Linear Equations

Rank of a matrix - Echelon form, Normal form, System of equations - consistence and inconsistency, solving non-homogeneous system of equations by LU-Decomposition.

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: First order ordinary Differential Equations

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

UNIT- IV: Higher Order Linear ordinary Differential Equations

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 , $e^{ax} v(x)$, $xv(x)$.

UNIT - V: Partial Differentiation

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

UNIT - VI: First order P.D.E

Forming PDE by eliminating arbitrary functions. Solutions of linear PDE (by Lagrange's subsidiary equation). Solutions of Non-linear PDE by Charpit's method.

Text Books

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

Reference Books

1. U.M.Swamy, A Text Book of Engineering Mathematics – I & II, 2nd Edition, Excel Books, New Delhi, 2011.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 8th edition, Maitrey Printech Pvt. Ltd, Noida, 2009.

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ENGINEER AND SOCIETY
(Common to CE, EEE & ECE)
I Year – I 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 patent 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.

Course Content

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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APPLIED CHEMISTRY

I Year – I Semester

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

Course Objectives

- To impart the knowledge of batteries, solar cells, sensors and bio-sensors and boiler troubles with hard water.
- To impart the knowledge of advanced materials viz., LCD, nano materials, polymers and instrumental methods of analysis.

Learning Outcomes

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

- explain the working of lead acid battery, nickel – cadmium battery, lithium ion battery and fuel cells and to explain the applications of sensors and bio-sensors.
- explain about new generation photo voltaic cells.
- apply a suitable method of water treatment depending on the quality requirement.
- explain the methods of synthesis of liquid crystals, nano materials properties and applications of CNTs and quantum dots.
- explain properties and engineering applications of fibre reinforced plastics, conducting polymers and bio degradable polymers.
- explain the principles and working of spectrophotometer and flame photometer for the determination of a given ion in a given solution.

Course Content

UNIT–I: Electrochemical Energy Systems and Sensors

- (a) Differences between primary cells and secondary cells, Construction, electro chemical reactions and applications of secondary cells- Ni-Cd battery, 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.
- (b) Sensors and Bio-Sensors – principle, description of electro chemical sensor –applications – working of glucometer – applications of bio-sensors.

UNIT–II: Solar Energy Devices

Photo Voltaic cells – Working principle – Applications – New generation Solar cells (Thin film Solar cells, organic solar cell, dye sensitized solar cells) – Solar reflectors – Solar trough, Solar dish, Solar tower - Solar water heater.

UNIT–III: Hard Water and Boiler Troubles

Hardness of water – calculation of hardness- disadvantages of using hard water in boilers – priming and foaming – sludge and scale formation – caustic embrittlement – boiler corrosion. Treatment of boiler feed water – Zeolite process, Ion exchange process – Internal treatment – Calgon conditioning – Phosphate conditioning – Colloidal conditioning – Desalination of Brackish water by RO method.

UNIT–IV: Nano Materials and Liquid Crystals

Nano materials : Concept of Nano materials - synthesis of nano materials – Sol-gel, Thin film preparation by Chemical vapour deposition method, carbon nano tubes (CNTs) – types, properties, applications of CNTs, quantum dots – applications.

Liquid crystals - types, properties, applications, working of LCD

UNIT–V: Polymers

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, applications- OLED, poly aniline, Bio-Degradable Polymers— PHBV.

UNIT–VI: Instrumental Methods of Analysis

Electronic transition in molecules – Absorption Spectra, Beer Lambert's Law, UV spectrophotometer - principle and working – determination of Ferric Iron by spectrophotometry - Flame photometry – principle and working, estimation of sodium by flame photometry.

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., 12th Edn.,2010.
2. Engineering Chemistry by J.C.Kurisascope and J.Rajaram. volumes 1 & 2, Tata Mc Graw-Hill Publishing.

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PROBLEM SOLVING USING C

(Common to CE, EEE & ME)

I Year – I Semester

Lecture : 4 Practical : 2

Internal Marks : 40

Credits : 4

External Marks : 60

Course Objectives

- To emphasize the use of flowcharts and pseudo code in problem solving.
- To gain knowledge in C language
- To develop C Programs to solve problems.
- To familiarize with the discrete components of a computer, MS Office

Learning Outcomes

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

- design flowcharts and pseudo code for solving problems.
- understand C tokens and control statements.
- gain knowledge on arrays, strings, pointers, functions, structures and files.
- use C language for solving problems
- self-learn advanced features of C.
- prepare applications using MS-Office.

Course Content

UNIT-I

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

General form of a C program, C Tokens, basic data types, type conversion, variable declaration, console i/o statements, order of evaluation.

Sample Problems such as evaluating formulae.

Programs :

1. Creating a document using MS Word.
2. Familiarizing with the usage and applications of MS Excel.
3. Creating a presentation using MS PowerPoint.
4. Write a C program to calculate the area of triangle using the formula $\text{area} = (s(s-a)(s-b)(s-c))^{1/2}$ where $s = (a+b+c)/2$
5. Write a C program to find the largest of three numbers using ternary operator

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: Calculate the sum of first N numbers, check the given number is prime or not.

Programs : Implement a C program for the following:

1. Find the roots of a quadratic equation.
2. Read two integer operands and one operator from the user, perform the operation and then print the result. (Consider the operators +, -, *, /, % and use Switch Statement)

3. Display first N natural numbers.
4. Check whether given number is Prime (or) not.

UNIT-III

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

Problem Solving: Perform addition and subtraction of two matrices.

Programs: Implement a C program for the following

1. To search whether the given element is in the array.
2. To perform Addition and multiplication of two matrices.

UNIT-IV

Pointers – Declaration, Initialization and operations.

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

Problem Solving: Develop c program to illustrate string handling functions-strlen(), strcmp(), strcat(), strcpy(), strrev().

Programs: Implement a C program for the following:

1. To find the factorial of a given integer using recursive function.
2. Function to exchange (Swap) values of two integers using call by reference.
3. To Illustrate string handling functions-strlen(), strcmp(), strcat(), strcpy(), strrev()

UNIT-V

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

Problem Solving: Implement a structure to read and display the Name, date of Birth and salary of an Employee.

Programs :

1. Write a C Program to implement a structure to read and display the Name, date of Birth and salary of n Employees.

UNIT-VI

File Handling- Text and binary files, file handling functions, random access to files.

Problem Solving: Implement a C program to copy contents of one file to another.

Programs:

1. Implement a C program to count the number of lines, words and characters in a file.

Text Books

1. Programming in C, Second Edition Pradip Dey and Manas Ghosh, OXFORD Higher Education.
2. C Programming, E Balaguruswamy, 3rd edition, TMH.

Reference Books

1. Programming in C, ReemaThareja, OXFORD.
2. C Programming, A Problem Solving Approach, Forouzan, Gillberg, Prasad, CENGAGE.
3. R G Dromey, How to Solve it by Computer, Prentice-Hall of India, 1999.

ENGINEERING DRAWING

(Common to CE & EEE)

I Year – I Semester

Lecture : 1 Practical : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To highlight the significance of universal language of engineers.
- To introduce the concepts of drawing 3-D objects in 2-D planes and vice versa with proper dimensioning and scaling.

Learning Outcomes

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

- apply principles of drawing in representing dimensions of an object.
- construct polygons and conical curves.
- draw projections of points, lines and planes.
- draw projections of solids in different positions.
- convert orthographic views into isometric views and vice-versa.

Course Content

UNIT–I: Introduction

Geometrical Constructions

Conic Sections: Ellipse, parabola, hyperbola – general method.

UNIT–II: Orthographic Projections

Introduction to Orthographic Projections, Projections of Points, Projections of Straight Lines parallel to both planes, Projections of Straight Lines-Parallel to one and inclined to other plane.

UNIT–III: Projections of Straight Lines

Projections of Straight Lines inclined to both planes.

UNIT–IV: Projections of Planes

Regular Planes Perpendicular / parallel to one Reference Plane and inclined to other Reference Plane, inclined to both the Reference Planes.

UNIT–V: Projections of Solids

Regular solids with axis perpendicular to one reference plane, axis inclined to one reference plane and perpendicular to other reference plane.

UNIT–VI: Transformation of Projections

Conversion of Isometric Views to Orthographic Views and orthographic to Isometric Views.

Semester End Examination Pattern

Semester end examination paper consists of eight questions out of which five questions are to be answered. All questions carry equal marks.

Text Books

1. N.D. Bhatt (2014), Engineering Drawing, 53rd edition , Chariot Publications.
2. K.VenuGopal (2016), Engineering Drawing and Graphics, 5th edition , New Age International (p) Ltd Publishers.

Reference Books

1. B.V.R.Gupta and M.Raja Roy(2016),Engineering Drawing with Autocad,3rd edition , I.K. Publishers.
2. M. B. Shah and B. C. Rana(2009),Engineering Drawing , 2nd edition,Pearson Education.
3. Dhanunjay A Jolhe (20014),Engineering Drawing , 2nd edition,Tata Mc GrawHill Publishers.

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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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APPLIED CHEMISTRY LAB

I Year – I Semester

Practical : 2

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To impart the skill on chemical and instrumental methods of analysis of various parameters for determining the quality of water.
- To impart the skill on preparation of synthetic materials.

Learning Outcomes

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

- test the quality parameters of water by volumetric and instrumental methods.
- to operate the sensors for testing the water quality.
- synthesize phenol – formaldehyde resin (Bakelite).
- operate spectrophotometer and determine the concentration of Ferric Iron in a given solution.

Course Content

Introduction to Chemistry Lab (the teachers are expected to teach fundamentals like Primary, Secondary Standard Solutions, Normality, Molarity, Molality etc and laboratory ware used, error, accuracy, precision, Theory of indicators, use of volumetric titrations).

1. Practice experiment-Determination of the amount of HCl using standard Na_2CO_3 .
2. Determination of alkalinity of a given water sample.
3. Determination of acidity of a given water sample.
4. Determination of total hardness of the water sample by EDTA method.
5. (a) Determination of pH of different water samples by using pH meter.
(b) Determination of conductivity of different water samples by digital conductivity meter.
6. Determination of concentration of the given acid by using standard base conductometrically.
7. Construction of an Electro Chemical Cell.
8. Determination of rate of corrosion of carbon steel metal in acid medium in the absence and presence of Thiourea inhibitor by gravimetric method.
9. Preparation of polyaniline.
10. (a) Preparation of Printed Circuit Board.
(b) Preparation of Phenol - Formaldehyde resin.

11. Determination of concentration of Ferric Iron in a given solution spectrophotometrically.

Lab Manual

1. Vogel's Textbook of Quantitative Chemical Analysis, Fifth edition, John Wiley & Sons, Inc., New York
2. Engineering chemistry laboratory manual & record by Srinivasulu .D, Parshva publications.
3. Engineering Chemistry Lab Manual by K.Mukkanti, B.S publications,2009.

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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	: <i>if</i> -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

- Samson, T. (2010). *Innovate with English*. Hyderabad: Foundation
 - Unit SEVEN and EIGHT only
- Vijayalakshmi, M. et al (2014). *Vocabulary Builder for Students of Engineering and Technology*. Hyderabad: Maruthi Publications.
- 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
- 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-written e-mail message and doing the following task:(Compulsory)

- a. Analyzing the reasons for the 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 them.

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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INTEGRAL TRANSFORMS AND VECTOR CALCULUS

(Common to EEE & ECE)

I Year – II Semester

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

Course Objectives

- To gain the knowledge of Laplace and inverse transforms.
- To understand the concepts of Fourier series and Fourier Transforms.
- To find the solutions of integral problems using vector concepts.

Learning Outcomes

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

- apply Laplace transforms to find the solutions of ordinary differential equations.
- express a function in Fourier series and in Fourier integral form.
- apply the concepts of vector differentiation and integration to the surface and volume integrals.

Course Content

UNIT–I: Laplace Transforms

Laplace transforms of standard functions – Shifting Theorems - Multiplication and division by t , transforms of derivatives and improper integrals – Unit step function – Dirac Delta function.

UNIT– II: Inverse Laplace Transforms

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

Application: Solution of ordinary differential equations.

UNIT–III: Fourier Series

Fourier series: Determination of Fourier coefficients (without proof) – Fourier series – Fourier series in an arbitrary interval– Half-range sine and cosine series

UNIT– IV: Fourier Transforms

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

UNIT–V: Vector Differentiation

Vector Differentiation: Gradient- Divergence- Curl - Laplacian operator

UNIT–VI: Vector Integration

Line, surface and volume integrals.

Integral theorems: Greens - Stokes - Gauss Divergence Theorems (Without proof) and related problems. Applications: Work done, flux across the surface

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, II, III: 11th edition, S. Chand Publishers, 2012, New Delhi.

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ELEMENTS OF ELECTRICAL CIRCUITS

I Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand basic laws and theorems of Electrical circuits.
- To familiarize with the steady state behaviour of DC and single phase AC circuits.

Learning Outcomes

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

- describe the history and classify elements of electrical engineering
- apply various circuit laws to analyze the electrical circuits.
- analyze the steady state behavior of DC and AC circuits.
- apply network theorems to analyze the electrical circuits.

Course Content

UNIT I: Introduction to Electrical Engineering

History of Electrical Engineering -Network elements classification, Circuit concepts –Resistor(R) - Inductor(L) - Capacitor(C) -Voltage and Current Sources (Ideal and Non-Ideal)- Independent and Dependent Sources- Voltage - Current relationship for passive elements.

UNIT II: Network Equations and Reduction Techniques

Ohm's law - Kirchhoff's laws – Source transformation - Network reduction techniques series, parallel, series parallel, star-to-delta or delta-to-star transformation, Nodal analysis, mesh analysis, super node and super mesh for D.C excitations.

UNIT III: Introduction to Single Phase Ac Circuits

Self and Mutual Inductance – Coefficient of coupling- Dot convention - Generation of alternating sinusoidal quantities - R.M.S, Average values and form factor for different periodic wave forms – sinusoidal alternating quantities – Phase and Phase difference – Complex and polar forms of representations, J Notation.

UNIT IV: Sinusoidal Steady State Analysis

Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation-Concept of Reactance, Impedance, Susceptance and Admittance-Power Factor and significance of Real and Reactive power, Complex Power.

UNIT V: Network Theorems -I (Without Proof)

Superposition, Reciprocity, Thevenin's, Norton's theorems for D.C and sinusoidal excitations.

UNIT VI: Network Theorems – II (Without Proof)

Maximum Power Transfer, Millman's, Tellegen's and compensation theorems for D.C and sinusoidal excitations.

Text Books

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, McGraw Hill Company, 6th edition
2. Theory & Problems of Electric Circuits by Joseph A. Edminister - Schaum series, 6th edition

Reference Books:

1. Network Analysis by Van Valkenburg, Prentice-Hall of India Private Ltd., 8th edition.
2. Network Analysis and Synthesis by Kuo, Franklin. F, John Wiley Publishers, 2nd edition.
3. Fundamentals of Electric Circuits by Alexander & Sadiku, 2nd edition.

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SOLID STATE PHYSICS
(Common to EEE & ECE)
I Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

The course is designed to make the students to learn the conditions for propagation of laser light in guided medium 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.
- identify conductivity mechanism in semiconductors
- determine types of polarization and classius-mossoti relation
- Differentiate classical and quantum free electron theories
- derive orbital and spin contribution for magnetism

Course Content

UNIT– I: Laser

Spontaneous and stimulated emission - Einstein's coefficient and their relations - basic characteristics of laser - Basic Requirements of laser - Helium-Neon laser - Semiconductor laser - CO₂ laser - Applications 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: Physics of Semiconductor

Properties of Fermi Dirac energy distribution function - Concentration of carriers in conduction band , valance band - Intrinsic carrier concentration - Drift and diffusion currents - Einstein's relations - Hall effect - Applications of hall effect

UNIT– IV: Dielectrics

Expression for local field - Classius mosotti relation - Types of polarization - Frequency response curve of dielectrics - Dielectric loss - Dielectric strength - Loss tangent

UNIT– V: Free electron and band theory of metals

Classical free electron theory - Drawbacks of classical free electron theory – Fermi level and Fermi Dirac energy distribution function - Quantum free electron theory – Band theory-Bloch function - Kronig -penney model

UNIT– VI: Magnetic Materials

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

Text Books

1. S.O.Pillai, Solid state physics, (7th Edition), New Age International. (unit - 3,4,5,6)
2. Dr.M.N. Avadhanulu,Dr. P.G.Kshirsagar, Engineering Physics (9th Edition), S.Chand Publications (unit-1,2)

Reference Books

1. A.J.Dekker, Solid state physics, Published by Macmillan India.
2. Charles Kittel, Introduction to solid state physics, Wiley India Pvt. Ltd.
3. B.B. Laud, Laser and Non-Linear Optics, New Age international publishers
4. P.K. Palanisamy, Engineering Physics , SciTech publications

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ENVIRONMENTAL STUDIES

(Common to CE, EEE & ECE)

I Year – II 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)

Course Content

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. Ltd.(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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ELEMENTS OF MECHANICAL ENGINEERING

I Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the basic concepts of Engineering Mechanics and the principles of various force systems under static and dynamic conditions.
- To study the working of hydraulic turbines and pumps.

Learning Outcomes

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

- determine the resultant of the given force systems.
- analyze force systems using equations of equilibrium.
- determine centroid of areas and calculate the moments of inertia of areas.
- determine stresses and strains in bars subjected to loads
- determine hydrodynamic force developed by impact of jets on various plates
- analyze the working of hydraulic turbines
- analyze the working of hydraulic pumps

Course Content

UNIT–I: Introduction to Engineering Mechanics-Basic Concepts

Systems of Forces: Coplanar, Concurrent and parallel forces – Resultant – Composition and resolution of forces, – Moment of Force systems in plane and its Application – Couples.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems. Lami's Theorem - Equilibrium of Coplanar forces in plane– condition of equilibrium.

UNIT–II: Centroid and Area moments of Inertia

Centroid : Centroid for simple figures

Area moments of Inertia: Moment of Inertia of standard figures

UNIT–III: Simple Stresses & Strains

Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain

UNIT–IV: Basics of Turbo machinery

Elements of hydro-electric power plants, Angular momentum Principle, Hydrodynamic force of jets on stationary and moving flat (vertical & inclined) and curved vanes, jet striking centrally and at tip - velocity diagrams, work done and efficiency, Flow over radial vanes.

UNIT–V: Hydraulic Turbines

Classification of hydraulic turbines, Pelton wheel, Francis turbine and Kaplan turbine- working proportions, work done, efficiencies, Draft Tube, Governing of Turbines

UNIT–VI: Hydraulic Pumps

Centrifugal Pump: Introduction to Centrifugal pump, Components and Working of Centrifugal pump, Work done by the Impeller, Static head, Manometric head, Losses and Efficiencies, Multistage Pumps – Pumps in series and parallel.

Reciprocating Pump: Introduction to Reciprocating Pump, Main components and working of a Reciprocating pump, Work done by Reciprocating pump - Single Acting, Coefficient of Discharge, Slip, Percentage Slip ,Negative Slip

Text Books

1. S.S.Bhavikatti and K.G.Rajashekarappa , Engineering Mechanics, New age International Pvt. Ltd., Publishers.
2. S.S. Rattan, “Strength of Materials”, Tata Mc Graw-Hill Publications, 2nd edition
3. Dr. P.N. Modi&Dr. S.M. Seth “Hydraulics and Fluid Mechanics Including Hydraulics Machines”, Standard book house.
4. D. Rama Durgaiah “Fluid Mechanics and Machinery”, New Age International publishers.

Reference Books

1. Timoshenko & Young, Engineering Mechanics,Tata Mc Graw – Hill education (India) Pvt. Ltd.
2. S.Ramamrutam, R.Narayanan, “Strength of materials”, Dhanpat Rai Publications, 14th edition.
3. T.R Banga, B.P.Makker, S.C. Sharma “Hydraulics Fluid Mechanics and Hydraulic Machines by Khanna Publishers.
4. Dr. R.K. Bansal “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications, 9th edition.

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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 Andhra Pradesh.

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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SOLID STATE 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.
- Understand the behaviour and characteristics of various active and passive components.
- To learn utilization of laser source for optical fiber communication

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 thermistor
- 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 bending losses in optical fiber.
2	Determination of numerical aperture of an optical fiber.
3	Determination of energy band gap of a semiconductor.
4	Determination of thermal resistance by thermistor.
5	Determination of time constant of RC circuit.
6	Determination of resonance frequency of LCR circuit in series and parallel.
7	Study of the characteristics of a Zener diode.
8	Determination of magnetic field along the axis of circular disc by using Stewart and Gee's Apparatus.
9	Study normal modes in string using forced vibrations in rods-Melde's experiment.
10	Determination of Frequency of A.C supply by sono meter.
11	Determination of Hall coefficient by Hall effect.
12	Draw Hysteresis curve of a ferro magnetic material.

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.

DC MACHINES AND TRANSFORMERS

II Year – I Semester

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

Course Objectives

- To familiarize with the constructional details and working principles of D.C. machines
- To introduce the methods of starting, speed control and testing of D.C. Machines.
- To impart knowledge on constructional details, working principles, and performance characteristics of transformers.

Learning Outcomes

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

- determine the performance of D.C generator for various operating conditions.
- find the performance characteristics of various types of D.C motors.
- select suitable speed control and testing methods of D.C motor for various applications.
- find the performance specifications of a single-phase transformer for various loading conditions.
- describe the operation of single phase and three phase transformers for various operating conditions.

Course Content

UNIT - I: D.C. Generators - Construction & Operation

D.C. Generators – Principle of operation – Constructional Features- E.M.F Equation – Armature windings - Armature reaction – Commutation Process. Types of DC generators.

UNIT - II: D.C. Motors

D.C Motors – Principle of operation – Back E.M.F. - Torque equation – characteristics of shunt, series and compound motors – Losses and Efficiency.

UNIT - III: Speed Control and Testing of D.C. Motors

Speed control – by varying armature resistance, field flux and armature terminal voltage. Testing Methods– Direct method, Swinburne's Method and Regenerative method. Losses and efficiency.

UNIT - IV: Single Phase Transformers - I

Transformers construction, principle of operation; EMF Equation, Phasor diagrams on no load and load , Equivalent circuit.

UNIT - V: Single Phase Transformers - II

OC and SC tests, Sumpner's test, regulation, losses and efficiency; autotransformer, its equivalent circuit -comparison with two winding transformers.

UNIT - VI: Three Phase Transformers

Connections – star-delta, delta-star, delta-delta, star-star connections, open delta connection, Tap changing transformers, parallel operation.

Text Books:

1. Electrical machines – P.S. Bhimbra, Khanna Publishers.
2. Performance and Design of Alternating Current Machines – Clayton and Hancock
3. Electrical Machines - J.B.Gupta, S.K.Kataria& Sons
4. Performance and Design of Alternating Current Machines – M.G. Say, John Wiley and Sons Publications, 3rd Edition, 1983.

Reference Books:

1. Problems in Electrical Engineering – Parker Smith, CBS Publishers, 9th edition, 1984.
2. Electrical machines – S.K. Bhattacharya
3. Electrical machines –D P. Kothari & I. J. Nagarth, TMH, 4th Edition, 2010
4. Theory of Alternating Current Machinery- Langsdorf, TMH Electrical Machines – A. Chakrabarti & S. Debnath – Mc Graw - Hill Education, 1st Edition, 2015.

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ELECTRIC CIRCUIT ANALYSIS

II Year – I Semester

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

Course Objectives

- To introduce three - phase balanced and unbalanced AC circuits.
- To familiarize with the mathematical tools pertaining to the analyses of the phenomenon of resonance, time-response and two-port networks.

Learning Outcomes

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

- quantify the specifications pertaining to electrical resonance.
- analyze three - phase circuits with both balanced and unbalanced supplies and / or loads.
- determine the transient behavior of R-L, R-C and R-L-C circuits for different excitations.
- characterize two- port networks with alternative descriptions.

Course Content

UNIT - I: Resonance

Resonance - series, parallel circuits, concept of band width and Q factor.

UNIT - II: Balanced Three Phase Circuits

Phase sequence- Star and delta connection-Relation between line and phase voltages and currents in balanced systems - Analysis of balanced three phase circuits - Measurement of Active and Reactive power in balanced three phase systems - Two Wattmeter Method of measurement of three phase power.

UNIT - III: Unbalanced Three Phase Circuits

Analysis of Three Phase unbalanced circuits - Loop Method- Application of Millman's Theorem - Star Delta transformation Technique – Measurement of Active and Reactive power in unbalanced three phase systems.

UNIT - IV: Transient Analysis for D.C Excitation

Transient response of R-L, R-C, R-L-C series circuits for D.C excitation-Initial conditions-solution method using differential equation and laplace transforms.

UNIT - V: Transient Analysis for A.C Excitation

Transient response of R-L, R-C, R-L-C series circuits for sinusoidal excitations- Initial conditions-Solution method using differential equations and laplace transforms.

UNIT - VI: Two port Networks

Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations, Cascaded networks.

Text Books

1. Engineering Circuit Analysis by William H. Hayt & Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
2. Engineering Network Analysis and Filter Design by Gopal Bhise G,R Prem Chadha, Durgesh Kulshreshtha, Umesh Publications 1st edition.

Reference Books

1. Network Analysis and Synthesis by M.E.Van Valkenburg, Prentice-Hall of India Private Ltd., 8th edition.
2. Fundamentals of Electric Circuits by Alexander & Sadiku, 2nd edition.
3. Introduction to circuit analysis and design by Tildon Glisson, Jr. Springer Publications.
4. Schaum's Outline of Electric Circuits by Mahmood Nahvi, PhD, Joseph A. Edminister 6th edition.

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ANALOG ELECTRONICS

II Year – I Semester

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

Course Objectives

- To familiarize with the volt-ampere characteristics and applications of PN junction diode, zener diode, BJT and MOSFET.
- To introduce the concepts of Feedback and Oscillators.

Learning Outcomes

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

- Identify V-I characteristics of Diodes, BJT, MOSFET
- analyze the biasing circuits of BJT and MOSFETs.
- develop small signal models for BJT and MOSFET.
- Differentiate various Feedback connection types.
- design oscillator circuits using BJTs

Course Content

UNIT - I: PN Junction Diode

Open-circuited P-N Junction, forward bias and reverse bias operation, The Volt-ampere characteristic, Temperature Dependence of the diode V-I characteristic, Zener diode and its V-I characteristics, Avalanche and zener breakdown mechanisms, Diode applications: Half wave rectifier, full wave rectifier, bridge rectifier, clippers and clampers.

UNIT - II: BJT

Construction and working of a transistor, Transistor Configurations- CB, CE and CC, Early Effect, Comparison of CB, CE and CC, Transistor operating regions, Operating point, Bias Stability, Self bias technique.

UNIT - III: MOSFETs

Depletion type MOSFET: Construction, Drain characteristics and Transfer characteristics; Enhancement type MOSFET: Construction, Drain characteristics and Transfer characteristics; Comparison of N-with P-channel MOSFETs, Biasing of Depletion type MOSFET and Biasing of Enhancement type MOSFET.

Unit IV: Small Signal Low Frequency Transistor Model

Two-Port Devices, The Hybrid Model, Analysis of a Transistor Amplifier Circuit using h-parameters, analysis of CB, CE and CC amplifiers using the Exact hybrid model, FET Small Signal Model.

UNIT - V: Feedback Amplifiers

Basic concept of Feedback, Effects of Negative feedback, Feedback connection types: Voltage series Feedback, Voltage shunt Feedback, Current series Feedback and Current shunt Feedback.

UNIT - VI: Oscillators

Classification of Oscillators, Barkhausen criterion, RC phase shift oscillator, Wien Bridge oscillator, Hartley oscillator and Colpitt's oscillator.

Text Books

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

Reference Books

1. K.Raja rajeswari, B.Visvesvara rao, K.Bhaskara Rama Murthy and P.Chalam raju pantulu- Electronic Devices and Circuits, 2nd Edition, Pearson Education
2. David A Bell, Electronic Devices and Circuits, 4th Edition, PHI, 2003
3. Floyd, Thomas, Electronic devices, Pearson Education, 5th Edition.
4. S. C. Sarkar, Electronic Devices and Circuits-1, The Millennium Edition, 2001.

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POWER SYSTEM – I

II Year – I Semester

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

Course Objectives

- To introduce the operation of thermal, hydel, nuclear power plants and different substations.
- To impart the knowledge of economic aspects and different tariff methods

Learning Outcomes

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

- identify different components of a thermal power station.
- describe the operation of various components of a nuclear power station.
- distinguish between the operation of hydro and gas power plants.
- develop the layout of a substation.
- analyze the significance of various factors for economic analysis of power generation.
- select the suitable tariff method for various consumers.

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 rods, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR. Radiation: Radiation hazards and Shielding

UNIT - III: Hydel and Gas Power Stations

Selection of site, block diagram approach of hydro electric power plant and classification of pumped storage power plants. Gas power stations: principle of operation and components (block diagram approach only)

UNIT - IV: Substations

Classification of substations, Indoor & Outdoor substations, Substations layout showing the location of all the substation equipment- Bus bar arrangements in the Sub-Stations and their classification. Advantages of Gas insulated substations.

UNIT - V: Economic Aspects of Power Generation:

Load curve, load duration and integrated load duration curves, Discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor, utilization factor, plant use factors- Numerical Problems. Costs of Generation and their division into Fixed, Semi-fixed and Running Costs.

UNIT - VI: Tariff Methods

Desirable Characteristics of a Tariff Method. Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods.

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
2. Power System Engineering by R k Rajput, Laxmi Publications.

Reference Books

1. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.

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NUMERICAL METHODS WITH COMPUTER APPLICATION

II Year – I Semester

Lecture : 3 Practical : 2

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the various numerical techniques using MATLAB
- To be aware of different methods to solve first order differential equations.
- To construct a curve for the given data.

Learning Outcomes

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

- demonstrate various commands in MATLAB programming.
- analyze a mathematical problem and select a suitable numerical technique to implement it in MATLAB programming.
- construct an interpolating polynomial for the given data using MATLAB.
- find derivatives and integrals by using numerical techniques using MATLAB..
- utilize Method of least squares to fit a curve for the given data using MATLAB.

Course Content

UNIT - I: Introduction to MATLAB

Pre-requisite : Basics of Linear algebra

Variables - Arrays: Vectors & Matrices - Array Operations – functions - plots in MATLAB.

Lab Experiments: MATLAB Programs - function programs – Expressions - Array Operations.

UNIT - II: Algebraic and Transcendental Equations

Pre-requisite: Commands of MATLAB

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

Lab Experiments:

1. To find out the root of the Algebraic and Transcendental equations using Bisection, Regula – falsi method.
2. To find out the root of the Algebraic and Transcendental equations using Newton – Raphson method.

UNIT - III: Interpolation

Pre-requisite: Commands of MATLAB

Interpolation - Introduction - Finite differences - Forward Differences - Backward differences - Central differences - Newton Interpolation formulae - Gauss Interpolation formulae - Lagrange's interpolation.

Lab Experiments:

1. To implement Newton's Forward and Backward Interpolation formula.
2. To implement Gauss Forward and Backward interpolation formula.
3. To implement Lagranges Interpolation formula.

UNIT - IV: Numerical Differentiation and Integration

Pre-requisite: Commands of MATLAB

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

Lab Experiments:

1. To implement Numerical Differentiations Newton's interpolation formulae.
2. To implement Numerical Integration using Trapezoidal, Simpson 1/3 rule.

UNIT - V: Numerical Solutions of Ordinary Differential Equations

Pre-requisite : Commands of MATLAB

Taylor's Series Method - Euler Method - Modified Euler Method - Runge – Kutta
Fourth order Method.

Lab Experiments:

1. To find out the Numerical solution of ordinary differential equations using Euler's Method
2. To find out the Numerical solution of ordinary differential equations using R-K Method of fourth order.

UNIT - VI: Curve Fitting

Pre-requisite : Commands of MATLAB

Fitting a straight line - Parabolic curve - exponential curve - power curve by the method of least squares.

Lab Experiments:

1. To implement Least Square Method to fit a Straight line and Parabolic curve.
2. To implement Least Square Method to fit a exponential curve and power curve.

Text Books

1. Laurent V. Fausett, Applied Numerical Analysis Using MATLAB: 2nd edition, Pearson Publication, 2012, New Delhi.
2. B.S.Grewal, Higher Engineering Mathematics : 42nd edition, Khanna Publishers, 2012, New Delhi.
3. B.V.Ramana, Higher Engineering Mathematics, Tata-Mc Graw Hill company Ltd.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics: 8th edition, Maitrey Printech Pvt. Ltd, 2009, Noida.
2. Robert J. Schilling, Sandra L. Harries, Applied Numerical Methods for Engineers using MAT Lab & C, Thomson Books.
3. John. H. Mathews, Kurtis D. Fink, Numerical methods using MAT Lab, 4th edition—PHI.
4. Steven C. Chapra, Raymond P. Canale, Numerical Methods for Engineers, 3rd Edition, TATA McGraw-Hill, 2000, New Delhi.

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MECHANICAL ENGINEERING LAB

II Year – I Semester

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

Course Objectives

- To demonstrate the basic concepts of engineering mechanics and solid mechanics experimentally.
- To study the performance of various hydraulic turbines and pumps.

Learning Outcomes

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

- determine the moment of force experimentally
- determine the centroid of plane lamina
- determine the modulus of elasticity experimentally
- select appropriate pump/turbine for suitable application.

List of Experiments

1. Determination of the lengths of the diagonal of a given Cuboid.
2. Determination of centroid of the plane lamina
3. Verification of Lami's theorem
4. Calculation of moment of a force using weight balancing technique and system of pulleys
5. Determination of modulus of elasticity using universal Testing machine
6. Determination of the efficiency of jet on vanes.
7. Performance Test on Pelton Wheel.
8. Performance Test on Francis Turbine.
9. Performance Test on Kaplan Turbine.
10. Performance Test on Single Stage Centrifugal Pump.
11. Performance Test on Multi Stage Centrifugal Pump.
12. Performance Test on Reciprocating Pump.

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ELECTRIC CIRCUITS LAB

II Year – I Semester

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

Course Objectives

- To impart practical knowledge on electric circuits.
- To familiarize with the application of network theorems.

Learning Outcomes

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

- verify the applicability of network theorems to practical electrical circuits.
- specify and test RLC series and parallel resonant circuits.
- evaluate the time constant of simple rc and rl circuits.
- interpret /correlate physical observations and measurements involving electrical circuits to theoretical principles.
- measure active and reactive power flows for a given electrical installation.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Series and Parallel Resonance.
2. Determination of Self, Mutual Inductances and Coefficient of coupling.
3. Verification of Superposition & Reciprocity Theorems.
4. Verification of Thevenin's and Norton's Theorems.
5. Verification of Maximum Power Transfer Theorem on A.C & D.C.
6. Verification of Compensation & Millman's Theorems.
7. Z and Y Parameters.
8. Transmission and hybrid parameters.
9. Measurement of Active Power for Star connected balanced loads
10. Measurement of Reactive Power for Star connected balanced loads.
11. Time response of first order RL/RC network for periodic non-sinusoidal inputs.
12. Determination of form factor for non-sinusoidal waveform.

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ANALOG ELECTRONICS LAB

II Year – I Semester

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

Course Objectives

- To familiarize with various electronic components and basic electronic lab instruments.
- To conduct experiments to obtain the characteristics of diodes, MOSFETs, and BJTs.
- To conduct experiments to obtain the frequency response / functionality of RC oscillator

Learning Outcomes

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

- identify various electronic components and basic electronic measuring instruments and other lab equipment.
- verify the I-V characteristics of junction diode, zener diode, MOSFET, BJT.
- test the Zener voltage as voltage regulator, BJT voltage-divider bias and using it as an amplifier.
- verify the functionality of feedback amplifiers and oscillator circuits.

List of Experiments

PART-A: Orientation of electronic components and basic electronic lab instruments.

PART-B:

1. I-V characteristics of P-N junction diode.
2. Clippers and clampers (output response and transfer characteristics)
3. Zener diode I-V characteristics and regulation characteristics.
4. Full-wave rectifier with and without using capacitor filter.
5. Common-Base transistor input & output characteristics.
6. Common-Emitter transistor input & output characteristics.
7. MOSFET characteristics (drain, transfer characteristics).
8. Transistor biasing.
9. Common Emitter Amplifier.
10. Voltage-shunt feedback amplifier, Current-series feedback amplifier.
11. RC phase shift Oscillator.
12. Open-ended experiment (voltage-series and current-shunt feedback amplifier, LC oscillators)

Reference Books

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, “Electronic Devices and Circuits”, Mc Graw Hill Education, 4th Edition, 2010.
2. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education Inc., 11th Edition, 2013.
3. K. Radha Krishna Rao, “Electronics for Analog Signal Processing - I”, NPTEL Video Course.
4. User manuals for basic electronic lab equipment.
5. Data sheets for electronic components.

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DIGITAL CIRCUIT DESIGN

II Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the concepts of different number systems and Boolean algebra.
- To introduce the design techniques of combinational, sequential logic circuits.
- To give a model of combinational and sequential circuits using HDLs.

Learning Outcomes

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

- design various logic circuits using Boolean laws.
- design combinational and sequential logic circuits.
- gain the knowledge of PLDs.
- develop digital circuits using HDL

Course Content

UNIT - I: Boolean Algebra and Logic gates

Number Systems - Binary numbers, Octal, Hexadecimal, Other Binary Codes; Complements, Signed binary numbers, Digital logic operations and gates, Basic theorems and Properties of Boolean Algebra, Boolean functions, Canonical and Standard Forms, Complements of Boolean functions, Two-level NAND and NOR, Implementation of Boolean functions.

UNIT - II: Combinational Logic Circuits

The Map Method (upto Four Variables), Don't care conditions, Design Procedure, Adders, Subtractors, 4-bit Binary Adder/ Subtractor circuit, BCD adder, carry look-a-head adder, Decoders and Encoders, Multiplexers, Demultiplexers.

UNIT - III: Sequential Logic Circuits

Design Procedure, Flip-Flops, truth tables and excitation tables, Conversion of flip-flops, Design of Counters, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter, Registers, shift registers, universal shift register.

UNIT - IV: Finite State Machines

Types of FSM, Capabilities and limitations of FSM, State assignment, Realization of FSM using flip-flops, Mealy to Moore conversion and vice-versa, Reduction of state tables using Partition technique.

UNIT - V: Programmable Logic Devices & HDL

Types of PLD's: PROM, PAL, PLA, Basic structure of CPLD and FPGA, Advantages of FPGA's. Introduction to Verilog - Structural Specification of Logic Circuits, Behavioral Specification of Logic Circuits, Hierarchical Verilog Code.

UNIT - VI: Digital Design Using HDLs

Verilog for combinational circuits - conditional operator, if-else statement, case statement, for loop; using storage elements with cad tools-using verilog constructs for storage elements, blocking and non-blocking assignments, non-blocking assignments for combinational circuits, flip-flop with clear capability, using verilog constructs for registers and counters.

Text Books

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI. (Unit I to IV)
2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGrawHill (Unit V, VI)

Reference Books

1. Charles H. Roth, Jr, "Fundamentals of Logic Design", 4th Edition, Jaico Publishers.
2. Zvi Kohavi and Niraj K.Jha, "Switching and Finite Automata Theory, 3rd Edition, Cambridge University Press, 2010.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall PTR.
4. D.P.Leach, A.P.Malvino, "Digital Principles and Applications", TMH, 7th Edition.

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CONTROL SYSTEMS

II Year – II Semester

Lecture : 3 Tutorial : 1

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 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 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- 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. 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, Wiley Studio Edition, 4th Edition. Feed back and control system – Joseph J Distefa.

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ENGINEERING ECONOMICS AND PROJECT MANAGEMENT

II Year – II Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To illustrate the importance of Managerial Economics and know its significant role in achieving business objectives.
- To understand and articulate the importance of Project Management in any business project

Learning Outcomes

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

- apply managerial economic concepts in business decision making.
- identify the influencing factors of demand for a product.
- categorize production with respect to time and cost.
- relate the market structures and pricing to a product.
- establish the suitable business organization with available resources.
- identify the importance of project management.
- apply network concepts in business decision making.

Course Content

UNIT - I: Introduction to Engineering Economics

Definition, Nature and Scope of Managerial Economics – Relation of Managerial Economics with other disciplines, Concept of Engineering Economics.

Demand Analysis: Demand Determinants, Law of Demand and its exceptions, Significance & Types of Elasticity of Demand. Factors governing demand forecasting- 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. Production function, Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts & BEP Analysis, Break-Even Point (simple problems)

UNIT - III: Introduction to Markets & Pricing strategies

Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition and Oligopoly.

Pricing strategies: Methods of Pricing: Cost based pricing, Demand based pricing, Competition based pricing and Strategy based pricing.

UNIT - IV: Introduction to Business Organizations

Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company.

UNIT - V: Project Management Concepts

Concept and Characteristics of a Project, Importance of Project Management. Project Planning: Project Evaluation, Financial Sources, Feasibility Studies.

UNIT - VI: PERT and CPM

Introduction, Development of Project Network, Time Estimation, Determination of the Critical Path, PERT Model, Measures of variability, CPM Model, Network Cost System (simple problems)

Text Books

1. Managerial Economics and Financial Analysis: by Aryasri, 2/e, TMH, 2005.
2. Managerial Economics: Varshney & Maheswari Sultan Chand, 2003.
3. Project Management by Shivathanu Pillay, University Press, New Delhi, 2009
4. Project Management by K. Nagarajan New Age International, New Delhi, 2010

Reference Books

1. Financial Accounting for Management: Ambrish Gupta, Pearson Education, New Delhi.
2. Managerial Economics: H. Craig Peterson & W. Cris Lewis, PHI, 4th Ed.
3. Managerial Economics: Suma Damodaran, Oxford University Press.
4. Clifford F Gray, Erik W Larson, "Project Management-The Managerial Process", Tata Mcgraw-Hill Publishing Co Ltd
5. John M Nicholas "Project Management For Business And Technology" Prentice Hall of India Pvt Ltd.

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INDUCTION AND SYNCHRONOUS MACHINES

II Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the constructional details, working principles, operating characteristics of three phase and single-phase induction motors.
- To introduce the concepts on constructional details, working principles and operating characteristics of synchronous machines.

Learning Outcomes

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

- calculate various performance parameters of a three-phase induction motor.
- select/identify various starting and speed control methods of three-phase induction motor
- describe the constructional details and working principles of single phase induction motor and synchronous machines.
- determine the performance characteristics of synchronous machine.
- describe the parallel operation of alternator with infinite bus bars.

Course Content

UNIT - I: Three Phase Induction Motors

Types, construction, principle of operation, production of rotating magnetic field, rotor frequency, rotor emf, current, phasor diagram, power flow diagram, equivalent circuit, Torque expression, torque-speed characteristics.

UNIT - II: Performance and Speed control of Three Phase Induction Motors

No load and blocked rotor tests, efficiency, starting and speed control methods.

UNIT - III: Single Phase Induction Motors

Single phase induction motor - Constructional features - Double revolving field theory- split-phase motors.

UNIT - IV: Alternators

Types, Construction, operating principle, EMF equation, Harmonics, armature reaction, Phasor diagrams, OCC, SCC and load characteristics.

UNIT - V: Regulation and Parallel operation of Alternators

Regulation – EMF, MMF and ZPF methods. Parallel operation -a) alternators b) alternator with infinite bus bars - load sharing.

UNIT - VI: Synchronous Motors

Principle of operation, Methods of starting, phasor diagrams; V and inverted V curves; synchronous condensers; hunting and its suppression.

Text Books

1. Electrical machines – P.S. Bhimbhra, Khanna Publishers.
2. Performance and Design of Alternating Current Machines – M.G. Say, John Wiley and Sons Publications, 3rd Edition, 1983.

Reference Books

1. Problems in Electrical Engineering – Parker Smith, CBS Publishers, 9th edition, 1984.
2. Theory of Alternating Current Machinery- Langsdorf, TMH
3. Electrical machines - Nagrath and Kothari.
4. Fundamentals of Electrical Machinery by S. Chapman

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ELECTROMAGNETIC FIELDS

II Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objective

- To impart principle of electric fields and potentials due to different static charge configurations.
- To disseminate knowledge on the properties of conductors, dielectrics and current densities.
- To familiarize with the applications of gauss law, Biot-Savarts law amperes law and faradays law.

Learning Outcomes

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

- determine electric field and potential for symmetrical charge configuration.
- distinguish between the conduction and convection currents and determine the dielectric boundary conditions
- compute magnetic fields for symmetric current distributions.
- quantify the magnetic forces and torque produced by currents in magnetic fields.
- apply maxwell's equations for time invariant fields and time variant fields.

Course Content

UNIT I: Electrostatics

Introduction to Electrostatic fields – Coulombs law - problems on Coulombs law - Force due to multiple charges - problems on multiple charges - Electric field intensity due different charge distributions.

UNIT II:

Gauss's law, Application of Gauss's Law, Max well's First equation, $\text{Div}(\mathbf{D}) = \rho$, work done in moving a point charge in an Electrostatic field

UNIT III: Conductors – Dielectrics

Electric Dipole - Dipole moment, Potential and EFl due to an Electric dipole - Torque on an electric dipole in an electric field - problems on Electric dipole - Behaviour of conductors in an electric field - conductors, and insulators - Electric field inside a dielectric material, concept of Polarization, Dielectric boundary conditions, - conduction and convection current densities - Ohm's law in point form - Equation of continuity.

UNIT - IV: Magnetostatics

Static magnetic fields – Biot-Savart's law – Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation, $\text{div}(\mathbf{B})=0$.

UNIT - V: Ampere's circuital law and its applications and Force in magnetic field

Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation, $\text{Curl}(\mathbf{H})=\mathbf{J}_c$, Field due to a circular loop.

Magnetic force - Moving charges in a Magnetic field - Lorentz force equation - force on a current element in a magnetic field - Force on a straight and a long current carrying conductor in a magnetic field - Force between two straight long and parallel current carrying conductors - Magnetic dipole and dipole moment - a differential current loop as a magnetic dipole - Torque on a current loop placed in a magnetic field.

UNIT - VI: Time Varying Fields

Time varying fields -Faraday's laws of electromagnetic induction- Its integral and point forms -Maxwell's fourth equation, $\text{Curl}(\mathbf{E})$, Statically and Dynamically induced EMFs - Simple problems -Modification of Maxwell's equations for time varying fields - Displacement current - Poynting Theorem and Poynting vector.

Text Books

1. "Engineering Electromagnetics" by William H. Hayt & John. A. Buck Mc. Graw-Hill Companies, 7th Editon.2006.
2. "Principles Electromagnetic " by Sadiku, Oxford Publications,4th edition.

Reference Books

1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd editon.
2. "Electromagnetics" by J. D Kraus Mc Graw-Hill Inc. 4th edition 1992.

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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

- familiarize with 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 Das and 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, Arunkumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books

1. Surveying Theory and Practice, James M Anderson and Edward, 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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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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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: Dielectric 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, bimetallic 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 Materials, Radioactive Materials, Galvanization 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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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, Wiley 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, battery ignition system - components, Magneto ignition system, Electronic ignition system.

Electrical System: charging circuit- generator, current-voltage regulator, starting 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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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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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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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.

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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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

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 XMLAJAX.

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

$\phi(x)$, $d(x)$, $\mu(x)$, $\sigma(x)$, Mobius inversion formula, Linear Diophantine 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 Montgomery 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-concentration and 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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DIGITAL CIRCUIT DESIGN LAB

II Year – II Semester

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

Course Objectives

- To get acquainted with the concepts of various Digital Circuits
- To familiarize with the CAD Tools.

Learning Outcomes

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

- learn the digital circuit concepts.
- design the digital circuits.
- develop digital circuits using CAD tools.

List of Experiments

Part-A: To design and simulate using Electronic Workbench

1. Full adder.
2. 8:1 multiplexer.
3. SR and D flip-flop.
4. Shift register\
5. Asynchronous counter.
6. Open Ended Experiment

Part B: To design and simulate using CAD tools

1. 8:3 priority encoder.
2. Ring counter.
3. Asynchronous counter.
4. Simple Datapath
5. ALU Design
6. Open Ended Experiment

Reference Books

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI.
2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGrawHill.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall PTR.

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ELECTRICAL MACHINES–I LAB

II Year – II Semester

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

Course Objectives

- To familiarize various testing methods and speed control of DC Machines.
- To disseminate knowledge on various tests and parallel operation of single phase transformers.

Learning Outcomes

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

- select the appropriate apparatus for determining the performance of DC machines and transformers based on the capacity experimentally.
- determine the equivalent circuit parameters of transformers experimentally.
- compute the performance characteristics of transformers and DC machines through suitable tests.

List of the experiments

Any **10** of the following experiments are to be conducted:

1. Magnetization characteristics of DC shunt generator.
2. Load test on DC Shunt generator.
3. Load test on DC compound generator
4. Speed control of DC shunt motor.
5. Brake test on DC compound motor.
6. Brake test on DC series motor.
7. Swinburne's test on DC shunt machine.
8. Hopkinson's test on a pair of DC shunt machines.
9. O.C and S.C tests on single phase transformer.
10. Sumpner's test on a pair of single phase transformers.
11. Parallel operation of two single phase transformers.]
12. Load test on singlephase transformer.

Additional experiments beyond the Syllabus

1. Retardation test on a DC shunt machine.
2. Separation of core losses in single phase transformer.

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Optional Elective - I

BIOMEDICAL ENGINEERING

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the basics of biological concepts and relate them 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 novel 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 diagnosis 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), evoked 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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Optional Elective - I

COMPUTER ORGANIZATION AND ARCHITECTURE

II Year – II Semester

Lecture : -

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 Book

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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Optional Elective - I

INTRODUCTION TO QUANTUM MECHANICS FOR ENGINEERS

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To develop in the student awareness of situations in engineering, which need ideas of quantum mechanics.
- To make the student understand the basic apparatus and methods of quantum mechanics

Learning Outcomes

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

- understand the wave nature and wave function of particles.
- identify the mathematical preliminaries for quantum mechanics
- apply stationary state equations for one dimensional problems.
- apply stationary state equations for three dimensional problems.
- analyse the different kinds of molecular bonding
- understand the nature of particles in solids

Course Content

UNIT - I:

Wave nature of particles and the Schrodinger equation Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and timeindependent Schrodinger equation for wavefunction, Born interpretation, probability current, Expectation values, Free-particle wavefunction and wave-packets, Uncertainty principle

UNIT - II:

Mathematical Preliminaries for quantum mechanics Complex numbers, Linear vector spaces, inner product, operators, eigenvalue problems, Hermitian operators, Hermite polynomials, Legendre's equation, spherical harmonics.

UNIT - III:

Applying the Schrodinger equation Solution of stationary-state Schrodinger equation for one dimensional problems– particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator. Numerical solution of stationary-state Schrodinger equation for one dimensional problems for different potentials Scattering from a potential barrier and tunneling;

related examples like alpha-decay, fieldionization and scanning tunneling microscope

UNIT - IV:

Three-dimensional problems: particle in three dimensional box and related examples, Angular momentum operator, Rigid Rotor, Hydrogen atom ground-state, orbitals, interaction with magnetic field, spin Numerical solution stationary-state radial Schrodinger equation for spherically symmetric potentials

UNIT - V:

Introduction to molecular bonding Particle in double delta-function potential, Molecules (hydrogen molecule, valence bond and molecular orbitals picture), singlet/triplet states, chemical bonding, hybridization

UNIT - VI:

Introduction to solids Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands Numerical solution for energy in one-dimensional periodic lattice by mixing plane waves.

Text Book

1. Eisberg and Resnick, Introduction to Quantum Physics

Reference Book

1. D. J. Griffiths, Quantum mechanics Richard Robinett, Quantum Mechanics
Daniel McQuarrie, Quantum Chemistry.

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ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on construction and working principles of electro-mechanical and digital measuring instruments.
- To introduce various methods of the measurement of Resistance, Inductance and capacitance.
- To familiarize with the operation of transducers.

Learning Outcomes

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

- describe operation of electrical measuring instruments.
- select suitable instrument for measuring power and energy of electrical systems.
- determine the parameters of electrical circuits using suitable measuring instruments.
- select a suitable transducer for measuring non-electrical physical quantities.
- analyse the operation of various digital meters and specify suitable digital meters for measuring electrical parameters.

Course Content

UNIT - I: Measuring Instruments

Classification ,Error Analysis– deflecting, controlling and damping torques – Ammeters and Voltmeters – Moving Coil, Moving iron type instruments – expression for the deflecting torque and control torque – Errors And compensations. Extension of range using shunts and Multipliers

UNIT - II: Measurement of Power and Energy

Single phase and three phase dynamometer wattmeter, expression for Deflecting and control torques – LPF and UPF-Extension of range of wattmeter using instrument transformers. Single Phase induction type energy meter – driving and braking torques – errors and compensations –Testing of Energy meter by direct and Phantom Loading.

UNIT - III: Potentiometers

Basic slide wire Potentiometer. Principle and operation of DC Crompton's potentiometer. Standardization –Volt Ratio Box. Measurement of Unknown resistance, Calibration of ammeter, volt meter and watt meter.

UNIT - IV: Bridges

Methods of measuring low, medium and high resistance – Kelvin's double bridge, Wheat stone's bridge – loss of charge Method –Methods of measuring Inductance and Capacitance-Maxwell's bridges, Anderson's bridge-Schering bridge

UNIT - V: Transducers

Definition of transducer, Classification of transducers, Advantages of Electrical transducers ,Characteristics and choice of transducers; Principle operation of resistor, inductor, and capacitor transducers, LVDT -Strain gauge and its principle of operation- guage factor, Thermistors, Piezo electric transducers, Hall sensors.

UNIT - VI: Digital Meters

Digital Voltmeter-Successive approximation, ramp and dual slope integrating type, continuous balance type. Extension Digits-Digital frequency Meter, phase angle meter, LCR Q-meter.

Text Books

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C Widdis, fifth Edition, Wheeler Publishing.
2. A course in Electrical & Electronic Measurements & Instrumentation by A.K.Sawhney, Dhanpat Rai & Co. Publications.

Reference Books

1. Electrical Measurements – by Buckingham and Price, Prentice – Hall.
2. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U,New Age International (P) Limited, Publishers.
3. Electrical and Electronic Measurements –by G.K. Banerjee, PHI Learning PrivateLtd, New Delhi 2012.
4. Principles of Measurement and Instrumentation – by A.S Morris, Pearson / Prentice Hall of India.
5. Electronic Instrumentation-by H.S.Kalsi Tata MCGraw-Hill Edition, 1995

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SIGNALS AND SYSTEMS

III Year – I Semester

Lecture : 3	Tutorial : 1	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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POWER SYSTEMS - II

III Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts for estimating the transmission line parameters and assessing the performance of transmission lines.
- To familiarize with different types of insulators, concepts of corona and sag in overhead lines.

Learning Outcomes

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

- estimate the inductance and capacitance for different conductor configurations.
- assess the performance of short & medium transmission lines.
- analyze the performance of long transmission lines and the effect of surge impedance loading.
- select a suitable insulator for a particular operating voltage, configuration and best method to improve string efficiency.
- analyze the effect of various factors on corona.
- evaluate the sag and tension of transmission line for various configurations under the effect of wind and ice.

Course Content

UNIT - I: Series parameters of Overhead Transmission Lines

Types of conductors, calculation of resistance for solid conductors, skin and proximity effect, Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition.

UNIT - II: Capacitance of Overhead Transmission Lines

Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase circuits.

UNIT - III: Performance of Short and Medium Transmission Lines

Classification of Transmission Lines - Short, medium, long lines and their model representations - Nominal-T, Nominal- π and end condenser method, Evaluation of A,B,C,D Constants –regulation and efficiency .

UNIT - IV: Performance of Long Transmission Lines

Long Transmission Line—Rigorous Solution – Evaluation of A,B,C,D Constants— Interpretation of the Long Line Equations –Surge Impedance and SIL of Long Lines— Wave Length and Velocity of Propagation –Ferranti effect - Charging Current - Effect on regulation of the Transmission Line.

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, Radio Interference.

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 , sag template and their applications.

Text Books

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta,U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
2. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998.

Reference Books

1. Power System Engineering by I.J.Nagarath and D.P.Kothari, Tata McGraw-Hill, 2nd Edition
2. Power system Analysis-by John J Grainger William D Stevenson, TMC Companies, 4th edition.

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SWITCH GEAR AND PROTECTION

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the operation of various types of circuit breakers and Relays.
- To introduce the concepts on various protection schemes of Generator, Transformer, Transmission lines and Bus bars.

Learning Outcomes

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

- identify suitable circuit breaker and relay for a particular application
- describe the operating principles of various types of relays.
- select an appropriate protection scheme for generator and transformer
- choose an appropriate protection scheme for transmission line and bus-bar.
- analyze various methods of neutral grounding.

Course Content

UNIT - I: Circuit Breakers

Circuit Breakers: Elementary principles of arc interruption, Restriking Voltage and Recovery voltages, Average and Max. RRRV, Current Chopping and Resistance Switching - CB ratings and Specifications. Description and Operation of Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT - II: Fundamentals of Relays

Principle of Operation and Construction of electromagnetic attraction and induction type relays. PSM, TSM. Relays Classification: Instantaneous, DMT and IDMT types. Application of relays: Over current/ Under voltage relays, Direction relays, Universal torque equation. Introduction to Static relays and Comparison with Electromagnetic Relays.

UNIT - III: Distance and Differential Relays

Distance relays: Impedance, Reactance and Mho relays, Characteristics of Distance Relays and Comparison. Three-zone distance relay protection using Impedance relays .Differential Relays and Percentage Differential Relays.

UNIT - IV: Generator & Transformer Protection

Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on percentage of Unprotected Winding.

Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CTs Ratio, Buchholtz relay Protection

UNIT - V: Transmission line and Bus-Bar Protection

Protection of Lines : Over Current, and. Translay Relay. Protection of Bus bars - Differential protection, Earth fault protection. over voltage protection using Lightning arresters.

UNIT - VI: Neutral Grounding

Grounded and Ungrounded Neutral Systems.- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

Text Books

1. Electrical Power Systems – by C.L.Wadhwa, New Age international (P) Limited, Publishers, 3rdedition.
2. Power System Engineering by B.L.Soni, Gupta, Bhatnagar, Chakrabarthy, Dhanpat Rai & Co.
3. Switchgear Protection And Power Systems by Sunil S. Rao, Khanna Publishers, 2008 edition.

Reference Books

1. Power System Protection and Switchgear by Badri Ram and D N VishwakarmaTata McGraw-Hill Education, 2011
2. Fundamentals of Power System Protection by Paithankar and S.R.Bhide.,PHI, 2003.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta S.Chand& Company Ltd.New Delhi 2004.

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COMPUTER NETWORKS

III Year – I Semester

Lecture : 4

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 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, V 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: 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 formats.

Application layer: The Domain Name System (DNS), Electronic Mail-Architecture-SMTP, POP3, FTP, HTTP.

Text Books

1. Andrew S Tanenbaum, Computer networks, 4th edition, Pearson.
2. Behrouz A Forouzan, Data communications and networking, 5th edition, TMH.

Reference Books

1. S. Keshav, An Engineering Approach to Computer Networks, 2nd edition, Pearson Education.
2. W.A. Shay, Thomson, Understanding communications and Networks, 3rd edition, Cengage Learning.

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PULSE AND INTEGRATED CIRCUITS

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of linear wave shaping for various inputs.
- To familiarize with the functioning of various Linear ICs such as OP-AMP, Timer, Voltage Controlled Oscillator.
- To introduce the concepts of D/A & A/D Convertors.

Learning Outcomes

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

- design different RC differentiator and integrator circuits.
- analyze the various multivibrator circuits.
- infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques.
- elucidate and design linear and non-linear applications using op-amps.
- describe the concepts of filters, Timers and VCO .
- apply the concepts of A/D and D/A convertors in various applications.

Course Content

UNIT - I: Linear Wave Shaping

Response of High pass and Low pass RC Circuits for sine, step, pulse and square wave inputs. High pass RC circuit as a differentiator, low pass RC circuit as an integrator.

UNIT - II: Multivibrators

The Stable states of a binary, fixed bias transistor binary, self biased transistor binary, commutating capacitors, monostable multivibrator, gate width and wave forms of a collector-coupled monostable multivibrator, astable collector-coupled multivibrator.

UNIT - III: Introduction to OP-AMP

The Operational Amplifier- Block Diagram, Schematic symbol, IC 741-Pin configuration, Equivalent circuit, ideal and practical Op-amp specifications, DC and AC characteristics, compensation techniques.

UNIT - IV: Applications of OP- AMP

Inverting and Non-inverting configurations, Summing amplifier, Difference amplifier, Integrator, Differentiator, Instrumentation amplifier, Schmitt trigger, triangular wave generator.

UNIT - V: Active Filters, IC 555 Timer and IC 566 VCO

1st order low-pass Butterworth filter, 1st order high-pass Butterworth filter, Band-Pass filters, Band Reject filters, All –Pass filter, Voltage controlled Oscillator, IC 555 Timer- Pin diagram, functional description, IC 566 VCO- Pin configuration, Block diagram.

UNIT - VI: D/A & A/D Convertors

Basic DAC techniques: Weighted Resistor DAC, R-2R Ladder DAC. Direct Type ADCs: The Parallel comparator type, successive approximation ADC, Indirect Type ADC: The Dual-Slope ADC, Specifications of ADC/DAC.

Text Books

1. Jacob Millman and Herbert Taub, “Pulse, Digital and Switching Waveforms”, TMH1st Edition. (Units-I to III).
2. OP-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.

Reference Books

1. Fundamentals of Pulse and Digital circuits, Ronald J.Tocci, PHI 3rd Edition.
2. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition, 2003.

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DATA STRUCTURES

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on 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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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, 4th Edition, B.S.Publications.
2. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman , 7th Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5th 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, Filariasis, 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 assess 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 University, available online, accessed, 7, 2008.
2. David F.Griffiths, October (2012) “An introduction to MATLAB” the University of Dundee, available online, Accessed, 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 overhead 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 gases-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 rods, 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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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, fluorescence 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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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.

Web link

www.statlearning.com

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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”, Wiley Publications, 2003.
2. Steve Suchring, “MySQL Bible”, John Wiley, 2002

Reference Books

1. Rasmus Lerdorf 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. Vikram Vaswani, “MYSQL: The Complete Reference”, 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.

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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 No Punishment.

UNIT - II: Cyber Crime and Criminal Justice

Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber fraud and Cyber Cheating, Virus on Internet Deformation, Harassment and E- mail Abuse

UNIT - III: Cyber Criminality Strategies and Trends

Network Service Providers, Jurisdiction and Cyber Crimes, 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 Event of Digital Signature compromise, E - Governance in the India. A Warning to Babudom, Are Cyber Consumers Covered under the Consumer Protection, Goods and Services, Consumer Complaint Defect in Goods and Deficiency in Services Restrictive and Unfair Trade Practices

UNIT - V: Traditional Computer Crime

Early Hacker and Theft of Components Traditional problems, Recognizing and Defining Computer Crime, Phreakers: Yesterday's Hackers, Hacking, Computers as Commodities, Theft of intellectual Property.

UNIT - VI: Web Based Criminal Activity

Interference with Lawful Use of Computers, Malware, DoS (Denial of Service) and DDoS (Distributed Denial of Service) Attacks, Spam, Ransomware and Kidnapping of Information, Theft of Information, Data Manipulation, and Web Encroachment Online Gambling Online Fraud, Securities Fraud and stock Manipulation, Ancillary crimes

Text Books

1. Vivek Sood, "Cyber Law Simplified", 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. Degeneracy in TP and resolving it.

UNIT - VI: Assignment and Sequencing Problems

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 and 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: Reliability and Life Testing
3. S. M. Ross: Probability Models, Harcourt India Pvt. Ltd.
4. D. C. Montgomery: 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, 4th Edition.

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CONTROL SYSTEMS LAB

III Year – I Semester

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

Course Objectives

- To provide a practical environment for finding performance of linear control systems
- To impart knowledge on effect of controllers on the performance of linear control systems experimentally.

Learning Outcomes

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

- describe the characteristics of d.c. servo motors, a.c. servo motors, synchros and magnetic amplifier.
- employ p, pi, pd and pid controllers.
- design lag, lead and lag–lead compensators.
- control the temperature using pid controller.
- determine the transfer function of d.c. motor and d.c. generator.
- verify the boolean expressions using programmable logic controller.

Lab Experiments:

Any 10 of the following experiments are to be conducted:

1. Time response of Second order system.
2. Characteristics of Synchros
3. Programmable logic controller – Study and Verification of truth Tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. Temperature controller using PID
8. Transfer function of DC motor
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Transfer function of DC generator
12. PLC - Traffic Light Control System
13. Analysis of time response of series RLC circuit
14. DC position control system

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ELECTRICAL MACHINES – II LAB

III Year – I Semester

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

Course Objectives

- To familiarize with the performance of induction and synchronous machines experimentally.
- To provide a practical environment for determining the characteristics of three phase transformers.

Learning Outcomes

After completion of the course, students will be able to

- estimate the performance of induction motors and synchronous machines.
- describe the operational behaviour of the induction motor under various loading conditions.
- determine the parameters of synchronous machine.
- operate an alternator in parallel with infinite bus bar.
- find operational characteristics of three phase transformer.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. No Load and Blocked rotor tests on three phase Induction motor.
2. Equivalent circuit of a single phase Induction motor
3. Brake test on three phase Induction motor.
4. Regulation of a three phase alternator by EMF and MMF methods.
5. Regulation of a three phase alternator by ZPF method.
6. Measurement of sequence impedances of a three phase alternator.
7. Determination of X_d , X_q of a salient pole alternator using slip test.
8. Synchronization of an alternator with infinite bus bar.
9. V and inverted V curves of a three phase synchronous motor.
10. Load test on a three phase transformer
11. Scott connection of transformers
12. Load test on a three phase alternator.

Additional experiments beyond the Syllabus:

1. Speed control of BLDC motor.
2. Line excited Induction Generator.

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Optional Elective - III

MECHATRONICS

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on design of complex engineering systems using sensors, actuators, controllers.
- To familiarize with the intelligent systems used in Mechatronics.

Learning Outcomes

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

- identify the elements of Mechatronic Systems
- select suitable sensors, actuators and controllers to meet specific requirements
- draw a parallelism between crisp set operations and fuzzy set operations through the use of characteristic and membership functions respectively.

Course Content

UNIT - I:

Introduction: Definition of Mechatronics, Mechatronics in manufacturing, Products, and design. Comparison between Traditional and Mechatronics approach, advantages and disadvantages of Mechatronics systems.

UNIT - II:

Sensors and Transducers: Types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature, light sensors and micro sensors.

UNIT - III:

Review of fundamentals of electronics. Data conversion devices, signal processing devices, relays, contactors and timers. Microprocessors, microcontrollers and PLCs.

UNIT - IV:

Actuators: Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, and transfer systems. Description of PID Controllers.

UNIT - V:

Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, and pumps. Design of hydraulic circuits.

Pneumatics: Production, distribution and conditioning of compressed air, system components and graphic representations.

Electro hydraulic, Electro pneumatic and hydro pneumatic servo systems.

UNIT - VI:

Fuzzy Set Theory: Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Properties of membership function, Fuzzy extension principle, Fuzzy Systems: fuzzification and defuzzification and fuzzy controllers.

Text Books

1. Bolton. W, "Mechatronics", Addison Wesley, 4th Edition, New Delhi.
2. Dan Nesulescu, "Mechatronics", 3rd Edition, Pearson Education
3. Michael B. Histanand David G. Aliatore, " Introduction to Mechatronics and Measurement Systems", McGraw-Hill

Reference Books

1. Devadas Shetty, Richard A Kolk, "Mechatronics System Design",
2. B.P. Singh (2002), "Advanced Microprocessor and Microcontrollers" New Age International Publisher.
3. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 2nd Ed, Prentice Hall, 2003.
4. H.J.Zimmermann, Fuzzy Set Theory and Its Applications, 2nd Ed., Kluwer Academic Publishers, 1996.
5. S.N. Sivanandam and S.N.Deepa, "Principles of Soft Computing" Second Edition, Wiley India Pvt.Ltd.

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Optional Elective - III

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the concepts of object oriented programming.
- To impart the knowledge on 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, and 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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Optional Elective - III

CONTROL SYSTEM DESIGN

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with various design specifications.
- Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).
- Design controllers using the state-space approach.

Learning Outcomes

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

- improve the performance of control systems with the aid of controllers and compensators.
- design lag, lead and lag-lead compensators.
- employ p, pi, pd and pid controllers.
- employ the state-space representation for the analysis and design of state feedback systems.
- apply the fundamental principles of nonlinearities to a nonlinear system.

Course Content

UNIT - I: Introduction

Introduction to time domain and frequency domain design specification and its physical relevance. Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response.

UNIT - II: Design of Classical Control System in the time domain

Introduction to compensator. Design of Lag, lead lag-lead compensator in time domain. Feedback and Feed forward compensator design. Feedback compensation. Realization of compensators.

UNIT - III: Design of Classical Control System in frequency domain

Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using bode diagram.

UNIT - IV: Design of PID controllers

Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control.

UNIT - V: Control System Design in state space

state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback. Ackerman's Formula for feedback gain design. Design of Observer. Reduced order observer.

UNIT - VI: Nonlinearities and its effect on system performance

Various types of non-linearities. Effect of various non-linearities on system performance. Singular points. Phase plot analysis.

Text Books

1. Automatic control system – B.C.Kuo , John Wiley and son's 8th edition, 2003.
2. Control system engineering – Norman S-Nice, Wiley Studio Edition, 4th Edition.
3. Linear control system analysis and design (conventional and modern) - J. J. D'Azzo and C. H. Houpis, McGraw Hill, 1995.

Reference Books

1. Design of feedback Control Systems - R. T. Stefani and G. H. Hostetter, Saunders College Pub, 1994.
2. Modern control engineering – K.Ogata , Prentice Hall of India Pvt. Ltd., 5th Edition.
3. Feed back and control system – Joseph J Distefa
4. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International Limited Publishers, 2nd edition.

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POWER ELECTRONICS

III Year – II Semester

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

Course Objectives

- To familiarize with switching behavior of power semiconductor devices
- To envisage the basic concepts of operation, control and design of power electronic converters.

Learning Outcomes

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

- select suitable semiconductor devices for various power converters.
- analyze the performance of controlled and uncontrolled single- phase and three- phase converters.
- employ suitable ac voltage controllers and cyclo-converters for a particular industrial applications.
- realize dc-dc converters without electrical isolation.
- develop control methods for inverters.

Course Content

UNIT - I: Power Semi-Conductor Devices

Power BJT –Power MOSFET – Power IGBT– their static and dynamic characteristics.

Thyristors – Silicon Controlled Rectifiers (SCR's) –Basic theory of operation of SCR– Triggering methods–Static, Dynamic characteristics of SCR, Series and parallel connections of SCR's– Snubber circuits– Specifications and Ratings of SCR's – Numerical problems.

UNIT - II: Single Phase Converters

Phase control technique, Natural Commutation

SinglePhase Half-Controlled Converter– R(Derivation of Performance parameters), RL, RLE load.

Half Controlled Converters: R and RL loads(Principle of operation only).

Fully Controlled Converters: Midpoint converter with R-Load (Principle of operation only).

Bridge connections with RL, RLE load without and with Freewheeling Diode – Derivation of average load voltage and current.

UNIT - III: Three Phase Converters

Three phase converters – Three pulse and six pulse converters – average load voltage with R and RL loads. Effect of source inductance (for single phase and Three phase converters)–Dual converters (both single phase and three phase).

UNIT - IV: AC Voltage Controllers & Cyclo-Converters

Single Phase AC Voltage Controllers –two SCRs in anti-parallel – With R and RL loads – modes of operation of Triac – Derivation of RMS load voltage,current and power factor – Numerical problems.

Cyclo-Converters: Single phase mid-point cyclo-converters, Bridge configuration with Resistive and inductive load (Principle of operation only)

UNIT - V: DC-DC converters and Commutation Circuits

Volt-second balance method – Amp second balance method – Operation of Buck Converter, Boost Converter, Buck-Boost Converter – Voltage gain, Ripple voltage expression –commutation circuits.

UNIT - VI: Inverters

Single phase inverter – Basic series inverter –Bridge inverter– Waveforms-Parallel inverter – Voltage control techniques for inverters, three Phase – 120° and 180° modes of operation.

Text Books

1. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
2. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998.
3. Erickson, Robert W., and Dragan Maksimovic. Fundamentals of Power Electronics. Springer Science & Business Media, 2007.

Reference Books

1. Power Electronics-by P.C.Sen,Tata Mc Graw-Hill Publishing.
2. Power Electronics-*by M.D. Singh*,Tata McGraw-Hill Education, 2008.

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PROBABILITY AND FUZZY MATHEMATICS

III Year – II Semester

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

Course Objectives

- introduce the concepts of probability.
- know about the significance of a random variable.
- learn discrete and continuous distributions such as binomial, poisson & normal distributions.
- to impart the knowledge of fuzzy set theory and fuzzy logic

Learning Outcomes

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

- use the concepts of probability in different real time problems.
- use probability distributions in appropriate scenario.
- 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
- apply fuzzy logic to control automatic engineering systems.

Course Content

UNIT - I: Probability

Axioms of probability, addition theorem, multiplication theorem, conditional probability, Bayes theorem[without proof]- problems.

UNIT - II: Random Variables

Introduction to random variables, discrete random variable, probability mass function, distribution function, mean and variance – problems.

Continuous random variable, probability density function, distribution function, mean, median, mode and variance – problems.

UNIT - III: Theoretical Probability Distributions

Discrete probability distributions – Binomial, Poisson distributions. Deriving mean and variance – problems. Continuous probability distributions – Normal distribution-area properties - problems.

UNIT - IV : Classical Sets and Fuzzy Sets

Introduction to classical sets, Fuzzy sets, Fuzzy set operations, properties of fuzzy sets.

UNIT - V : Fuzzy Relations

Fuzzy Cartesian product, Fuzzy relations, operations on fuzzy relations, properties of fuzzy relations, lamda cut for fuzzy relations, Composition of fuzzy relations, Fuzzy tolerance and equivalence relations.

UNIT - VI : Fuzzy Logic

Fuzzy logical connectives, Approximate reasoning.

Text Book

1. Dr. T. K. V. Iyengar, Dr. B. Krishna Gandhi, S. Ranganatham and Dr. M.V. S. S. N. Prasad, Probability and Statistics, S. Chand & Company Ltd., New Delhi.
2. Miller, John E. Freund, Probability and Statistics for Engineers, PHI, Delhi.
3. Timothy J. Ross., Fuzzy Logic with Engineering Applications - Second Edition, Wiley Publications, 2007, New Delhi.

Reference Books

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

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MICROPROCESSORS, MICROCONTROLLERS AND ITS APPLICATIONS

III Year – II Semester

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

Course Objectives

- To familiarize with the architecture of 8086 processor & 8051 microcontroller and assembly language programming.
- To emphasize with the concepts of I/O Interfacing with 8086 and 8051.
- To introduce the fundamentals of ARM.

Learning Outcomes

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

- recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
- identify a detailed s/w & h/w structure of the microprocessor and microcontroller
- illustrate how the different peripherals (8255) are interfaced with Microprocessor
- interface various I/O devices to the 8051 microcontroller.
- know the ARM philosophy

Course Content

UNIT - I: Basics of Microprocessor & Microcontroller

A basic microprocessor system, the CPU, memory I/O organization of microprocessor system, microprocessor Architecture and its operations: microprocessor initiated operations, internal data operations, peripheral or external initiated operations, Fetch and execute cycles, difference between microprocessor and microcontroller.

UNIT - II: Architecture of 8086 Microprocessor

8086 Architecture, register organization, Memory organization, 8086 pin diagram: common function signals, minimum and maximum mode signals. Interrupts, Interrupt structure, processing, timing diagrams.

UNIT - III: Assembly language of 8086& Interfacing

Addressing modes, classification of instructions, Assembly directives, programs using data transfer arithmetic, logical, Branch, String instructions, Evaluation of arithmetic expressions, strings etc. Interfacing with Memory & I/O, interfacing with 8255- Stepper Motor Control.

UNIT - IV: Architecture of 8051

8051 Architecture, memory organization, ports, timers & serial communication, Addressing modes, instructions set of 8051.

UNIT - V: Applications of 8051

Interfacing with display devices: LED's, 7 Segment display unit, LCD unit, Temperature measurement system, Relay control, A/D, D/A.

UNIT - VI: ARM Processor fundamentals

The RISC design philosophy, ARM design philosophy, Embedded System Hardware, Registers, CPSR, pipeline, Exceptions, Interrupts and the vector table, core extensions, Architecture Revisions.

Text Books

1. D.V Hall, "Microprocessors & Interfacing", TMH, 2nd Edition, 2005. (Unit I-Unit III)
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontrollers and Embedded Systems", Pearson, 2nd Edition (Unit IV-Unit V).

Reference Books

1. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM Systems Developer's Guides- Designing & Optimizing System Software", Elsevier, 2008. (Unit VI)
2. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram Publication, 2000.
3. A. K. Ray and K.M. Bhurchandani, "Advanced Microprocessors and Peripherals", TMH, 2nd edition, 2006.
4. Barry B. Brey, "The Intel Microprocessors: Architecture, Programming, and Interfacing", PHI, 6th Edition.

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DIGITAL SIGNAL PROCESSING

III Year – II Semester

Lecture : 3 Tutorial : 1

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

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. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education / PHI, 2013.

Reference Books

1. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI
2. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
3. Digital Signal Processing: MH Hayes, Schaum's Outline series, TATA McGraw Hill, 2007.

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EMBEDDED SYSTEM DESIGN

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objective

- 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.

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 (RTL-level), custom single purpose processor design (RTL-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, 2002. (Unit II to VI).
2. Introduction to Embedded Systems - Shibu.K.V, Tata McGraw Hill Education Private Limited, 2009 (Unit I).

Reference Books

1. Raj kamal, “Embedded Systems”, TMH, 2nd Edition, 2008.
2. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier Publications, 2005.

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PRINCIPLES OF VLSI DESIGN

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize the students with the MOSFET characteristics, CMOS processing, and VLSI circuits characterization, design, and testing.

Learning Outcomes

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

- characterize the MOS devices
- explore CMOS process technology
- draw layouts
- apply design techniques and testing and verification principles for VLSI circuits

Course Content

UNIT- I: MOS Transistor Theory

Brief history, VLSI design flow, ideal I-V characteristics, C-V characteristics, non-ideal I-V effects, DC transfer characteristics, switch-level RC delay models.

UNIT - II: CMOS Processing Technology

CMOS technologies, layout design rules, CMOS process enhancements, technology related CAD issues.

UNIT - III: Circuit Characterization and Performance Estimation

Delay estimation, logical effort and transistor sizing, power dissipation, interconnect, reliability, scaling.

UNIT - IV: Design Methodology

Design methodology, design flows, CMOS physical design styles.

UNIT - V: Special-purpose Subsystems

Packaging, power distribution, I/O, Clock.

UNIT - VI: Testing and Verification

Tests categories, testers, test fixtures, test programs, logic verification principles, silicon debug principles, manufacturing test principles, design for testability, boundary scan.

Text Book

1. Neil H.E.Weste, David Harris, and Ayan Banerjee, "CMOS VLSI Design: A Circuits and Systems Perspective", Pearson Education Inc., Third Edition, 2005 (Indian Reprint 2014).

Reference Books

1. Kamran Eshraghian, Douglas A Pucknell, and Sholeh Eshraghian, "Essentials of VLSI Circuits and Systems", PHI Learning, 2009.
2. Sung-Mo Kang, Yusuf Leblebici "CMOS Digital Integrated Circuits: Analysis and Design", TMH Education, Third Edition, 2003.
3. Carver Mead and Lynn Conway, "Introduction to VLSI Systems", Addison Wesley, First Edition, 1979.
4. Eugene D. Fabricius, "Introduction to VLSI design", McGraw-Hill International Edition, 1990.
5. IIT Bombay, "VLSI Design", NPTEL Web Course.

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DSP PROCESSORS AND ARCHITECTURE

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the Architecture and interfacing of TMS320C54XX processors.
- To conversant with applications of DSP processors.

Learning Outcomes

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

- apply the concepts of Sampling, DFT and Filters.
- calculate DSP computational Errors.
- identify the Architectural features of DSP processors.
- interface I/O and memory devices with DSP Processors.

UNIT - I: Computational Accuracy in DSP Implementations

Number formats for signals and coefficients in DSP systems, dynamic range and precision, sources of error in DSP implementations, A/D Conversion errors, DSP computational errors, D/A conversion errors, compensating filter.

UNIT - II: Architectures for Programmable DSP Devices

Basic architectural features, DSP computational building blocks, bus architecture and memory, data addressing capabilities, address generation unit, programmability and program execution, speed issues, features for external interfacing.

UNIT - III: Programmable Digital Signal Processors – TMS320C54XX

Data addressing modes, memory space, program control, instructions and programming, on-chip peripherals, interrupts pipeline operation.

UNIT - IV: Analog Devices Family of DSP Devices

Analog devices family of DSP devices-ALU and MAC block diagram, shifter instruction, base architecture of ADSP 2100, ADSP-2181 high performance processor.

UNIT - V: Blackfin Processor

Introduction to Blackfin processor-The Blackfin Processor, introduction to micro signal architecture, overview of hardware processing units and register files, address arithmetic unit, control unit, bus architecture and memory, basic peripherals.

UNIT - VI: Applications of Programmable DSP Devices

Introduction, DSP- based biotelemetry receiver: Pulse Position Modulation, decoding scheme for the PPM Receiver, biotelemetry receiver implementation, ECG signal processing for heart rate determination, brain tumor detection using DSP processor.

Text Books

1. Avtar Singh and S. Srinivasan –,"Digital Signal Processing" , Thomson Publications, 2004.
2. K Padmanabahan, R.Vijayarajeswaran, Ananthi. S, "A practical Approach to Digital Signal Processing", New Age International, 2006/2009

Reference Books

1. Woon-Seng Gan, Sen M. Kuo, "Embedded Signal Processing with the Micro signal Architecture", Wiley - IEEE Press, 2007.
2. B. Venkataramani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", 2004, TMH.
3. Jonatham Stein, "Digital Signal Processing", John Wiley, 2005.

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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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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 Resistors

Resistivity, Range of Resistivity- free electron theory - classical theory & quantum theory. Semiconducting materials: Energy gap in solids - intrinsic semi conductors - extrinsic semi conductors - element & compound 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 susceptibility - complex dielectric 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, Reflection, 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 tilted 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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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 novel 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 diagnosis 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), evoked 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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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’Reilly 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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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 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 - 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, 2nd Edition, Dreamtech Press
- Dave Thomas, Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide, 4th Edition, Pragmatic Bookshelf
- Randal L. Schwartz,ý Brian D. Foy ,ý Tom Phoenix, Learning Perl, 6th edition, O'REILLY Publications.

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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 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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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.
- use 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 n th 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 differential 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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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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ELECTRICAL SYSTEMS SIMULATION LAB

III Year – II Semester

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

Course Objectives

- To impart knowledge on the programming and simulation of electrical circuits, electrical machines, power systems and power electronics using MATLAB software.
- To familiarize with the programming skills of dynamic response of linear control systems.

Learning Outcomes

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

- apply the programming skills to analyze the behavior of linear control system using MATLAB.
- analyze the behavior of the passive circuits through network theorems using SIMULINK.
- investigate the stability, controllability and observability of the given control system.
- design a pid controller through simulation.
- analyze the behavior of various electrical machines and power electronic converters.
- determine the parameters of a transmission line.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Transient response of series RLC circuit for step and sinusoidal inputs.
2. Series and parallel RLC circuits at resonance.
3. Verification of Superposition and Maximum power transfer theorems.
4. Stability analysis of the given control system by Root locus, Bode plot, and Nyquist plot.
5. Controllability and observability of a control system.
6. Design of PID controller for a second order control system.
7. Modeling and simulation of separately excited dc motor.
8. Modeling and simulation of single phase transformer.

9. Modeling of transmission line using short line approximation and nominal pi methods.
10. Determination of efficiency and regulation of a long transmission line network.
11. Single phase full controlled converter and AC voltage controller.
12. Single phase voltage source and current source inverters.

Text Book

1. “Simulation Tools for Electrical Engineers”, N. Yadaiah and G. Tulasi Ram Das, Pearson Education.

Reference Books

1. MATLAB user’s manual- Mathworks, USA.
2. SIMULINK user’s manual- Mathworks, USA.
3. MATLAB - control system tool box - Mathworks, USA.

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ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB

III Year – II Semester

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

Course Objectives

- To know the need of measuring various electrical quantities, to measure various circuit elements.
- To understand the working & construction of various electrical measuring instruments.

Learning Outcomes

After completion of the course, students will be able to

- identify the measuring instruments used for measuring electrical quantities.
- select appropriate measuring instrument with range for measurement of various electrical quantities.
- select appropriate instrument for measurement of power, energy.
- calibrate Ammeter, Volt meter.
- select appropriate Transducer for the measurement of strain.
- measure the Inductance and Capacitance values

List of Experiments

Any five experiments from the following list

1. Calibration and Testing of single phase energy Meter
2. Kelvin's double Bridge – Measurement of low resistance
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Capacitance Measurement using Schering Bridge.
5. Inductance Measurement using Anderson Bridge.
6. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
7. Measurement of 3 phases reactive power with single-phase wattmeter for balanced loading.
8. Calibration LPF wattmeter – by Phantom testing.
9. Dielectric oil testing using H.T. testing Kit.
10. LVDT– characteristics and Calibration.
11. Resistance strain gauge – strain measurement and Calibration.
12. Hall Effect Sensor.

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MICROPROCESSORS, MICROCONTROLLERS AND ITS APPLICATIONS LAB

III Year – II Semester

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

Course Objectives

- To introduce the assembly language programming concepts and interfacing with 8086 processor.
- To familiarize with the Embedded-C language programming concepts and interfacing with 8051 microcontroller.

Learning Outcomes

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

- acquire the knowledge of assembly language programming using 8086 microprocessor.
- perform various arithmetic and shift operations with 8086 based system.
- interface various I/O modules with 8086 based system.
- implement various real time applications using 8051.

List of Experiments

Part A: Assembly Language Programming Exercises/Experiments using 8086 Trainer kit

1. Implementation of simple decimal arithmetic and bit manipulation operations.
2. Implementation of code conversion between BCD, Binary, Hexadecimal and ASCII.
3. Implementation of searching and sorting of 16-bit numbers.
4. Implementation of String manipulations.

Part B: Interfacing Exercises/Experiments with 8086 trainer kit through Assembly Language Programming

1. Develop a stepper motor interface for rotating through any given sequence.
2. Develop a Digital-to-Analog Converter interface for waveform generation.
3. Develop an Analog-to-Digital Converter interface for analog signal to digital conversion.
4. Implementation of 2's complement and decoder functionalities using DIDO interface.

Part C: Assembly Language Programming Exercises/Experiments in 8051 using Keil

1. Develop a Embedded C Program to interface seven segment display to port1 and port2 and display the count from 00 to FFH
2. Implement the functionality of traffic signal controller using 8051 microcontroller.
3. Develop an Embedded C Program to display the given string on LCD.
4. Open ended Experiment

Reference Books

1. D. V. Hall, "Microprocessors and Interfacing", TMGH, 2nd edition 2006
2. Barry B. Brey, "The Intel Microprocessors", PHI, 7th edition 2006.
3. M.A. Mazidi, J.G. Mazidi, R.D. McKinlay, "The 8051 microcontroller and embedded systems", Pearson, 2nd Edition.

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DATABASE MANAGEMENT SYSTEMS

III Year – II Semester

Lecture : -

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 concepts on writing 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, Enhanced E–R Modeling: 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 Concept, 3rd edition, MH.
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, MH.

Reference Books

1. Elmasri Navrate, Fundamentals of Database Systems, 5th Pearson Education
2. C.J.Date, Introduction to Database Systems, 8th Pearson Education
3. Peter Rob and C Coronel, Database Systems design, Implementation, and Management, 7th Edition.

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NANO ELECTRONICS

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the limitations of scaling the silicon devices, basic concepts and progress of nanoelectronics.
- To know the fabrication techniques and scaling of nanodevices.
- To study the significance of tunneling effect in nanoelectronic devices and the concepts of Coulomb blockade.

Learning Outcomes

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

- explain the behavior of nanoscale devices.
- explore the fabrication techniques used for nanodevices.
- identify the importance of scaling.
- demonstrate the concepts of coulomb blockade and electron transport mechanisms.

Course Content

UNIT - I: Toward the Nanoscale

Scientific opportunities, technological motivations, improving materials on the nanoscale, fabrication techniques on the nanoscale, improvement in characterization methods for the nanoscale, new principles of device operation at the nanoscale, nanotechnology for optoelectronics.

UNIT - II: Growth and Fabrication of Nanostructures

Bulk crystal and heterostructure growth, nanolithography, etching, and other means of nanostructures and nanodevices, spontaneous formation and ordering of nanostructures, clusters and nanocrystals, methods of nanotube growth- chemical and biological methods for nanoscale fabrication, fabrication of nano-electromechanical systems.

UNIT - III: Nanoscale MOSFETs

Introduction, MOSFET scaling, short- channel effects, multiple-gate MOSFETs, FinFETs.

UNIT - IV: Tunnel Junctions

Tunneling through a potential barrier, potential energy profiles for material interfaces.

UNIT - V: Coulomb Blockade

Coulomb blockade in a nanocapacitor, tunnel junction excited by a current source, coulomb blockade in a quantum dot circuit.

UNIT - VI: Nanostructure Devices

Resonant tunneling diode, single electron transistors, carbon nanotube transistor, transport of spin and spintronics.

Text Books

1. Vladimir V. Mitin, Viatcheslav A. Kochelap, and Michael A. Stroscio, "Introduction to Nanoelectronics: Science, Nanotechnology, Engineering, and Applications", Cambridge University Press, 2008 (UNITS: I & II).
2. George W. Hanson, "Fundamentals of Nanoelectronics", Pearson Education, 2009 (UNITS: IV - VI).

Reference Books

1. Anantha Chandrakasan, "FinFETs and Other Multi-Gate Transistors", Springer, 2008 (UNIT: III).
2. Jerry G. Fossum and Vishal P. Trivedi, "Fundamentals of Ultra-Thin-Body MOSFETs and FinFETs", Cambridge University Press, 1st Edition, 2013 (UNIT: III)
3. Prof. Navakanta Bhat, "Nanoelectronics: Devices and materials", NPTEL Video Course, IISc, Bangalore.
4. MIT Open Course Ware, "Introduction to Nanoelectronics".
5. <https://ocw.mit.edu/courses/.../6-701-introduction-to-nanoelectronics-spring-2010>.

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Optional Elective - V

SOLAR AND WIND ENERGY SYSTEMS

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of Wind power generation systems and their control
- To familiarize with different Solar power generation and its grid interfacing

Learning Outcomes

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

- explain the energy utilization and application of renewable energy systems
- realize the concepts of fixed speed and variable speed wind energy systems
- explain the generation of electricity using PV systems with applications
- suggest appropriate PV interfacing methodology to grid

Course Content

UNIT - I: Introduction

World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilization – Renewable Energy Scenario in India and around the World Applications of renewable energy systems.

UNIT - II: Wind Turbines

Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects

UNIT - III: Constant Speed Wind Generation Systems

Generating Systems- Constant speed constant frequency systems - Choice of Generators- Synchronous Generator-Squirrel Cage Induction Generator.

UNIT - IV: Variable Speed Wind Generation Systems

Need of variable speed systems-Power-wind speed characteristics-Variable speed constant frequency systems synchronous generator- DFIG- PMSG

UNIT - V: PV Systems

Introduction to PV-Cells and their structures, Array, Solar power extraction using PV-Cells, I-V Characteristics, Maximum power point tracking-Methods, Applications

UNIT - VI: PV Interfacing Systems

PV Inverters without D.C. to D.C. converters, PV-Inverters with D.C. to D.C. converters-on low frequency side and high frequency side with isolation, without isolation. Grid interfacing-with isolation, without isolation

Text Books

1. Solar & Wind Energy Technologies – McNeils, Frenkel, Desai, Wiley Eastern, 1990
2. Ion Boldea, “Variable speed generators”, Taylor & Francis group, 2006.

Reference Books

1. Eduardo Lorenzo G. Araujo, Solar electricity engineering of photovoltaic systems, Progensa, 1994.
2. L.Freris “Wind Energy conversion Systems”, Prentice Hall, 1990

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POWER SYSTEM ANALYSIS

IV Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of multi-node power systems using an admittance matrix or impedance matrix representation.
- To introduce the formulation of load flow problem and development of algorithms for solving load flow problems.
- To familiarize with the fault analysis in interconnected systems.

Learning Outcomes

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

- describe the per unit system of power system.
- apply the concepts of addition or removal of element in the power system for determining the impedance matrix.
- formulate and solve the power flow problem of power system.
- develop and solve the positive, negative, and zero sequence networks for systems consisting of machines, transmission lines and transformers.
- determine the fault voltages and currents for various faults.
- analyze the stability of power system under various disturbances.

Course Content

UNIT - I: Representation

Per unit quantities, single line diagram, Impedance diagram of a power system, Graph theory definition, formulation of Y-Bus by direct inspection method.

UNIT - II: Z-Bus Formulation

Formation of Z-Bus: Partial network—Algorithm for the Modification of Zbus Matrix for addition element for the following cases: Addition of element from a new bus to reference—Addition of element from a new bus to an old bus—Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems).—Modification of Z-Bus for the changes in network (Problems).

UNIT - III: Power Flow Studies

Necessity of power flow studies – Derivation of Static power flow equations-Gauss-Seidel method (limited to 3 buses), algorithm.

Newton-Raphson method in polar coordinates form-Derivation of Jacobian matrix, Power flow solution using N-R method (3 bus), Decoupled and Fast decoupled method (3 bus), algorithms.

UNIT - IV: Symmetrical Fault Analysis & Symmetrical Components

Three phase short circuit currents and reactances of synchronous machines, short circuit MVA calculations. Synthesis of unsymmetrical phasors from their symmetrical components, operators, symmetrical components of unsymmetrical phasors, power in terms of symmetrical components, sequence networks-Positive, negative and zero sequence network

UNIT - V: Unsymmetrical Fault Analysis

Various types of unsymmetrical faults, LG, LL, LLG on unloaded alternator, unsymmetrical faults on power systems.

UNIT - VI: Power System Stability Analysis

Classification of stability, description of steady state stability power limits, transfer reactance, synchronizing power coefficient, power angle curve and determination of steady state stability, Derivation of swing equation, determination of transient stability by equal area criterion, application of equal area criterion, methods to improve steady state and transient state stability.

Text Books

1. Modern Power system analysis-I.J.Nagrath and D.P.Kothari- TMH, 2nd edition.
2. Computer methods in power systems analysis-Glenn W.Stagg, Ahmed H.El. Abiad- Mc. Graw- Hill International Editions.

Reference Books

1. Power system analysis-Grainger and Stevenson, Tata Mc. Graw-Hill.
2. Power system analysis-A.R.Bergen, PHI.
3. Power system analysis-Hadi saadat- TMH edition.
4. Power system analysis-B.R.Gupta-Wheeler Publications.
5. Electrical Power systems –C.L.Wadhwa -New Age International.

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BIG DATA ANALYTICS

IV Year – I Semester

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

Course Objectives

- To introduce the architectural concepts of Hadoop and introducing map reduce paradigm.
- To disseminate the 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

What is 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 MANNING Publ.
3. Dirk deRoos, Hadoop for Dummies, 1st edition, For Dummies.

Reference Books

1. Paul Zikopoulos, Tom Deutsch "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, TMH, 2012.
2. Srinath Perera, Thilina Gunarathne, Hadoop Map Reduce Cookbook, Packt Publishing.

Web Links

1. Hadoop: <http://hadoop.apache.org/>
2. Hive: <https://cwiki.apache.org/confluence/display/Hive/Home>
3. Piglatin: <http://pig.apache.org/docs/r0.7.0/tutorial.html>.

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CMOS DIGITAL IC DESIGN

IV Year – I Semester

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

Course Objectives

- To familiarize the students with the design of CMOS digital circuits.
- To make the students understand the impact of interconnects on the delay offered by digital logic circuits.

Course Outcomes

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

- characterize the behaviour of CMOS inverter
- design various combinational and sequential circuits using CMOS logic
- identify different components contributing to delay offered by interconnects
- design complex digital circuits
- design memory based array structures.

Course Content

UNIT - I: The CMOS Inverter

The static CMOS inverter, static behaviour, dynamic behaviour, power, energy and energy delay, technology scaling and its impact on the inverter metrics.

UNIT - II: Combinational Logic Design in CMOS

Static CMOS design, dynamic CMOS design, choosing a logic style, designing logic for reduced supply voltages.

UNIT - III: Sequential Logic Design in CMOS

Timing metrics for sequential circuits, classification of memory elements, static latches and registers, dynamic latches and registers, pipelining, non-bistable sequential circuits.

UNIT - IV: Interconnects

Capacitive parasitics, resistive parasitics, inductive parasitics

UNIT - V: Designing Complex Digital Integrated Circuits

Standard-cell design approach, array-based design, configurable and reconfigurable design.

UNIT - VI: Designing Memory Array Structures

Semiconductor memories, memory core, memory peripheral circuitry, design of PLA.

Text Book

1. Jan M. Rabaey, AnanthaChandrakasan, Borivoje Nikolic, "Digital Integrated Circuits: A Design Perspective", Pearson Education Inc., Second Edition.

Reference Books

1. Sung-Mo Kang, Yusuf Leblebici "CMOS Digital Integrated Circuits: Analysis and Design", TMH Education, Third Edition, 2003.
2. David A. Hodges, Horace G. Jackson, Resve A Saleh, "Analysis and Design of Digital Integrated Circuits" McGraw-Hill Higher Education; 3 edition (2003)
3. Amitava Dasgupta, "Digital Integrated Circuits", NPTEL Video Course, Department of Electrical Engineering, IIT Madras.

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POWER SEMICONDUCTOR DRIVES

IV Year – I Semester

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

Course Objectives

- To envisage the use of single phase and Three - phase full controlled and half controlled rectifier to different motor drives.
- To familiarize the need of Electrical drive system with the chopper controlled Four-quadrant operation of DC motor and electric braking.
- To introduce the control operation of synchronous and asynchronous drives.

Learning Outcomes

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

- analyze the operation of converter controlled electrical drives with active and passive loads
- realize the voltage and current waveforms of converter fed drives
- adopt the application of chopper for four quadrant operation of DC drives
- apply the scalar control and slip power control schemes to asynchronous motor drives
- describe the inverter-fed control of synchronous motor and its closed loop control methodologies

Course Content

UNIT - I: Control of DC Motors by Single Phase and Three Phase Converters

Introduction, Single Phase semi and fully controlled converter for separately excited DC motor drives and DC series excited motor- continuous and discontinuous conduction, Speed and Torque expressions and characteristics, numerical problems.

Three phase semi and fully controlled converters fed to DC separately excited and DC series motors (continuous current operation only) – Speed and Torque expressions and characteristics – numerical problems.

UNIT - II: Four Quadrant Operation of DC Drives

Introduction to Four quadrant operation –Dual converter for four quadrant operation, single phase and three phase dual converters, Electric Braking – Plugging, Dynamic and Regenerative Braking operations. Numerical problems

UNIT - III: Control of DC Motors by Choppers

Introduction, principle of chopper operation, control techniques used in DC choppers
Chopper configuration, Single quadrant, two –quadrant and four quadrant chopper
fed dc separately excited and series excited motors (Continuous current operation)
and their Output voltage and current wave forms – Speed torque expressions.
Numerical Problems, Closed Loop operation of Chopper controlled Dc excited
motor- operation below and above base speed

UNIT - IV: Control of Induction Motor from Stator Side

i) Through stator voltage control: Introduction to Speed control methods of Induction motor from Stator side. Stator voltage control, Ac Voltage Controller for three phase induction motors, advantages and disadvantages, four quadrant AC voltage controller.

ii) Through Rotor Frequency: Variable frequency characteristics, voltage source inverter(VSI) fed Induction motor drive, Waveforms –speed torque characteristics, Variable voltage and frequency control of induction motor by Voltage source Inverter (PWMControl)– numerical problems on induction motor drives – Closed loop operation of induction motor drive with regenerative braking.

UNIT - V: Control of Induction Motor of Rotor Side

Static rotor resistance control – Slip power recovery Schemes – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics – advantages disadvantages, applications – Numerical Problems.

UNIT - VI: Control of Synchronous Motors

Types of control, Separate control & self-control of synchronous motors –VSI fed self-controlled synchronous motor drive, phasor diagrams of cylindrical rotor wound field motor and salient pole motor, synchronous operation from fixed frequency supply-starting torque, running torque, pull in and pullout torque, braking, speed control of synchronous motor drive-open loop true synchronous mode, self-control mode, LCI fed SM drive, Closed loop LCI fed SM drive.

Text Books

1. Fundamentals of Electric Drives – by G K Dubey Narosa Publications.
2. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI.

Reference Books

1. Power Electronics – MD Singh and K B Kanchandani, Tata – McGraw-Hill Publishing company, 1998.
2. Modern Power Electronics and AC Drives by B.K.Bose, PHI.
3. Power semiconductor drives by S. Shivsnagaraju, M Balasubbareddy, A. Mallikarjun prasad, PHI publications, Eastern economy Edition, 2012.

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FLEXIBLE AC TRANSMISSION SYSTEMS

IV Year – I Semester

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

Course Objectives

- To Introduce the Flexible AC Transmission System devices for understanding the power flow in transmission lines.
- To familiarize the students with the basic types of FACTS controllers.
- To develop an understanding of different types of converters and their operation in different modes.
- To expose students to the practical problems associated with the operation of Power system and the necessity of FACTS devices.
- To gain the knowledge of selection of appropriate FACTS device for a particular application.

Learning Outcomes

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

- apply the knowledge of FACTS devices for enhancing power handling capacity in the transmission network.
- demonstrate the knowledge and understanding of the fundamental principles and control practices associated with FACTS controllers.
- describe different types of FACTS controllers.
- determine the operational related problems of transmission system and suggest the remedial measures.
- select an appropriate FACTS controller to meet specified performance requirements.

UNIT - I: FACTS Concepts

FACTS concepts, Transmission interconnections, power flow in an AC System, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, benefits from FACTS controllers.

UNIT - II: Voltage Source Converters

Single phase, three phases, full wave bridge converters, transformer connections for 12 pulse, 24 and 48 pulse operation. Three level voltage source converter,

pulse width modulation converter, basic concept of current source converters, and comparison of current source converters with voltage source converters.

UNIT - III: Static Shunt Compensation

Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, methods of controllable var generation, variable impedance type static var generators, switching converter type var generators, hybrid var generators.

UNIT - IV: SVC and STATCOM

The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping, operating point control and summary of compensation control.

UNIT V: Static Series Compensators

Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, functional requirements. GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC), control schemes for GSC, TSSC and TCSC.

UNIT - VI: Static Voltage and Phase Angle Regulators

Voltage and phase angle regulation, power flow control by phase angle regulators, real and reactive loop power flow control, improvement of transient stability and power oscillation damping with phase angle regulators, functional requirements, continuously controllable thyristor tap changers, thyristor tap changer with discrete level control, switching converter-based voltage and phase angle regulators, hybrid phase angle regulators

Text Books

1. “Understanding FACTS Devices” N.G.Hingorani and L.Guygi, IEEE Press, Indian Edition is available:—Standard Publications

Reference Books

1. HVDC & FACTS Controllers: applications of static converters in power systems - Vijay K.Sood- Springer publishers.
2. Sang.Y.H and John.A.T, “Flexible AC Transmission systems” IEEE Press (2006).

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Professional Elective - IV

CYBER SECURITY

IV Year – I Semester

Lecture : 3	Tutorial : 1	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

Course Content

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, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet.

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, Linux Firewall, Windows Firewall, Snort: Introduction Detection System.

UNIT - III: Web Application Tools

Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities -Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John theRipper, L0htcrack, Pwdump, HTC-Hydra.

UNIT - IV: Introduction to Cyber Crime and law

Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime.

UNIT - V: Introduction 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 to Incident Response

UNIT - VI: Introduction to Cyber Crime Investigation

Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

Text Books

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley.

Reference Books

1. Cyber Security essentials edited by James Graham, Ryan Olson, Rick Howard.
2. Introduction to Computer Networks and Cybersecurity By Chwan-Hwa (John) Wu, J. David Irwin.

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Professional Elective - IV

DIGITAL IMAGE PROCESSING

IV Year – I Semester

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

Course Objectives

- To introduce fundamental concepts of image processing and different operations on image elements.
- To expose to the practical problems associated with processing of an image.
- To familiarize with advanced image processing operations.

Learning Outcomes

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

- analyze the need for image transforms, types and their properties.
- process the images for the enhancement of certain properties or for optimized use of the resources.
- explore causes for image degradation and to develop various restoration techniques.
- evaluate the image compression techniques

Course Content

UNIT - I: Fundamentals of Image Processing and Image Transforms

Introduction, fundamental steps in image processing, components of image processing system, image sensing and acquisition, image formation model, image sampling and quantization, pixel relationships, image distance measures.

Image Transforms - Need for image transforms, properties of DFT, Discrete Cosine Transform, Hadamard transform, Walsh transform, Haar transform, Slant transform.

UNIT - II: Image Enhancement

Spatial Domain: Gray level transformations, histogram processing, spatial filtering smoothing and sharpening. **Frequency Domain:** Filtering in frequency domain – smoothing and sharpening filters, homomorphic Filtering, notch filter inverse filter, wiener filter.

UNIT - III: Image Restoration

Image degradation model, noise modeling, image restoration in the presence of only noise-mean filters, order statistic filters, band reject filters, band pass filters,

UNIT - IV: Image Segmentation and Morphology

Detection of discontinuities, edge detection, threshold based segmentation, region based segmentation – region growing, region splitting and merging.

Morphology: dilation, erosion, opening and closing, hit or miss transformation, basic morphological algorithms.

UNIT - V: Image Compression

Image compression: Fundamentals, image compression model, types of redundancy, variable length coding, arithmetic coding, LZW coding, bit-plane coding, run length coding.

UNIT - VI: Color Image Processing

Color Image Processing: Color fundamentals, color models-RGB, CMYK and HSI, color transformations.

Applications of image processing: Content based image retrieval systems, digital watermarking, image mosaicing and image compositing.

Text Books

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, 2nd edition, Pearson Education, 2003. (Units: I-V except image transforms)
2. S.Sridhar, “Digital Image Processing”, Oxford University Press, 2011. (Unit-I image transforms and Unit-VI).

Reference Books

1. Anil K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 2nd edition 2004.
2. S.Jayaraman, “Digital Image Processing”, Tata McGraw-Hill Education, 2011.

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POWER SYSTEM OPERATION AND CONTROL

IV Year – I Semester

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

Course Objectives

- To familiarize with the optimal generation allocation of power system with and without losses.
- To impart knowledge on the transmission loss formula and hydrothermal scheduling.
- To introduce the concepts of load frequency control and steady state response of single and two area systems.

Learning Outcomes

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

- evaluate optimal generation schedule with and without losses.
- compute loss coefficients and transmission losses.
- find the solution for short term hydrothermal scheduling problems.
- determine the steady state changes in frequency in single area and two area load frequency control.
- suggest suitable voltage control method for different applications.

Course Content

UNIT - I: Economic Operation of Power System (without losses)

Optimal operation of Generators in Thermal Power Stations, heat rate Curve – Cost Curve, Incremental fuel cost, input output characteristics, Optimum generation allocation with line losses neglected.

UNIT - II: Economic Operation of Power Systems (with losses)

Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula.

UNIT - III: Hydrothermal Scheduling

Optimal scheduling of Hydrothermal System, scheduling problems – short term Hydrothermal scheduling problem.

UNIT - IV: Single Area Load Frequency Control

Necessity of keeping frequency constant, modeling of speed governing system, modeling of steam turbine, generator, Definition of Control area – Single area control – Block diagram representation of isolated power system – Steady state analysis – Dynamic response – Uncontrolled case.

UNIT - V: Load Frequency Controllers & Two Area Load Frequency Control

Proportional plus integral control of single area and its block diagram representation, steady state response – Load frequency control and economic dispatch control. Load frequency control of two area system – uncontrolled case and controlled case, tie-line bias control.

UNIT - VI: Reactive Power & Emergency Control

Relation between reactive power & voltage, different voltage control methods: Shunt & Series compensation, on-load tap changing transformer, booster transformer, Alternator voltage regulator (AVR), Emergency control: Concepts, Coherent area dynamics, stability enhancement methods, Average system frequency, center of Inertia.

Text Books

1. Electric Energy systems theory: Olle I.Elgerd TMH, 2nd edition.
2. Power Systems Engineering : IJ Nagarath & DP Kothari – TMH.

Reference Books

1. Power System Analysis: Hadi Saadat - TMH.
2. Power System Analysis & Stability – S.S vadhera Khanna Publishers.
3. Power System Engineering, Chakravarthy, Soni, Gupta & Bhatnagar, Dhanapat Rai & Sons.

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Professional Elective - IV

HIGH VOLTAGE ENGINEERING

IV Year – I Semester

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

Course Objectives

- To understand breakdown mechanisms occur in solids gases and liquid dielectrics.
- To understand various generation methods employed for High DC, AC and impulse voltages.
- To distinguish various methods employed for measurement High DC, AC and impulse voltages.

Learning Outcomes

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

- analyse the behavior of dielectric material under Different circumstances.
- demonstrate an understanding of high voltage engineering techniques.
- conduct analysis of industrial equipment.
- identify the most suitable equipment for performing specific testing on high voltage applications.
- perform basic AC, DC, impulse voltage and partial discharge tests on high voltage equipment and insulation systems in the laboratory environment.

UNIT - I: Break Down In Gaseous And Liquid Dielectrics

Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids. Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

UNIT - II: Generation Of High Voltages And Currents

Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

UNIT - III: Measurement Of High Voltages And Currents

Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

UNIT - IV: Non-Destructive Testing Of Material And Electrical Apparatus

Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements.

UNIT - V: High Voltage Testing Of Electrical Apparatus

Testing of Insulators and bushings, Testing of Isolators and circuit breakers, testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements

UNIT - VI: Industrial Application to High Voltage Engineering

Electrostatic precipitator, electrostatic separator, electrostatic copying, electrostatic coating and pulsed power.

Text Books

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition.
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.

Reference Books

1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.

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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 agencies and 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; skills and strategies; rescue, relief reconstruction. Case Studies: Lessons and Experiences from Various Important Disasters in India

UNIT - III: Flood and Drought Disaster

Raising flood damage, assessing flood risk, flood hazard assessment, flood impact assessment, flood risk reduction options. Drought and development, relief management and prevention, drought mitigation and management-integrating technology and people.

UNIT - IV: Landslide and Earthquake Disaster

Land slide hazards zonation mapping and geo environmental problems associated with the occurrence of landslides. The use of electrical resistivity method in the study 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 safety and 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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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, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic 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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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 algorithms 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-point, 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 occurred.

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, Earthing – 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. Refrigeration 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
- assess 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 (IoT).
- To famialirize 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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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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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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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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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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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, lambda 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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ENGINEERING OPTIMIZATION

IV Year – I Semester

Lecture : 2	Tutorial : 1	Internal Marks : 40
Credits : 2		External Marks : 60

Course Objectives

- To emphasize various categories of existing engineering problems.
- To familiarize with different optimization techniques and approaches.

Learning Outcomes

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

- apply the knowledge of Mathematics in analyzing an Engineering problem.
- develop an optimization problem in standard form and assess the optimality of a solution.
- analyze multi objective and multidisciplinary optimization problems
- construct algorithm for constrained and unconstrained nonlinear optimization problem of multiple variables.
- select an appropriate optimization technique for a system

UNIT - I: Introduction

Standard form of linear programming problem (L.P.P), Geometry of L.P.P., Graphical solution, Formulation of design problems as mathematical programming problems, classification of optimization problems.

UNIT - II: Linear Optimization

Simplex method, Big-M method, two phase Simplex method, duality in optimization, duals of linear and quadratic programming problems.

UNIT - III: Unconstrained Optimization

Introduction to optimum design, General principles of optimization, Problem formulation & their classifications, Single variable and multivariable optimization.

UNIT - IV: Constrained Optimization I

Techniques of unconstrained minimization- Golden section, Random, pattern and gradient search methods, Interpolation methods.

UNIT - V: Constrained Optimization II

Optimization with equality and inequality constraints, Direct methods, Indirect methods using penalty functions, Lagrange multipliers, Geometric programming.

UNIT - VI: Advanced Optimization

Multi stage optimization, dynamic programming, stochastic programming, Multi objective optimization.

Text Books

1. Rao, S. S., “Engineering Optimization: Theory and Practice”, 4th edition, Wiley, ISBN 978-0-470-18352-6.
2. Ravindran, K. M. Ragsdell, G. V. Reklaitis., “Engineering Optimization: Methods and Applications”, 2nd Edition ISBN: 978-0-471-55814-9.

Reference Books

1. S.Kalavathi., “Operation Research”, 2nd Edition, Vikas Publications.
2. Taha, Hamdy, Operations Research, 7th edition, Macmillan Publishing company.

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POWER ELECTRONICS LAB

IV Year – I Semester

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

Course Objectives

- To provide knowledge on behavior of power electronic circuits using different power converters experimentally.
- To familiarize with the practical problems associated with control and firing circuits of power electronics.

Learning Outcomes

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

- plot the characteristics of various power semiconductor switches.
- trigger and commutate the SCR using various methods
- analyse and test the operation of simple power electronic circuits.
- operate the given drive in all four quadrants.
- analyse the performance of PWM converter.
- perform closed loop control of DC motor

List of Experiments

Any 10 experiments from the following list are required to be conducted:

1. Study of Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for silicon controlled rectifier (SCR)
(a) R triggering (b) RC triggering (c) UJT triggering
3. Forced Commutation circuits (Class A, B, C, D).
4. Single Phase Half and Fully controlled bridge converter with R and RL load.
5. Single Phase AC Voltage Controller with R and RL load.
6. Single Phase Cyclo – converter with R and RL load.
7. Single Phase bridge inverter using PWM technique with R and RL load.
8. Single Phase series and parallel inverter with R and RL load.
9. Single Phase dual converter with RL load
10. Three Phase half and full controlled bridge converter with R and RL load.
11. Chopper Controlled DC Motor
12. Single Phase IGBT based V/F control induction motor.

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POWER SYSTEMS LAB

IV Year – I Semester

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

Course Objectives

- To impart knowledge on protective relays, over voltage, over current and impedance relay.
- To introduce the concepts on Ferranti effect and surge impedance loading experimentally.

Learning Outcomes

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

- determine the sub transient reactance of a Salient Pole Machine.
- verify the characteristics of the over voltage and over current relay.
- analyze the importance of transmission line parameters.
- describe the Ferranti effect and surge impedance loading.
- plot the characteristics of PV Module.

List of Experiments

Any 10 of the following experiments are to be conducted

1. Characteristics of IDMT over Current Relay.
2. Characteristics of Static Negative Sequence Relay.
3. Characteristics of Over Voltage Relay. (Microprocessor Type).
4. Characteristics of Reverse Power Relay.
5. Simulation of 220KV Transmission line model.
 - i) Ferranti Effect
 - ii) Transmission line constants
6. Determination of I-V and P-V characteristics of PV module with varying radiation.
7. Characteristics of Induction Motor Protection relays
8. Determination of I-V and P-V characteristics of series and parallel combination of PV module.
9. Determination of Sub-Transient Reactance of a Salient Pole Machine.
10. Characteristics of impedance relay.
11. Transformer Oil Testing and testing of Buchholtz relay.

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Optional Elective - VII

ANALOG AND DIGITAL COMMUNICATION

IV Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize students with fundamentals of analog and digital communication systems and various techniques for analog and digital modulation and demodulation schemes.

Learning Outcomes

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

- understand the functioning of AM and FM transmitters and receivers.
- determine power relations for various modulation schemes and evaluate the impact of noise in AM and FM modulation schemes.
- explain basic concepts of Digital Communication System.
- analyse different digital modulation techniques.
- identify error detection & correction capabilities of linear block codes

Course Content

UNIT - I: Continuous Wave Modulation - I

Introduction, need for modulation, amplitude modulation-definition, description in time and frequency domains, power relations, generation and detection.

UNIT - II: Continuous Wave Modulation-II

DSB-SC- time-domain and frequency-domain description, generation and coherent detection, AM SSB Modulated waves-time-domain description. Noise in AM systems; Comparison of various AM techniques.

UNIT - III: FM Generation

Introduction to angle modulation, Single tone frequency modulation, narrow band FM and wideband FM time and frequency domain descriptions, constant average power, transmission bandwidth of FM wave, generation of FM waves: direct FM, Detection of FM waves: balanced frequency discriminator, pre-emphasis and de-emphasis in FM.

UNIT - IV: Digital Pulse Modulation

Elements of digital communication systems, Elements of PCM, Differential PCM systems (DPCM), Delta Modulation, Noise in PCM & DM Systems, Comparison of PCM & DM Systems.

UNIT - V: Digital Modulation Techniques

Gram-Schmidt orthogonality procedure, Modulation & demodulation: Phase Shift Keying, Differential Phase Shift Keying, Amplitude Shift Keying, Frequency Shift Keying, similarity of BFSK and BPSK

UNIT - VI: Information Theory & Coding

Information and its properties. Average information, Entropy and its properties. Shannon's theorem, Shannon-Fano and Huffman coding, efficiency calculations, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes.

Text Books

1. Simon Haykin, John Wiley, "Principles of Communication Systems", 2nd Edition.
2. H Taub & D. Schilling, Gautam Sahe, "Principles of Communication Systems", TMH, 2007 3rd Edition.

Reference Books

1. Singh & Sapre "Communication Systems Analog & Digital", TMH, 2004.
2. B.P. Lathi, "Communication Systems", BS Publication, 2006
3. John G. Proakis, Masond, Salehi, "Fundamentals of Communication Systems", PEA, 2006.

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Optional Elective - VII

INTRODUCTION TO PYTHON PROGRAMMING

IV Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the fundamentals of Python programming language.
- To familiarize with the various objects of Python.
- To learn exception handling in Python.

Learning Outcomes

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

- describe the basic elements of Python.
- Implement branching constructs in Python.
- Describe the methodology of String Formatting.
- Differentiate between Tuples and Lists in Python.
- Define the properties of Dictionary keys.
- Implement various built-in methods of files in Python.

Course Content

UNIT - I

Introduction to python programming - python, history of python, features of python, downloading-installation and run the python script; python program input and output, comments, operators, variables and assignments.

UNIT - II

Syntax and style – statements and syntax, variable assignments, identifiers, basic style guidelines, memory management.

Data types – Numbers-introduction, types, sequences – **strings** –strings and operators.

UNIT - III

Lists- operators, built in functions, features of lists; **Tuples** - operators, built in functions, features of tuples; **Dictionaries**- introduction, operators, built in functions, dictionary keys.

UNIT - IV

Conditional and loop statements – if, else, else-if, while, for, break, continue, pass statements.

Functions- introduction, creating, calling and pass functions, function arguments.

UNIT - V

Files and input/output- objects, built-in functions, built-in attributes; **Modules**- introduction and importing modules.

Errors and exceptions – exceptions in python, detecting and handling exceptions

UNIT - VI

Classes and OOP – introduction, OOP, classes, instances, binding and method invocation, composition, sub classing and derivation, inheritance

Text Books

1. Wesley J. Chun, “Core Python Programming”, Prentice Hall, 2001.
2. Think Python, 2 nd ed, Allen Downey, 2012, Green Tea Press.

Reference Books

1. https://mva.microsoft.com/en-US/training-courses/introduction-to-programming-with-python-8360?l=lqhuMxFz_8904984382
2. https://onlinecourses.nptel.ac.in/noc17_cs10/preview
3. <https://www.tutorialspoint.com/python/index.htm>

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Optional Elective - VII

INTEGRATION OF RENEWABLE ENERGY SOURCES

IV Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the characteristics of various types of renewable energy sources and converters.
- To explain the power quality issues on the grid by integrating renewable energy sources.

Learning Outcomes

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

- Identify the characteristics of renewable energy sources and converters.
- To introduce the converter topologies
- Analyze the importance of storage and sizing of hybrid systems.
- Realize the problems related to isolated systems.
- Analyze the challenges faced by the grid by integrating renewable energy sources.
- Understand the power synchronizing technologies

Course Content

UNIT - I: Review of Characteristics of Power Sources

Basic review of power generation from wind - Solar PV - Thermal - Small hydro - Biomass power strategies in each of these energy conversion systems - Review of maximum power point tracking techniques in solar PV and wind (perturb & observe, hill climbs, incremental conductance).

UNIT - II: Converter Topologies

DC/DC converter (buck, boost, buck boost) - DC/AC inverters (sine, triangular, PWM techniques) - Phase locked loop for inverters.

UNIT - III: Hybrid Systems

Advantages of hybrid power systems - Importance of storage in hybrid power systems - Design of hybrid power system based on load curve - Sizing of hybrid power systems.

UNIT - IV: Isolated Systems

Control issues in isolated systems for voltage and frequency - Small signal stability in isolated power systems - Importance of storage and dump load in isolated systems.

UNIT - V: Issues in Integration of Renewable Energy Sources

Overview of challenges in integrating renewable sources to the grid - Impact of harmonics on power quality - Need to maintain voltage within a band and fluctuations in voltage because of renewable integration.

UNIT - VI: Power inverter and converter technologies

Mechanism to synchronize power from renewable sources to the grid - Overview of challenges faced in designing power injection from offshore generation sources - Challenges in modeling intermittent nature of renewable power in a power system.

Text Books

1. Power Electronics, Converters, Applications and Design” by N. Mohan; T.M. Undeland; W.P. Robbins. 1995, John Wiley and Sons.
2. Renewable Energy Integration Challenges and Solutions Series: Green Energy and Technology Hossain, Jahangir, Mahmud, Apel (Eds.)

References Book

1. Integration of Alternative Sources of Energy Felix A. Farret, M. Godoy Simões December 2005, Wiley-IEEE Press.

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ELECTRICAL DISTRIBUTION SYSTEM

IV Year – II Semester

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

Course Objectives

- To introduce concepts on design of substation and primary feeders.
- To familiarize with various coordination procedures of protective devices.

Learning Outcomes

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

- distinguish various load models in the distribution system
- describe the primary feeder ratings and voltage levels.
- design an optimum location of the substation.
- analyze the distribution system and its associated coordination procedures
- select appropriate voltage control method in the distribution systems

Course Content

UNIT - I: General Concepts

Introduction to distribution systems, Load modeling and characteristics. Coincidence factor, contribution factor loss factor – relationship between the load factor and loss factor. Classification of loads (residential, commercial, agricultural and Industrial) and their characteristics.

UNIT - II: Distribution Feeders

Design Considerations of Distribution Feeders; Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.

UNIT - III: Substations

Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

UNIT - IV: System Analysis

Voltage drop and power – loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines. Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations DC

distributors for following cases: radial DC distributor fed at one end and at both ends (equal / unequal voltages), ring main distributor, stepped distributor and AC distribution. Comparison of DC and AC distribution.

UNIT - V: Protection

Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, and line sectionalizes, and circuit breakers.

Coordination: Coordination of Protective Devices: General coordination procedure, residual current circuit breaker RCCB (Wikipedia)

UNIT - VI: Compensation for Power Factor Improvement & Voltage Control

Capacitive compensation for power factor control, Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), Power factor correction, capacitor allocation- Economic justification- Procedure to determine the best capacitor location.

Voltage Control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

Text Book

1. “Electric Power Distribution System Engineering”- by Turan Gonen, Mc Graw-hill Book Company.

Reference Book

1. Electric Power Distribution- by A. S. Pabla, Tata Mc Graw – hill Publishing Company, 4th edition, 1997.

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ARTIFICIAL INTELLIGENCE TECHNIQUES

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce concepts on Neural Networks and fuzzy logic
- To familiarize with the applications of AI techniques.

Learning Outcomes

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

- describe learning tasks in Artificial Intelligent Techniques(AIT).
- analyze learning algorithm for Neural Networks.
- analyze different architectures of Artificial Neural Networks.
- apply AIT to electrical engineering problems.

Course Content

UNIT - I: Introduction to AI techniques

Introduction to artificial intelligence systems– Humans and Computers – Knowledge representation – Learning process – Learning tasks – Methods of AI techniques.

UNIT - II: Neural Networks

Organization of the Brain – Biological Neuron – Biological and Artificial neuron Models, MC Culloch-pitts neuron model, Activation functions, Learning rules, neural network architectures- Single-layer feed-forward networks: – Perceptron, Learning algorithm for perceptron- limitations of Perceptron model

UNIT - III: ANN paradigm

Multi-layer feed-forward network (based on Back propagation algorithm)– Radial-basis function networks- Recurrent networks (Hopfield networks).

UNIT - IV: Classical and Fuzzy Sets

Introduction to classical sets – properties – Operations and relations – Fuzzy sets – Membership – Uncertainty – Operations – Properties – Fuzzy relations – Cardinalities – Membership functions.

UNIT - V: Fuzzy Logic System Components

Fuzzification – Membership value assignment – Development of rule base and decision making system – Defuzzification to crisp sets – Defuzzification methods – Basic hybrid system.

UNIT - VI: Application of AI techniques

Load forecasting – Load flow studies – Economic load dispatch – Load frequency control – Reactive power control – Speed control of dc and ac motors.

Text Books

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by S.Rajasekaran and G.A. Vijayalakshmi Pai – PHI Publication.
2. Fuzzy logic with fuzzy applications- by T.J. Ross, TMH.

Reference Books

1. Introduction to Artificial Neural Systems – Jacek M. Zurada, Jaico Publishing House, 1997.
2. Fundamentals of Neural Networks Architectures, Algorithms and Applications - by laurene Fausett, Pearson.
3. Neural Networks, Algorithms, Applications and programming Techniques by James A. Freeman, David M. Skapura.
4. Introduction to Neural Networks using MATLAB 6.0 by S N Sivanandam, S Sumathi, S N Deepa TMGH.

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ADVANCED CONTROL SYSTEMS

IV Year – II Semester

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

Course Objectives

- To impart knowledge on the implementation of compensators in frequency domain.
- To impart knowledge on different types of state variable forms for the LTI and LTV systems.
- To familiarize with the concepts on nonlinear control systems.
- To introduce the concepts on design of state feedback controllers.

Learning Outcomes

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

- design a compensator for continuous time systems.
- apply the concepts of controllability and observability in evaluating the performance of control system.
- apply the fundamental principles of nonlinearities to a nonlinear system.
- determine the stability of a given nonlinear system.
- design an appropriate feedback controller and/or observer for physical plants.

Course Content

UNIT - I: Classical Control Design Techniques

Compensation techniques – lag, lead, lag-lead controllers design in frequency domain, PID controller tuning using Z-N method.

UNIT - II: Concept of Controllability and Observability

Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form. Tests for controllability and observability for continuous time systems –time invariant case, Principle of Duality, Controllability and observability form Jordan canonical form and other canonical forms.

UNIT - III: Describing Function Analysis

Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

UNIT - IV: Stability Analysis

Stability in the sense of Lyapunov's Lyapunov's stability and Lyapunov's instability theorems. Direct method of Lyapunov's theorem for the Linear and Nonlinear continuous time autonomous systems.

UNIT - V: Model Control -I

Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement and Ackermann's formula.

UNIT - VI: Model Control -II

State observers, Full order observer and reduced order observer, effects of the addition of the observer on a closed loop systems.

Text Books

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996.
2. Modern control engineering – K.Ogata, Prentice Hall Of India, 3rd edition, 1998.
3. Control system Engineering – I.J. Nagrath, M.Gopal. New Age International Publications, 5th edition.

Reference Books

1. Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw-Hill Companies, 1997.
2. Systems and Control by Stanislaw H. Zak, Oxford Press, 2003.
3. Automatic feedback control system synthesis – Truxal, International student edition.

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Professional Elective - V

ENERGY, AUDIT, CONSERVATION AND MANAGEMENT

IV Year – II Semester

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

Course Objectives

- To introduce the basic concepts of Energy Auditing and Management.
- To familiarize the various Techniques of Electrical Energy Conservation..

Learning Outcomes

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

- understand the Process of Energy Audit of Industries.
- apply the concepts of Energy management for Efficient Energy Utilization and Conservation.
- identify a suitable method for Energy Conservation of various electric devices.
- analyze the benefits of energy conservation from the Economic aspects.

UNIT - I: Basic Principles of Energy Audit

Energy audit- definitions, concept , types of audit, energy index, cost index ,pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT - II: Energy Management

Principles of energy management, organizing energy management program, initiating, planning,controlling, promoting, monitoring, reporting- Energy manger, Qualities and functions, language, Questionnaire – check list for top management.

UNIT - III: Energy Efficient Motors

Energy efficient motors , factors affecting efficiency, loss distribution , constructional details, characteristics - variable speed , variable duty cycle systems, RMS hpvoltage variation-voltage unbalance- over motoring- motor energy audit.

UNIT - IV: Power Factor Improvement

Power factor – methods of improvement, location of capacitors, Pf with non linear loads, effect of harmonics on power factor, power factor motor controllers

UNIT - V: Lighting and Energy Instruments

Good lighting system design and practice, lighting control, lighting energy audit – Energy. Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC's.

UNIT - VI: Economic Aspects and Analysis

Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis- Energy efficient motors- calculation of simple payback method, net present worth method- Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

Text Books

1. Energy management by W.R. Murphy AND G. McKay Butter worth, Heinemann publications.
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company- 1st edition, 1998

Reference Books

1. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd- 2nd edition, 1995.
2. Energy management hand book by W.C.Turner, John wiley and sons.
3. Energy management and good lighting practice: fuel efficiency- booklet 12- EEO.

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SOCIAL ELECTRICAL MACHINES

IV Year – II Semester

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

Course Objective

- To envisage the operation, characteristics and performance of descendants of synchronous and asynchronous motors.
- To familiarize with the open loop and closed loop operation and applications of special synchronous motors.

Learning Outcomes

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

- describe the operation of special synchronous motors.
- realize the performance of various special synchronous motors
- adopt the control methods and topologies of SRM, Stepper motor and PMBLDC motor.
- analyze the performance characteristics of linear induction motor and servo motors.
- employ special synchronous motors to a suitable application.

Course Content

UNIT - I: Switched Reluctance Motor

Principle of operation – Design of stator and rotor pole arc – Power converter for switched reluctance motor – Control of switched reluctance motor.

UNIT - II: Stepper Motors

Construction – Principle of operation – Theory of torque production – Hybrid stepping motor – Variable reluctance stepping motor – Open loop and closed loop control.

UNIT - III: Permanent Magnet DC Motors

Construction – Principle of working – Torque equation and equivalent circuits – Performance characteristics – Moving coil motors.

UNIT - IV: Permanent Magnet Brushless DC Motor

Construction – Principle of operation – Theory of brushless DC motor as variable speed synchronous motor – Sensor less and sensor-based control of BLDC motors.

UNIT - V: Linear Motors

Linear induction motor: Construction— principle of operation— applications. Linear synchronous motor: Construction – principle of operation— applications.

UNIT - VI: Other Motors

Ac series motor, Universal motor, DC and AC servo motor.

Text Books

1. Special electrical Machines, K.Venkata Ratnam, University press, 2009, New Delhi.
2. Brushless Permanent magnet and reluctance motor drives, Clarendon press, T.J.E. Miller, 1989,Oxford.

Reference Books

1. Special electrical machines, E.G. Janardhanan, PHI learning private limited, 2014.
2. Electrical motor drives- modelling analysis and control, R. Krishnan, PHI learning private limited, 2014.

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Professional Elective - VI

DIGITAL CONTROL SYSTEMS

IV Year – II Semester

Lecture : 3	Tutorial : 1	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.

* * *

Professional Elective - VI

UTILIZATION OF ELECTRICAL ENERGY

IV Year – II Semester

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

Course Objectives

- To impart knowledge on electric heating and welding methods for residential, commercial and industrial applications.
- To familiarize with the fundamental laws of illumination, working principles of different lamps, basic concepts of electric traction and electric braking.

Learning Outcomes:

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

- describe various electric heating and welding methods.
- design illumination systems for residential, commercial and industrial environments.
- analyze various speed time curves of electric traction.
- determine the tractive effort, power and specific energy consumption of electric traction.

Course Content

UNIT - I: Electric Heating

Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.

UNIT - II: Electric Welding

Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT - III: Illumination

Introduction to sources of light, terms used in illumination, laws of illumination, basic principles of light control, illumination levels for various purposes.

UNIT - IV: Methods of Illumination

Types of Lamps: Discharge lamps, MV and SV lamps, tungsten filament lamps and fluorescent tubes, Comparison between tungsten filament lamps and fluorescent tubes, design of interior and exterior lighting systems.

UNIT - V: Electric Traction – I

Systems of electric traction and track electrification. Review of existing electric traction systems in India, Special features of traction motor, Mechanics of train movement, Speed-time curves for different services, trapezoidal and quadrilateral speed time curves

UNIT - VI: Electric Traction – II

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

Text Books:

1. Utilization of Electric Energy by Garg and Giridhar, Khanna Publishers, First Edition, 1982.
2. Art & Science of Utilization of electrical Energy by H.Partab, Dhanpat Rai & Sons, second edition, 1999.

Reference Books:

1. Utilization of Electrical Power including Electric drives and Electric Traction by N.V.Suryanarayana, New Age International (P) Limited, First Edition, 1996.
2. Generation, Distribution and Utilization of electrical Energy by C.L. Wadhwa, Wiley Eastern Limited, second edition, 1997.

* * *

Professional Elective - VI

HVDC TRANSMISSION SYSTEMS

IV Year – II Semester

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

Course Objectives

- To introduce the concepts of HVDC Transmission.
- To familiarize with various converters , controllers and networks used in HVDC Transmission.

Learning Outcomes

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

- design the voltage level and ratings of the HVDC system for a given amount of power transfer.
- identify the suitable converter and its control scheme in HVDC Transmission.
- estimate the amount of reactive power to be compensated for a given HVDC Transmission system.
- develop a suitable model for a given AC- DC network
- choose appropriate protecting device for various faults in HVDC stations.
- design a suitable filter to eliminate harmonics in the HVDC System.

UNIT - I: Basic Concepts

Economics & terminal equipment of HVDC transmission systems: types of HVDC links – apparatus required for HVDC systems – comparison of AC & DC transmission, application of DC transmission system – planning & modern trends in D.C. transmission.

UNIT - II: Analysis Of HVDC Converters

Choice of Converter configuration – analysis of Graetz – characteristics of 6 Pulse & 12 Pulse converters –Cases of two 3 phase converters in star –star mode – their performance. Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system; Starting and stopping of DC link; Power Control.

UNIT - III: Reactive Power Control And In HVDC

Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies sources of reactive power-AC Filters – shunt capacitors synchronous condensers.

UNIT - IV: Power Flow Analysis in AC/DC Systems

Modeling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC load flow – P.U. System for D.C. quantities-solution of AC-DC Power flow-Simultaneous method-Sequential method.

UNIT - V: Converter Faults

Converter faults – protection against over current and over voltage in converter station – surge arresters – DC breakers –Audible noise-space charge field-corona effects on DC lines-Radio interference.

UNIT - VI: Harmonics & Protection

Generation of Harmonics, Characteristics and Non- Characteristics harmonics, Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics. Types of AC filters, Design of Single tuned filters –Design of High pass filters.

Text Books

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited Publishers, First Edition, 2005.
2. EHVAC and HVDC Transmission Engineering and Practice – S.Rao. Khanna Publishers, 1990.

Reference Books

1. HVDC Transmission – J.Arrillaga. published by the institution of electrical engineering, London, UK, 1998.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons, First Edition.
3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications, First Edition.

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ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

MECHANICAL 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 become a competent centre in moulding students as professional mechanical engineers having ethical standards and social consciousness

Mission:

- * To impart value based education and to enhance competencies of students through effective design and delivery of the curriculum that fulfils the needs of the industry.
- * To instill desire and confidence in the students to cater the needs of the society through their activities of excellence.
- * To impart technical skills and nurture values, and mould the students as professionals to offer solutions to the technological challenges.
- * To guide and support the students for enhancing nation's wealth through entrepreneurship.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- * Graduates of the program will have bright careers in Mechanical Engineering domain and allied areas.
- * Graduates of the program will have life skills, sense of ethical conduct and social responsibility.
- * Graduates of the program will continue to learn and update their competencies to face dynamically changing technological environment.

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)

- * design and analyze thermal systems related to power generation and human comfort for sustainable environment.
- * develop eco friendly products and manufacturing processes.
- * effectively use various mechanical engineering software tools for design, analysis and optimization.

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 internship / 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:

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

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:

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

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
$\geq 6.5 \text{ \& } < 7.5$	First Class
$\geq 5.5 \text{ \& } < 6.5$	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 reevaluate 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)	16	10.00	10 - 15
3	Engineering Sciences (ES)	27	16.87	10 - 20
4	Professional Core (PC)	52	32.50	25 - 35
5	Professional Electives (PE)	18	11.25	8 - 12
6	Open Electives (OE) & Self Study Course	12	7.50	5 - 10
7	Others (Project, Survey Camp, Internship, etc.)	14	8.75	8 - 10
8	Mandatory Non-Credit Courses	-	-	-

COURSE STRUCTURE & 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	MA2501	Linear Algebra & Differential Equations	4	1	-	4
3	PH2502	Physics for Engineers	3	1	-	3
4	EN2501	Environmental Studies	3	-	-	2
5	CT2501	Problem Solving Using C *	4	-	2	4
6	ME2505	Engineering Graphics	1	-	4	3
7	EG2502	Functional English Lab	-	-	2	1
8	PH2503	Engineering Physics Lab	-	-	2	1
Total			19	2	10	21

* Integrated Course with Theory and Laboratory

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	MA2503	Integral Transforms and Multiple Integrals	3	1	-	3
3	EN2502	Engineer & Society	3	-	-	2
4	CH2505	Industrial Chemistry	3	1	-	3
5	CE2501	Engineering Mechanics	4	1	-	4
6	ME2506	Computer Aided Engineering Drawing	-	-	2	1
7	ME2507	Engineering Workshop	-	-	2	1
8	EG2504	Professional Communication Lab	-	-	4	2
9	ME2508	Industrial Chemistry Lab & Engg. Mechanics Lab	-	-	2	1
Total			16	3	10	19

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	EE2501	Elements of Electrical and Electronics Engineering	3	1	-	3
2	ME2510	Engineering Thermodynamics	3	1	-	3
3	ME2511	Kinematics of Machines	3	1	-	3
4	ME2512	Solid Mechanics	3	1	-	3
5	ME2513	Engineering Metallurgy	4	-	-	3
6	EE2502	Electrical and Electronics Engineering Lab	-	-	2	1
7	ME2514	Solid Mechanics and Metallurgy Lab	-	-	4	2
8	ME2515	Computer Aided Modeling Lab	-	-	2	1
Total			16	4	8	19
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	ME2516	Manufacturing Processes	4	-	-	3
2	ME2517	Applied Thermodynamics	3	1	-	3
3	ME2518	Dynamics of Machines	3	1	-	3
4	ME2519	Fluid Mechanics	3	1	-	3
5		Open Elective-I (see list of Open Electives)	4	-	-	3
6	ME2522	Thermal Engineering Lab	-	-	4	2
7	ME2523	Manufacturing Processes Lab	-	-	4	2
8	ME2524	Machine Dynamics Lab	-	-	2	1
Total			17	3	10	20
9	NS2501	NSS /Fine Arts / Yoga / Self Defense (Mandatory Non-Credit Course)	-	-	2	-
10		Optional Elective - I	-	-	-	3
	EE2512	i) Control Systems				
	ME2525	ii) Nano Technology				
	CT2506	iii) Digital Logic Design				
11	ME2526	Optional Elective - II (MOOCs) Student shall opt from the list of MOOCs given by the Department)	-	-	-	2

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	MA2509	Numerical and Statistical Methods	3	1	-	3
2	ME2527	Metal Cutting and Machine Tools	4	-	-	3
3	ME2528	Turbo Machinery	3	1	-	3
4		Professional Elective - I	4	-	-	3
5		Open Elective-II (see list of Open Electives)	4	-	-	3
6	ME2534	Fluid Mechanics and Turbo Machinery Lab	-	-	4	2
7	ME2535	Machine Tools Lab	-	-	4	2
8	ME2536	Computer Aided Machine Drawing Lab	-	-	4	2
Total			18	2	12	21
9		Optional Elective - III	-	-	-	3
	CT2514	i) Computer Graphics				
	EE2503	ii) Fuzzy Logic Systems				
	EC2520	iii) Micro Processors and Interfacing				
10	ME2537	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	BA2503	Engineering Economics and Accountancy	4	-	-	3
2	ME2538	Metrology and Instrumentation	3	1	-	3
3	ME2539	Design of Machine Members	3	1	-	3
4	ME2540	Heat Transfer	3	1	-	3
5		Professional Elective - II	4	-	-	3
6		Open Elective-III (see list of Open Electives)	4	-	-	3
7	ME2546	Heat Transfer Lab	-	-	4	2
8	ME2547	Metrology and Instrumentation Lab	-	-	4	2
9	ME2548	Computer Aided Engineering Analysis Lab	-	-	2	1
Total			21	3	10	23
10		Optional Elective - V	-	-	-	3
	CT2507	i) Object Oriented Programming through Java				
	ME2549	ii) Mechatronics				
	EC2512	iii) Embedded System Design				
11	ME2550	Optional Elective - VI (MOOCs)	-	-	-	2
Students shall opt from the list of MOOCs given by the Department)						

L : Lecture T : Tutorial P : Practical

IV Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	ME2551	Industrial Engineering and Management	3	1	-	3
2	ME2552	CAD / CAM	3	1	-	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	ME2562	Simulation Lab	-	-	4	2
7	ME2563	Mini Project	-	-	4	2
8	ME2564	Internship / Industrial Training / Practical Training	-	-	-	2
Total			18	2	8	21
9		Optional Elective - VII	-	-	-	3
	CT2534	i) Big Data Analytics				
	CT2512	ii) Computer Organization and Architecture				
	ME2565	iii) Cryogenics				
10	ME2566	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			No. of Credits
			L	T	P	
1		Professional Elective - V	4	-	-	3
2		Professional Elective - VI	4	-	-	3
3	ME2575	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			No. of Credits
			L	T	P	
		Professional Elective - I	4	-	-	3
	ME2529	i) Non Conventional Sources of Energy				
	ME2530	ii) Mechanical Vibrations				
	ME2531	iii) Mechanics of Composite Materials				
	CT2505	iv) Data Structures				
		Professional Elective - II	4	-	-	3
	ME2543	i) Principles of Finite Element Method				
	ME2544	ii) Robotics				
	ME2545	iii) Automobile Engineering				
	CT2513	iv) Database Management Systems				
		Professional Elective - III	4	-	-	3
	MA2515	i) Optimization Techniques				
	ME2555	ii) Refrigeration and Air Conditioning				
	ME2556	iii) Unconventional Machining Process				
	ME2557	iv) Tribology				
		Professional Elective - IV	4	-	-	3
	ME2558	i) Total Quality Management				
	ME2559	ii) Computational Fluid Dynamics				
	ME2560	iii) Condition Monitoring				
	ME2561	iv) Design of Transmission Elements				
		Professional Elective - V	4	-	-	3
	ME2567	i) Design for Manufacturing and Assembly				
	ME2568	ii) Production Planning and Control				
	ME2569	iii) Power Plant Engineering				
	ME2570	iv) Theory of Elasticity				
		Professional Elective - VI	4	-	-	3
	ME2571	i) Rapid Prototyping				
	ME2572	ii) Gas Dynamics and Jet Propulsion				
	ME2573	iii) Automation in Manufacturing				
	ME2574	iv) Non Destructive Techniques				

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 conversation **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 & DIFFERENTIAL EQUATIONS

(Common to CE, EEE, ME & ECE)

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 know the procedures to find the solutions of first and second order differential equations.
- To understand different procedures to solve first order linear & non-linear partial differential equations.

Learning Outcomes

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

- use the concepts of eigenvalues and eigenvectors in solving engineering problems.
- apply 1st & 2nd order differential equations to solve various engineering problems.
- apply the techniques of partial differentiation to find maxima and minima of two/three variables.
- solve first order linear & non-linear partial differential equations.

Course Content

UNIT - I: System of Linear Equations

Rank of a matrix - Echelon form, Normal form, System of equations - consistence and inconsistency, solving non-homogeneous system of equations by LU-Decomposition.

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: First order ordinary Differential Equations

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

UNIT - IV: Higher Order Linear ordinary Differential Equations

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* , $e^{ax}v(x)$, $xv(x)$.

UNIT- V: Partial Differentiation

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

UNIT - VI: First order P.D.E

Forming PDE by eliminating arbitrary functions. Solutions of linear PDE (by Lagrange's subsidiary equation). Solutions of Non-linear PDE by Charpit's method.

Text Books

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

Reference Books

1. U.M.Swamy, A Text Book of Engineering Mathematics – I & II, 2nd Edition, Excel Books, New Delhi, 2011.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 8th edition, Maitrey Printech Pvt. Ltd, Noida, 2009.

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PHYSICS FOR ENGINEERS

I Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To solve oscillating systems problems.
- To understand crystal structures and defects.
- To apply principles of optics for engineering applications.

Learning Outcomes

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

- derive expression for oscillations (SHM).
- analyze crystal parameters to investigate crystal structures and defects.
- explore the possibilities of using nuclear energy for power generation.
- apply principles of interference, diffraction and polarization and Lasers to engineering situations.

Course Content

UNIT - I: Simple Harmonic Oscillations

Characteristics of sound - Simple harmonic motion-Displacement-Amplitude-period-frequency-phase-wavelength - equation for simple harmonic motion - Theoretical analysis : (a) free vibrations, (b) Damped vibrations, (c) Forced vibrations – Resonance.

UNIT - II: Crystal Structure

Lattice, basis, unit cell - Crystal systems - Miller indices - Crystal planes – Von Laue formula for inter planar distance - Packing Fraction - X-Ray diffraction - Bragg's law.

UNIT - III : Crystal Imperfections

Imperfections in crystals-Point defects-Schottky and Frenkel defects-Energy for formation of a vacancy –Equilibrium concentration of Schottky and Frenkel defects-Line defects-Edge and Screw dislocation-Burger's vector.

UNIT - IV: Nuclear Energy – Source of Power

Mass defect & Binding Energy – Fusion and Fission as sources – Fast breeder Reactors.

UNIT - V: Physical Optics

Interference due to thin films – Interferometry - Newton's rings – Fraunhofer Diffraction – Fraunhofer diffraction due to circular aperture – Resolving power of Telescope - Polarization - Double refraction - Half wave and quarter wave plates - polarimeter.

UNIT - VI: Laser

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

Text Books

1. RK Gaur & SL Gupta, Engineering Physics (Edition 2011), Dhanapat rai publications.
2. M.N. Avadhanulu, P.G. Kshirsagar , Engineering Physics(9th Edition), S.Chand Publications.

Reference Books

1. Ajoy Ghatak, Optics(5th Edition), Tata McGraw-Hill
2. Charles Kittel, Introduction to solid state physics, Wiley India Pvt. Ltd.
3. B.B. Laud, Laser and Non-Linear Optics, New Age international publishers
4. P.K. Palanisamy, Engineering Physics , SciTech publications

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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)

Course Content

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 watertreatment-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. Ltd.(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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PROBLEM SOLVING USING C

(Common to CE, EEE & ME)

I Year – I Semester

Lecture : 4 Practical : 2

Internal Marks : 40

Credits : 4

External Marks : 60

Course Objectives

- To emphasize the use of flowcharts and pseudo code in problem solving.
- To gain knowledge in C language
- To develop C Programs to solve problems.
- To familiarize with the discrete components of a computer, MS Office

Learning Outcomes

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

- design flowcharts and pseudo code for solving problems.
- understand C tokens and control statements.
- gain knowledge on arrays, strings, pointers, functions, structures and files.
- use C language for solving problems
- self-learn advanced features of C.
- prepare applications using MS-Office.

Course Content

UNIT - I

Problem Solving Steps – Understanding problem, developing algorithm, flow chart, coding, debugging and testing. General form of a C program, C Tokens, basic data types, type conversion, variable declaration, console i/o statements, order of evaluation. Sample Problems such as evaluating formulae.

Programs :

1. Creating a document using MS Word.
2. Familiarizing with the usage and applications of MS Excel.
3. Creating a presentation using MS PowerPoint.
4. Write a C program to calculate the area of triangle using the formula $\text{area} = (s-a)(s-b)(s-c)^{1/2}$ where $s = (a+b+c)/2$
5. Write a C program to find the largest of three numbers using ternary operator

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: Calculate the sum of first N numbers, check the given number is prime or not.

Programs : Implement a C program for the following:

1. Find the roots of a quadratic equation.
2. Read two integer operands and one operator from the user, perform the operation and then print the result. (Consider the operators +, -, *, /, % and use Switch Statement)

3. Display first N natural numbers.
4. Check whether given number is Prime (or) not.

UNIT - III

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

Problem Solving: Perform addition and subtraction of two matrices.

Programs: Implement a C program for the following

1. To search whether the given element is in the array.
2. To perform Addition and multiplication of two matrices.

UNIT - IV

Pointers – Declaration, Initialization and operations.

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

Problem Solving: Develop c program to illustrate string handling functions-strlen(), strcmp(), strcat(), strcpy(), strrev().

Programs: Implement a C program for the following:

1. To find the factorial of a given integer using recursive function.
2. Function to exchange (Swap) values of two integers using call by reference.
3. To Illustrate string handling functions-strlen(), strcmp(), strcat(), strcpy(), strrev()

UNIT - V

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

Problem Solving: Implement a structure to read and display the Name, date of Birth and salary of an Employee.

Programs :

1. Write a C Program to implement a structure to read and display the Name, date of Birth and salary of n Employees.

UNIT - VI

File Handling- Text and binary files, file handling functions, random access to files.

Problem Solving: Implement a C program to copy contents of one file to another.

Programs:

1. Implement a C program to count the number of lines, words and characters in a file.

Text Books

1. Programming in C, Second Edition Pradip Dey and Manas Ghosh, OXFORD Higher Education.
2. C Programming, E Balaguruswamy, 3rd edition, TMH.

Reference Books

1. Programming in C, ReemaThareja, OXFORD.
2. C Programming, A Problem Solving Approach, Forouzan, Gillberg, Prasad, CENGAGE.
3. R G Dromey, How to Solve it by Computer, Prentice-Hall of India, 1999.

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ENGINEERING GRAPHICS

I Year – I Semester

Lecture : 1 Practical : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To highlight the significance of universal language of engineers.
- To impart basic knowledge and skills required to prepare engineering drawings.

Learning Outcomes

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

- Apply principles of drawing to represent dimensions of an object.
- Construct polygons, scales and curves.
- Draw projections of points, lines and planes.
- Draw projections of solids with axis inclined to one plane.

Course Content

UNIT - I: Geometrical Constructions and Scales

Principle of Dimensioning, Geometrical Construction- Polygons.

Plain, Vernier and Diagonal Scales.

UNIT - II: Conic Sections

Ellipse, Parabola, Hyperbola –General Method. Curves – Epi Cycloid, Hypocycloid; Involute

UNIT - III: Orthographic Projections

Introduction to Orthographic Projections; Projections of Points; Projections of Straight Lines parallel to both planes; Projections of Straight Lines-Parallel to one and inclined to other plane.

UNIT - IV: Projections of Straight Lines

Projections of Straight Lines inclined to both planes, determination of true lengths, angle of inclinations and traces.

UNIT - V: Projections of Planes

Regular Planes Perpendicular / parallel to one Reference Plane and inclined to other Reference Plane; inclined to both the Reference Planes.

UNIT - VI: Projections of Solids

Prisms, Cylinders, Pyramids and Cones with the axis inclined to one Plane and for both the reference planes.

Semester End Examination Pattern

Semester end examination paper consists of eight questions out of which five questions are to be answered. All questions carry equal marks.

Text Books

1. Engineering Drawing by N.D. Bhatt, Chariot Publications.
2. Engineering Drawing by K. Venugopal, V. Prabhu Raja, G. Sreekanjana, New Age International Publishers.

Reference Books

1. Engineering Drawing by M.B. Shah and B.C. Rana, Pearson Publishers.
2. Engineering Drawing by Dhananjay A. Jolhe, Tata McGraw Hill Publishers.
3. Engineering Graphics for Degree by K.C. John, PHI Publishers.

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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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ENGINEERING PHYSICS LAB

I Year – I Semester

Practical : 2

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To make the students gain practical knowledge to co-relate with the theoretical studies.
- To impart skills in measurements.
- To design and plan the experimental procedure and to record and process the results.

Learning Outcomes

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

- use function generator, spectrometer, travelling microscope for making measurements.
- test optical components using principles of interference and diffraction of light
- determine the rigidity, coupling constant, velocity and fundamental laws pertinent to vibrations.
- determine the width of narrow slits, spacing between close rulings using lasers and appreciate the accuracy in measurements.

List of Experiments

S.No.	Name of the experiment- Aim
1	Determine the rigidity modulus of given wire-Torsional Pendulum.
2	Determine the velocity sound-Volume Resonator.
3	Determine the coupling constant of Coupled oscillator.
4	Verification of laws of vibrations of stretched strings.
5	Study of normal modes in string using Forced vibrations in rods-Melde's experiment.
6	Draw the frequency response curves of LCR Series and Parallel circuits
7	Determination of lattice constant – lattice dimensions kit.
8	Determine the radius of curvature of plano convex lens-Newton Rings.
9	Determine the thickness of thin object-wedge method.
10	Laser beam divergence and spot size determination.
11	Determination of wave length of source using diffraction grating.
12	Determine the dispersive power of a given material of the prism.

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.

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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

- Samson, T. (2010). *Innovate with English*. Hyderabad: Foundation
 - Unit SEVEN and EIGHT only
- Vijayalakshmi, M. et al (2014). *Vocabulary Builder for Students of Engineering and Technology*. Hyderabad: Maruthi Publications.
- 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
- 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-written e-mail message and doing the following task:(Compulsory)

- a. Analyzing the reasons for the 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 them.

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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INTEGRAL TRANSFORMS AND MULTIPLE INTEGRALS

(Common to CE & ME)

I Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To gain the knowledge of Laplace and inverse Laplace transforms.
- To understand the concept of Fourier Transforms.
- To know vector integral theorems such as Green's, Gauss & Stoke's.

Learning Outcomes

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

- apply Laplace transforms to find the solutions of ordinary differential equations.
- find Fourier transforms and inverse transforms for a given function.
- evaluate Areas and Volumes using multiple integrals.
- apply the concepts of vector differentiation and integration to the surface and volume integrals.

Course Content

UNIT - I: Laplace Transforms (Without Proofs)

Laplace transform of standard functions, Properties: Change of scale, Shifting Theorems, Laplace transform of derivatives and integrals, multiplication and division by t . Unit step function, Dirac Delta function.

UNIT - II: Inverse Laplace Transforms

Inverse Laplace transforms - by partial fractions – by Convolution theorem (without proof). **Application:** Solution of ordinary differential equations.

UNIT - III: Fourier Transforms

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

UNIT - IV: Multiple Integrals (only Cartesian form)

Double integrals - areas, triple integrals – volume.

UNIT - V: Vector Differentiation

Vector Differentiation: Gradient- Divergence – Curl- Scalar potential.

UNIT - VI: Vector Integration

Integral theorems: Greens - Stokes - Gauss Divergence Theorems (Without proof) and related problems.

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. Erwin Kreyszig, Advanced Engineering Mathematics : 8th edition, Maitrey Printech Pvt. Ltd, 2009, Noida.
2. U.M.Swamy, A Text Book of Engineering Mathematics – I & II : 2nd Edition, Excel Books, 2011, New Delhi.
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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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 patent 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.

Course Content

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- Unviersity 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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INDUSTRIAL CHEMISTRY

I Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge of corrosion prevention methods and water treatment technologies.
- To enable the students to obtain the knowledge on various types of electro chemical energy systems, polymers, fuels, lubricants and their applications in engineering.

Learning Outcomes

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

- explain the working of lead acid battery, nickel - cadmium battery, lithium ion battery and fuel cells.
- apply a suitable method of corrosion prevention for a given problem.
- apply a suitable method of water treatment depending on the quality requirement.
- explain the analysis of fuels, to calculate the calorific value and air requirement for combustion of a given fuel and to explain the synthesis and extraction methods of different liquid fuels.
- explain the preparation, properties and applications of polymers and composite materials.
- explain the characteristic features of a lubricant and their applications.

Course Content

UNIT - I: Electro Chemical Energy Systems

Differences between primary cells and secondary cells. Construction, electro chemical reactions and applications of secondary cells – Ni-Cd battery, 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, Phosphoric acid fuel cell.

UNIT - II: Corrosion and its Prevention

Dry and wet corrosion and their mechanisms. Pilling - Bedworth Rule. Types of Corrosion – galvanic corrosion, concentration cell corrosion, pitting corrosion and stress corrosion – Factors influencing the rate of corrosion – Temperature, pH and dissolved oxygen – Corrosion Prevention methods – Cathodic protection-Sacrificial Anodic method and Impressed current method – Metallic coatings –galvanization and tinning methods. Corrosion problems in boilers and heat exchangers and preventive measures.

UNIT - III: Water and its Treatment

Hardness of water – Calculation of hardness- Disadvantages of using hard water in Boilers – priming and foaming, sludge and scale formation – caustic embrittlement – Boiler corrosion. Treatment of boiler feed water – Zeolite process, Ion exchange process. Internal treatment – Calgon conditioning and Colloidal conditioning. Desalination of Brackish water by RO method.

UNIT - IV: Fuels

Definition and classification of fuels. Calorific value of a fuel – Characteristics of a good fuel. Coal – Types of Coal. Analysis of Coal – Proximate and Ultimate analysis. Bomb Calorimeter and Junker's gas Calorimeter. Problems on calculation of calorific value. Liquid fuels – Petroleum Extraction – Fractional distillation. Synthetic Petrol – Bergius process and Fisher Tropsch process. Problems on air requirement for combustion.

UNIT - V: Polymers and Composites

Polymers – Definition of a polymer and polymerization – Degree of polymerization – Functionality – Types of polymerization – addition, condensation and copolymerization with examples.

Plastics – thermo plastics and thermo setting plastics. Compounding of plastics. Moulding techniques – Compression, Injection and Blow film moulding. Preparation, properties and applications of PVC, Polystyrene, Teflon and Bakelite.

Composites – Definition of matrix and reinforcement. Fibre reinforced plastics – Glass fibre, Carbon fibre reinforced plastics. Preparation methods – hand layup method, matched metal die moulding method, Properties – applications

UNIT - VI: Lubricants

Definition and classification of lubricants. Functions of a good lubricant. Mechanism of lubrication. Experimental determination of properties of a liquid lubricant – Viscosity, Aniline point, Flash and Fire point, Pour and Cloud point. Additives to lubricants. Lubrication by nano films. Applications of lubricants.

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., 12th Edn., 2010.
2. Engineering Chemistry by J.C.Kuriscose and J.Rajaram. volumes 1 & 2, Tata Mc Graw-Hill Publishing.

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ENGINEERING MECHANICS

(Common to CE & ME)

I Year – II Semester

Lecture : 4 Tutorial : 1

Internal Marks : 40

Credits : 4

External Marks : 60

Pre-Requisites

- Linear Algebra and Differential equations]

Course Objectives

- To impart the basic concepts of force systems, free body diagram and equilibrium conditions
- To familiarize on calculating the geometric properties like centroid, moment of inertia of various sectional areas and masses and introduce the concept of friction and virtual work.
- To develop the knowledge on basic principles of kinematics and kinetics with simple applications.
- To introduce applications on using work-energy principle and Impulse-momentum methods.

Learning Outcomes

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

- explain the concept on resultant and equilibrium of a force system.
- determine centroid, moment of inertia of areas.
- determine center of mass, centre of gravity and moment of inertia of bodies.
- apply the principle of friction to connected bodies, ladders and virtual work principle to simply supported beam and connected systems
- distinguish between kinematics and kinetics.
- apply the work energy and impulse momentum methods of various engineering problems.

Course Content

UNIT–I : Force systems-Resultant and Equilibrium Conditions, Moment and Couple

Introduction to engineering mechanics –Types of forces-Coplanar, Concurrent and parallel forces – Resultant – Composition and resolution of forces, method of projections – Types of supports, Free Body Diagrams, Equations of Equilibrium of Coplanar Systems. Lami's Theorem -Moment of force systems in plane and its Application – Couples- Equilibrium of Coplanar concurrent force systems – Conditions of equilibrium.

UNIT–II: Friction, Virtual work Principle

Introduction, limiting friction and impending motion - Coefficient of friction, Laws of static friction, cone of static friction, applications of friction- Impending motion of connected bodies between blocks, ladder friction.

Virtual work - virtual displacement, Principle of virtual work – Applications to connected systems and reactions of simply supported beam.

UNIT–III: Centroid, Centre of Gravity and Area Moment of Inertia

Centroids of standard figures (from basic principles) – Centroids of Composite Figures, Centre of gravity of standard bodies (from basic principles), centre of gravity of composite bodies, Moment of Inertia - definition, Moment of Inertia of standard figures –Parallel axis theorem- Polar Moment of Inertia, Moment of Inertia of composite figures.

UNIT–IV: Centre of Mass, Moment of Inertia of Bodies

Center of Mass- Definition, Moment of Inertia - definition, Transfer Formula for Mass moment of Inertia, Mass moment of Inertia of standard bodies.

UNIT–V: Kinematics and Kinetics

Kinematics: Rectilinear and Curve linear motions –Time, Displacement, Velocity and Acceleration & their relations – Linear & Angular.

Kinetics: Newton's laws of motion and D'Alembert's principle simple applications -Rotation of a body about a fixed axis- Applications.

UNIT–VI: Work – Energy Method

Work – Energy principles, Law of conservation of energy, Power, Work-Energy Applications to Particle motion, connected bodies.

Impulse and Momentum: Principle of momentum and Impulse, Law of conservation of momentum, Impulse and momentum method, collision of bodies, simple applications.

Text Books

1. Engineering Mechanics, Timoshenko, Young and J.V. Rao, Tata Mc Graw – Hill education (India) Pvt. Ltd.
2. Engineering Mechanics, R.K.Bansal, Laxmi publications Pvt. Ltd.

Reference Books

1. Singer's Engineering Mechanics Statics and Dynamics, K.Vijay Kumar Reddy and J.Suresh Kumar, B.S publications, Hyderabad.
2. Engineering Mechanics statics and dynamics, Nelson e.w, Tata Mc Graw – Hill publishing company limited, New Delhi.
3. Engineering. Mechanics, S.S.Bhavikatti and K.G.Rajashekarappa, New age International Pvt. Ltd., Publishers.
4. Engineering Mechanics, Basudeb Bhattacharya, Oxford University Press.

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COMPUTER AIDED ENGINEERING DRAWING

I Year – II Semester

Practical : 2

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To impart knowledge and skills required to draw projections of solids in different contexts.
- To impart the skills required for drafting using drafting package.

Learning Outcomes

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

- represent sectional views of solids using drafting package.
- develop the surfaces of regular solids using drafting package.
- Draw isometric and orthographic projections using drafting package.

Introduction to Drafting Package

Draw commands, Modify Commands, Dimensioning Commands

Exercises for Practice using Package

- Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone
- Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid, Cone.
- Isometric Views of Lines, Plane Figures, and simple solids
- Conversion of Orthographic Views to Isometric Views

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ENGINEERING WORKSHOP

I Year – II Semester

Practical : 2

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To impart hands-on training on basic engineering trades.

Learning Outcomes

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

- use various tools to prepare basic carpentry, fitting and welded joints.
- prepare jobs of various shapes using black smithy.
- make basic house wire connections.
- fabricate simple components using tin smithy.
- Prepare mould cavity using single and multipiece pattern.

List of Trades

Practice any two experiments from each trade of any six trades

1) Carpentry :

- a) T-Lap Joint
- b) Cross Lap Joint
- c) Dovetail Joint.

2) Fitting

- a) V-Fit
- b) Square Fit
- c) Half Round Fit

3) Black Smithy

- a) Round to Square
- b) S-Hook
- c) Round to Ring.

4) House Wiring

- a) Parallel / Series Connection
- b) Stair Case wiring
- c) Florescent Lamp connection.

5) Tin Smithy

- a) Taper Tray
- b) L - Pipe
- c) Funnel

6) Welding

- a) Lap joint
- b) Butt joint
- c) T-joint

7) Foundry

- a) Mould making using Single piece pattern
- b) Mould making using multi piece pattern

8) Plumbing

- a) Screwed pipe joint – For GI Pipes, PVC Pipes
- b) Glued or cemented pipe joint – for PVC pipes

9) Handling of Power Tools

- a) Jig Saw
- b) Circular Saw
- c) Hand Drill
- d) Hand Grinder

Reference Books

1. Elements of Workshop Technology vol.-1 & vol.-2 by A. K. Hajra Choudhury, S. K. Hajra Choudhury, Nirjhar Roy
2. Workshop Manual , P.Kannaiyah, K.L. Narayana , Scitech Publishers
Engineering Drawing by Dhananjay A. Jolhe, Tata McGraw Hill Publishers

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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 Andhra Pradesh.

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 08 marks
 - A telephone conversation
 - The minimum number of exchanges to be specified
 - Writing a resume 10 marks
The length (1 page / 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 15 marks
 - Group discussion
 - Time: 10-15 minutes (approx.) per group
- c. Viva voce with an external examiner 15 marks

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INDUSTRIAL CHEMISTRY LAB & ENGINEERING MECHANICS LAB

I Year – II Semester

Practical : 2

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To impart skills for testing lubricating oils and finding calorific value of a fuel.
- To impart skills for testing the pH of water sample and to calculate the rate of corrosion of a metal.
- To impart knowledge on basic engineering applications.

Learning Outcomes

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

- test suitability of lubricating oil for a given condition.
- determine the calorific value of a fuel by bomb calorimeter and Junker's gas calorimeter.
- determine the corrosion rate of a given metal in a given environment by gravimetric method.
- determine the pH of the given water sample.
- calculate axial forces in trusses, moment of force and angle of deflection
- verify Lamé's theorem.

Industrial Chemistry Lab

List of Experiments (Any six of the below experiments may be performed)

1. Determination of viscosity of given lubricating oil by using redwood viscometer.
2. Determination of flash and fire point of the given Lubricating oil
3. Determination of pour and cloud point of the given lubricating oil.
4. Determination of calorific value of fuel by bomb calorimeter.
5. Determination of calorific value of gaseous fuel by Junker's gas calorimeter.
6. Determination of pH of given water sample.
7. Determination of rate of corrosion of carbon steel metal in acid medium in the absence and presence of Thiourea inhibitor by gravimetric method.

Text books

1. Engineering chemistry laboratory manual & record by Srinivasulu D, Parshva publications.
2. Engineering Chemistry lab manual by K.Mukkanti, B.S.Publications, 2009.

Engineering Mechanics Lab

List of Experiments

1. Calculation of moment of a force using weight balancing technique and system of pulleys
2. Determination of angle of deflection of T bar due to eccentric loading
3. Calculation of centroid of the plane lamina
4. Determination of axial forces in members of a loaded truss
5. Verification of lamie's theorem
6. Analysis of trapezoidal trusses for different loads
7. Understanding the vector and vector quantities

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ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year – I Semester

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

Course Objectives

- To introduce the basic concepts of electrical circuits.
- To familiarize with the constructional details, working principles of DC and AC machines.
- To familiarize with the operation of diode and transistors.

Learning Outcomes

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

- apply the basic laws and theorems to solve any electrical circuit.
- demonstrate the operational characteristics of the DC machines & AC machines.
- choose an appropriate machine to meet specified performance requirements for a particular application.
- outline the working principles of special motors.
- demonstrate the characteristics of diode and transistors.

Course Content

UNIT - I: Electrical Circuits

Basic definitions, Types of elements, Ohm's Law, Kirchhoff's Laws, Series, Parallel circuits, Mesh and nodal analysis, Superposition, Thevenin's and maximum power transfer theorems for simple dc circuits.

UNIT - II: DC Machines

Operating principle of DC Generator, emf equation, types of DC Generators, DC motor operating principle, types of DC motors, torque equation, applications, three point starter.

UNIT - III: Transformers

Principle of operation of single phase transformers, emf equation, losses in transformer, efficiency and regulation.

UNIT - IV: Induction Machines

Construction and operating principle of induction motor, slip-torque characteristics, applications.

UNIT - V: Special Purpose Motors

Construction, working principle and applications of stepper motors, A.C. and D.C servomotors, universal motors, Industrial applications.

UNIT - VI: Diode and Transistor

P-N junction diode, symbol, V-I Characteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems), PNP and NPN Junction transistor, Transistor as an amplifier, SCR Characteristics.

Text Books

1. David V. Kerns, JR. J.David Irwin , Essentials of Electrical and Computer Engineering ,Pearson.
2. V.K.Mehta, Principles of Electrical and Electronics Engineering S.Chand & Co.

Reference Books

1. M.S Naidu and S. Kamakshaiah, Introduction to Electrical Engineering , TMH Publ.
2. Kothari and Nagarath , Basic Electrical Engineering ,TMH Publications.
3. Rajendra Prasad ,Fundamentals of Electrical Engineering , PHI publications.
4. Ashfaq Husain, Fundamentals of Electrical Engineering', Dhanpat Rai & Co.

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ENGINEERING THERMODYNAMICS

II Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with basic concepts of system, properties and cycles.
- To introduce the laws of thermodynamics and their applications to various thermodynamic processes and cycles.

Learning Outcomes

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

- distinguish between closed, open and isolated systems and different types of energy interactions
- find the internal energy, enthalpy, work and heat energy interactions for various thermodynamic processes and cycles
- calculate the performance of a heat engine, refrigerator and heat pump and apply the principle of increase of entropy to various processes occurring in nature
- calculate available and unavailable energies in various thermodynamic processes, and formulate various thermodynamic relationships by combining first and second laws of thermodynamics
- evaluate the properties of a pure substance and determine the work and heat interactions for various phase change processes
- perform gravimetric and volumetric analysis of mixture of gases
- evaluate the efficiency and mean effective pressures of various gas power cycles.

Course Content

UNIT - I: Basic Concepts

System, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic approaches. Concept of Continuum, properties, Thermodynamic Equilibrium, State, Path, Process, Cycle, Quasi-static Process, Irreversible Process, Causes of Irreversibility. Energy in State and in Transition, Work and Heat, Point and Path functions, various forms of Work. Zeroth Law of Thermodynamics, Concept of Temperature, Principles of Thermometry, Reference Points, Const. volume gas thermometer, scales of temperature - Ideal Gas Temperature.

UNIT - II: First Law of Thermodynamics

First law for a system undergoing a cycle and for a change in state of system, internal energy and enthalpy, constant volume and constant pressure specific heats and their relation to internal energy and enthalpy of ideal gases.

First law of thermodynamics for a control volume, Steady flow energy equation and its application to engineering equipment, Perpetual Motion machine of first kind.(PMM-I)

UNIT - III: Second Law of Thermodynamics

Limitations of first law, Heat engines and Refrigerators, Kelvin- Planck and Clausius statements of Second law, PMM of second kind (PMM-II), Carnot cycle and Carnot theorems, Absolute thermodynamic scale.

Entropy: Inequality of Clausius, Entropy change in reversible process, T-dS relations, Entropy change of a system during an irreversible process, Principle of increase of entropy, Entropy change of an ideal gas, Available and unavailable energies, Availability function for closed and open system. Max well's relations.

UNIT - IV: Properties of pure substances

Pure Substance, Phase, Phase Transformation, P-V, P-T, T-S, and h-s diagrams of a Pure substance (water), Triple point, Critical point, P-V-T surfaces, Dryness Fraction, Determination of steam Properties using steam tables and Mollier Chart. Measurement of steam Quality – Steam Calorimetry.

UNIT - V: Perfect Gases and Gas Mixtures

Equation of State, specific and Universal Gas constants, Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes, Equivalent Gas constant and Internal Energy, Enthalpy, specific Heats and Entropy of Mixture of perfect Gases.

UNIT - VI: Gas Power Cycles

Otto, Diesel, Dual Combustion cycles and comparison of Otto, diesel, dual Cycles, Brayton cycle, Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressure on Air standard basis.

Text Books

1. PK Nag “Engineering Thermodynamics”, Tata McGraw Hill Publishing Company Ltd., 6th Edition.
2. Richard E Sonntag, Claus Borgnakke, Gordon J. VanWylen “Fundamentals of Thermodynamics”, 7th edition.

Reference Books

1. Yunus A. Cengel & Michael A. Boles “Thermodynamics-An Engineering Approach” Tata McGraw Hill Education. 7th edition.
2. Micheal J Moran and Howard N Shapiro “Fundamentals of Engineering Thermodynamics” wiley 8th Edition.
3. Y.V.C.Rao-”Engineering Thermodynamics”; University Press.
4. Kenneth Wark Jr “ Thermodynamics” Tata McGraw Hill Education.

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KINEMATICS OF MACHINES

II Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts to study the relative motion between the links of mechanisms.
- To familiarize with the kinematic analysis of machines.

Learning Outcomes

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

- distinguish different mechanisms with their applications.
- determine the velocities and accelerations of links in mechanisms.
- construct cam profiles for different types of follower motions.
- perform kinematic analysis of gears and gear trains.

Course Content

UNIT - I: Mechanisms

Link , kinematic pair, constrained motion, kinematic chain, degrees of freedom, Kutzbach criterion for planar mechanism, Grashoff's law, mechanism, inversion of mechanism , inversions of four bar, single slider and double slider mechanisms, pantograph, Hooke's Joint - single and double Hooke's joint, velocity ratio, polar diagram.

UNIT - II: Velocity Analysis of Mechanisms

Instantaneous center, Kennedy theorem, velocity analysis using instantaneous centre method, absolute and relative velocities, velocity analysis using relative velocity method .

UNIT - III: Acceleration Analysis of Mechanisms

Acceleration analysis of slider crank and four bar mechanism using relative acceleration method , Coriolis component of acceleration

Synthesis of mechanisms: Introduction, function generation for four bar mechanism, Freudenstein equation for four bar mechanism, Chebyshev spacing.

UNIT - IV: Cam And Followers

Types, terminology, types of follower motion- uniform velocity, simple harmonic motion, uniform acceleration and retardation, construction of cam profiles.

UNIT - V: Gears

Types, terminology, law of gearing, velocity of sliding, forms of teeth, path of contact, arc of contact, phenomena of interference.

UNIT - VI: Gear Trains

Types- simple, compound, reverted and epicyclic gear train, kinematic analysis of gear trains - differential of an automobile.

Text Books

1. S.S Ratan, Theory of Machines , Tata McGraw Hill Publications.
2. Design of Machinery : An Introduction to the Synthesis and Analysis of Mechanisms and Machines, Robert L. Norton, McGraw-Hill.

References Books

1. Thomas Bevan ,Theory of Machines , Pearsons Education.
2. J.S.Rao and R.V.Dukkipati , Mechanism and Machine Theory, New Age Publishers.
3. A. Ghosh, A. K. Mallik, Theory of Mechanisms and Machines, East West Press Pvt. Ltd.

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SOLID MECHANICS

II Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the knowledge on internal behaviour of mechanical elements under the action of applied loads.

Learning Outcomes

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

- determine stresses and strains in structural members subjected to various loads
- draw shear force and bending moment diagrams for beams
- calculate the deflections in beams subjected to transverse loads
- evaluate the crippling load for columns with different end conditions.
- design shafts subjected to torsion based on strength and rigidity.
- determine the stresses induced in thick and thin cylinders subjected to pressures

Course Content

UNIT - I: Stresses & Strains

Elasticity and plasticity – types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – working stress – factor of safety – lateral strain, poisson's ratio & volumetric strain – bars of varying section – composite bars – temperature stresses- relation between elastic constants, principal stresses , Mohr's circle.

UNIT - II: Shear Force and Bending Moment Diagrams

Introduction, types of beams, shear force diagrams and bending moment diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads, point of contra flexure relation between shear force and bending moment and rate of loading

UNIT - III: Bending Stress and Shear Stresses

Bending Stress : Theory of simple bending, bending equation, neutral axis, determination bending stresses, section modulus of standard cross sections.

Shear Stresses: Shear stress equation, shear stress distribution across various beams with standard cross sections.

UNIT - IV: Deflection of Beams

Bending into a circular arc – slope, deflection and radius of curvature, differential equation for the elastic line of a beam, double integration and Macaulay's methods, Mohr's theorems, moment area method, determination of slope and deflection for beams subjected different loads.

UNIT - V: Torsion and Columns & Struts

Torsion: Introduction-derivation of torsion equation- torsion of circular shafts- pure shear-transmission of power by circular shafts, shafts in series, shafts in parallel.

Columns & Struts : Crippling load, derivation of Euler's equation for columns with different end conditions, limitations of Euler's formula, Rankine's Formulae.

UNIT - VI: Thin and Thick Pressure Vessels

Thin Cylinders: Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses, volumetric strain in thin cylinders, thin spherical shells.

Thick Cylinders: Lamé's equation, cylinders subjected to inside & outside pressures, compound cylinders.

Text Books

1. S.Ramamrutham, R.Narayanan," Strength of materials", Dhanpat Rai Publications, 14th edition
2. James M. Gere And Barry Goodier ,"Mechanics of materials", CENGAGE Learning Custom Publishing, 8th edition.

Reference Books

1. Beer and Johnson, "Mechanics of Materials", Tata Mc GrawHill publications, 5th edition.
2. Popov and Egor P., "Engineering Mechanics of Soilds", Prentice Hall India.
3. S.S. Rattan, "Strength of materials", Tata Mc Graw-Hill Publications, 2nd edition.
4. Dr. R K Bansal, "A text book of strength of materials", Lakshmi Publications, 3rd edition.

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ENGINEERING METALLURGY

II Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the fundamentals of crystallography, metallurgy, heat treatment and metal properties.

Learning Outcomes

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

- understand the production of iron.
- Classify the steels based on their production process.
- illustrate crystallization and grain growth of metals.
- identify the effect of alloying elements and invariant reactions on the behavior of metals.
- choose a suitable heat treatment process to impart desired properties of metals.
- appraise nature of non ferrous & composite materials.
- select suitable material and characterization technique for an application.

Course Content

UNIT - I: Iron and Steel Making

Iron Making: Introduction to iron making - blast furnace, operations of blast furnace, coke oven batteries, types of reduction reactions in blast furnace,.

Steel Making: Production of cast iron –cupola furnace; production of steel - bessemer converter, open hearth furnace& electric furnace.

UNIT - II: Solidification of Pure Metals and Alloys

Mechanism of solidification, nucleation-homogeneous and heterogenous nucleation- growth -single crystal -polycrystalline materials, crystal growth-planar growth – dendritic growth – solidification time - cooling curves - non-crystalline solids- glass transition temperature. crystal defects: one, two and three dimensional defects.

Solid solutions: Hume Rothary rule substitutional, and interstitial solid solutions, intermediate phases

UNIT - III: Phase Diagrams and Iron Carbon Equilibrium Diagram

Phase Diagrams: Construction of equilibrium diagrams involving complete and partial solubility, Gibbs phase rule, lever rule. different types invariant reactions – eutectic, eutectoid, peritectic, peritectectoid reactions etc.

Iron Carbon Equilibrium Diagram: Description of phases- steels, cast iron, different reactions of the iron-iron carbide equilibrium system, alloy groups - properties, composition and uses (wrought iron, grey cast iron, malleable iron, SG iron and steels)

UNIT - V: Heat Treating of Steels

TTT curves, continuous cooling curves, heat treatment processes – annealing, normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods - carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening.

UNIT - V: Non Ferrous Metals and Alloys and Composite Materials

Properties and applications of titanium - titanium alloys, copper – copper alloys, and aluminium – aluminium alloys.

Composite materials: Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal – matrix composites and C – C composites.

UNIT - VI: Material Selection and Characterization

Classification of engineering materials, engineering requirements of materials, criterion for selection of materials for engineering applications through structure properties-performance relationship, levels of internal structure like macro, micro, crystal and atomic and their correlated properties.

Materials Characterization: Scanning Electron Microscope - SEM, X-ray diffraction XRD, - Thermogravimetric Analysis (TGA).

Text Books

1. Sidney H. Avener, “Introduction to physical metallurgy”, Tata Mc Graw Hill Publications, 2nd edition.
2. Donald R. Askeland and Wendelin J. Wright, “Essential of Materials science and engineering”, CL Engineering publications, 2nd edition.
3. Sir Alan Cottrell, “An Introduction to Metallurgy”, Universities Press, 2nd edition.

Reference Books

1. V.D. Kodgire, S.V. Kodgire. “Material science and Metallurgy for Engineers”, Everest publishing house, 42nd edition.
2. Agarwal, “Science of engineering materials”, S.Chand Publications.
3. William D. Callister, David G. Rethwisch, “Materials science and engineering an introduction”, Loose leaf publications, 8th edition.
4. W.G. Vinas & HL Mancini, “An introduction to material science”.
5. R. A. Flinn and P K Trojan, “Engineering Materials and Their Applications”, Published by Houghton Mifflin, Wilmington, Massachusetts, U.S.A, 2nd edition.

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ELECTRICAL AND ELECTRONICS ENGINEERING LAB

II Year – I Semester

Practical : 2
Credits : 1

Internal Marks : 40
External Marks : 60

Course Objectives

- Information to supplement the Electrical & Electronics Engineering course.
- To conduct tests on various electrical & electronic circuits and to familiarize experimental procedures of those Circuits.

Learning Outcomes

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

- apply the concepts of theorems for a given electrical circuit.
- evaluate the performance of AC and DC Machines.
- relate physical observations and measurements involved in electrical circuits to theoretical principles.
- illustrate the characteristics of PN Junction diode and its application in rectifier circuits.
- describe amplifier circuit using NPN transistor

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Verification of Kirchhoff's Laws
2. Verification of Superposition Theorem
3. Verification of Maximum Power Transfer Theorem
4. Experimental Verification of Thevenin's Theorem
5. Speed Control of DC Shunt Motor
6. Open Circuit and Short Circuit Test on Single Phase Transformer
7. Brake Test on DC Shunt Motor
8. Brake Test on Three Phase Induction Motor
9. P-N Junction Diode Characteristics
10. Rectifiers With and Without Filters (Half Wave and Full Wave)
11. Transistor CE Characteristics
12. SCR Characteristics

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SOLID MECHANICS AND METALLURGY LAB

II Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Any 6 experiments are to be conducted from each of the following

A) SOLID MECHANICS LAB

Course Objectives

- To impart hands on training to examine the mechanical properties of materials.

Learning Outcomes

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

- determine the young's modulus, rigidity modulus of materials and stresses induced in bars and beams of uniform cross section.
- determine the hardness number.
- determine the stiffness of spring.
- determine the impact strength of materials.
- determine the shear stress under single shear and double shear.

List of Experiments

1. Determination of modulus of elasticity using universal Testing machine.
2. Determination of modulus of elasticity and bending stress in
 - a) Simply Supported Beam
 - b) Cantilever beam
3. Determination of modulus of rigidity using torsion testing machine.
4. Determination of Hardness number using
 - a) Brinells hardness test.
 - b) Rockwell hardness test.
5. Determination of stiffness of springs using Spring Testing machine.
6. Determination of Impact strength using Impact Testing Machine
 - a) Izod test
 - b) Charpy test
7. Determination of shear strength using Universal testing machine.
8. Detemination of compressive strength using compression testing machine.

B) METALLURGY LAB

Course Objectives

- To impart hands on training in preparation of metal specimen so as to observe the microstructure.

Learning Outcomes

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

- prepare the Specimen using rough grinding, finish grinding and polishing.
- use different types of etchants to expose the microstructure of metal and alloys.
- observe the microstructure and ascertaining the same.
- performe Jominy End Quench test.
- observe the behavior of metal during fracture.

List of Experiments

1. Preparation and study of the Microstructure of pure metals like Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Preparation and study of the Micro Structures of Cast Irons.
4. Preparation and study of the Micro Structures of Non-Ferrous alloys.
5. Preparation and study of the Micro structures and hardness of Heat treated steels.
6. Hardenability of steels by Jominy End Quench Test.

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COMPUTER AIDED MODELING LAB

II Year – I Semester

Practical : 2

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To impart hands on training for part modeling and assembly using Modeling Package.

Learning Outcomes

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

- draw sketches and models of parts using modelling package
- assemble the parts using assembly module.

List of experiments

1. Drawing of sketch of part - I
2. Drawing of sketch of part - II
3. Modeling of a part.
4. Modeling of a part and generation of orthographic views – I
5. Modeling of a part and generation of orthographic views - II
6. Creating detailed drawing with sectional views –I
7. Creating detailed drawing with sectional views -II
8. Modeling and assembly of parts - I
9. Modeling and assembly of parts - II
10. Modeling and assembly of parts - III
11. Creating Schematic Diagrams
12. Creating a model of the sheet metal part

Reference Book

1. Reference Manual on Solid Edge fundamentals by Siemens Product Lifecycle Management Software Inc.

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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 molding method based on the geometry and quantity.
- design a pattern and gating system for producing a casting.
- 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, Design of pattern for a given casting

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

Melting: Types of Furnaces, cupola, crucible, Electric arc.

UNIT - II: Gating & Riser Design

Gating System: Elements and their functions, Types of Gating systems, Types of Gates,

Riser Design & Location: Types of Risers, Riser Design (Size & Location), Design Considerations for casting.

Solidification: Progressive & Directional solidification, Solidification time .

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, Welding techniques.

Fusion Welding: Principle of Oxy Acetylene welding, Equipment Setup, Types of flames , Applications Principle of Arc welding, Equipment setup, Arc blow, Types of Arc welding processes :SMAW,TIG, MIG, Plasma Arc Welding, Thermit welding.

Characteristics of arc welding process. :- Heat & power requirements in Arc welding.

UNIT - IV:

Pressure Welding: Principle of Resistance welding, Equipment set up, Different resistance welding methods, Heat & power requirements in resistance welding.

Solid State Welding: Friction welding, Induction welding and Explosive welding

Welding Defects: Their causes - remedies

Welding Allied Processes: Soldering, Brazing and Braze welding

UNIT - V:

Metal Forming: Classification of metal working processes.

Rolling: Forces and geometrical relationship in Rolling, Analysis of Rolling load, Torque and power - Types of Rolling mills, Rolling defects and remedies.

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

Extrusion: Classification of Extrusion process, Mechanics of Extrusion, Impact Extrusion, Hydrostatic Extrusion and Extrusion Defects.

UNIT - VI:

Forging: Basic forging operations ,Open die forging, Closed die forging, press forging, Drop forging, Roll forging , calculation of forging load in closed die forging, Defects

Sheet Metal Forming Operations: Blanking and piercing, Bending, Spring back in sheet metal operation Deep drawing, Stretch forming, Embossing, Coining.

Presses – Classification Dies.

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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APPLIED THERMODYNAMICS

II Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the principles of operation of heat engines and compressors along with the performance characteristics.
- To familiarize with various thermodynamic cycles of Refrigeration and psychrometric processes.

Learning Outcomes

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

- distinguish between 2-stroke and 4- stroke, S.I and C.I engines and draw the heat balance sheet
- determine the indicated power of single and multistage reciprocating air compressors
- analyze the performance of steam power cycle under various conditions
- design a steam nozzle for the given pressure drop
- illustrate the principle of working of steam condensers and evaluate the vacuum and condenser efficiencies
- describe the working of gas turbines and evaluate the effect of operating variables on thermal efficiency
- explain the working principles of refrigeration cycles and determine the C.O.P
- find the change in moisture and energy during various psychrometric processes.

Course Content

UNIT - I:

IC Engines: IC Engine Components, Classification, SI and CI engines, Four Stroke and Two Stroke Engines, Valve and Port Timing Diagrams, Comparison of 2-stroke and 4-stroke, SI and CI Engines.

Testing and Performance of I.C Engines: Measurement of Fuel consumption, Air consumption, Brake power, Frictional Power and Indicated Power, Performance tests, Heat balance sheet.

UNIT – II:

Reciprocating Compressors: Principle of operation, single stage compressor - equation for work (with and without clearance volume), Isothermal efficiency and volumetric efficiency, effect of clearance. Multi stage compression - Inter cooling, saving of work, minimum work condition for Multistage stage compression.

UNIT - III:

Steam Power Cycles: Rankine cycle - schematic layout, Thermodynamic analysis, concept of mean temperature of heat addition, Methods to improve cycle

performance - Regeneration & Reheating cycles.

Boilers: Classification, working of water tube and fire boilers, Mountings and Accessories.

UNIT - IV:

Steam Nozzles: Working principle, functions of a nozzle, applications, Types of nozzles, flow through nozzles, thermodynamic analysis, velocity of fluid at nozzle exit, Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, general relationship between area velocity and pressure in a nozzle flow, Super saturated flow.

Steam Condensers: Requirements of steam condensing plant, classification of condensers, working principle of different types condensers, vacuum efficiency and condenser efficiency, air leakage -sources and its affects.

UNIT - V:

Gas Turbines: Simple gas turbine plant ideal cycle - open & closed cycles, Effect of operating variables on thermal efficiency, actual cycle, Methods of improving efficiency – regeneration, inter cooling and reheating.

Jet propulsion: Principle of Jet propulsion, Classification of jet propulsive Engines, working principle of Turbo-Jet, Turbo-Propeller, Turbo Fan, Ram-Jet, Pulse-Jet Engines, and Rocket Engines.

UNIT - VI:

Refrigeration: Need for Refrigeration, Methods of refrigeration, Bell - Coleman cycle, Refrigerating effect, COP, vapor compression refrigeration system, Vapor absorption refrigeration system.

Air Conditioning: Introduction, Psychrometric Properties -Atmospheric air, dry air, Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapor pressure, Degree of saturation, Adiabatic Saturation, Carrier's Equation, Psychrometric chart, Psychrometric processes, Types of Air conditioning systems.

Text books

1. V.P. Vasandani and D.S. Kumar "Treatise on Heat Engineering" Metropolitan Book co, New Delhi. 4th edition.
2. M. L. Mathur, R. P. Sharma " A Course in Internal Combustion Engines" Dhanpat Rai & Sons, 2010.
3. C P Arora "Refrigeration and Air Conditioning" TMH. 3rd edition.

Reference Books

1. V.Ganesan "I.C. Engines" T.M.H., New Delhi. 4th edition.
2. Manohar Prasad "Refrigeration and Conditioning" New Age publications. 3rd edition.
3. R. Yadav "Thermodynamics and Heat Engines" Vol. II, central Publishing House Allahabad. 7th edition.

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DYNAMICS OF MACHINES

II Year – II Semester

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

Course Objectives

- To familiarize with the dynamic force analysis of machines and their effect.

Learning Outcomes

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

- analyze simple mechanisms with and without considering the inertia forces
- design the flywheel for different applications
- estimate the effect of gyroscopic couple on the stability of moving vehicles.
- analyze and design the governors.
- evaluate the effect of friction on power transmission in devices like bearings, clutches and brakes
- analyze balancing problems in rotating and reciprocating machinery
- determine the natural frequencies in vibrating systems.

Course Content

UNIT - I:

Static and Dynamic Force Analysis: Analysis of four bar and slider crank mechanism.

Flywheel :Turning moment diagrams , fly wheels, fluctuation of energy and speed.

UNIT - II:

Gyroscope: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, aero plane and ship.

Governors: Watt, porter , proell and Hartnell governor, governor performance - sensitiveness, isochronism and hunting.

UNIT - III:

Bearings & Clutches: uniform pressure theory, uniform wear theory-pivot and collar bearings, clutches - single disc, multiple disc clutch, cone clutch, centrifugal clutch.

Brakes: block brakes, band brakes, band and block brakes, internal expanding brake.

Dynamometers: Introduction , types - prony, rope brake , epi cyclic, Bevis Gibson and belt transmission dynamometers.

UNIT - IV:

Balancing of Rotating Masses: Balancing of rotating masses, single and different planes, analytical and graphical methods

UNIT - V:

Balancing of Reciprocating Masses: primary and secondary balancing , balancing of single cylinder and multi cylinder in line engine, V-Engine and radial engines .

UNIT - VI:

Vibrations: Introduction, types of vibrations, free longitudinal vibrations, damped vibrations, logarithmic decrement, forced vibrations, vibrations isolation and transmissibility, transverse vibrations, whirling of shafts, critical speeds.

Text Books

1. S.S Ratan, Theory of Machines , Tata McGraw Hill Publications
2. A. Ghosh, A. K. Mallik, Theory of Mechanisms and Machines, East West Press Pvt. Ltd.

References Books

1. Design of Machinery : An Introduction to the Synthesis and Analysis of Mechanisms and Machines, Robert L. Norton, McGraw-Hill, 2012
2. Thomas Bevan ,Theory of Machines ,Pearsons Education.
3. J.S.Rao and R.V.Dukkipati , Mechanism and Machine Theory, New Age Publishers.

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FLUID MECHANICS

II Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize the fluid properties, basic laws and principles used to describe equilibrium and motions of fluids.
- To introduce the principles of conservation of mass, momentum and energy and their application in study of fluid flow.

Learning Outcomes

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

- elaborate the properties of fluid and analyze the hydrodynamic forces acting on submerged /floating bodies
- classify the motion of fluids and describe flow field
- apply the concepts of continuity, momentum and Bernoulli's equations in solving fluid flow problems
- determine the various losses of fluid flow in a closed conduit
- apply the dimensional analysis and derive the equations governing the fluid flow.
- apply the concept of boundary layer theory and evaluate lift and drag forces acting on submerged bodies

Course Content

UNIT - I:

Introduction: Physical properties of fluids – Mass density, specific weight, specific gravity, viscosity, vapor pressure Compressibility, surface tension and Capillarity.

Fluid statics: Fluid pressure - Variation of fluid pressure in a fluid, Pascal's law, Atmospheric, Absolute, Gauge and Vacuum pressure. Measurement of Pressure – Piezometer, U- tube and differential manometers, Mechanical gauges. Hydrostatic forces on plane and curved surfaces, Buoyancy and Flotation.

UNIT - II:

Fluid kinematics: Flow fields and description of fluid Motion- Lagrangian Method and Eulerian Method, Types of fluid flows, Stream line, path line, streak lines and stream tube. Equation of continuity in differential form, acceleration of a fluid particle, Translation and Rotation, Vorticity, Velocity Potential, Stream function.

UNIT - III:

Fluid dynamics: Surface and body forces, Forces acting on Fluid in Motion – Euler's Equations of Motion, Bernoulli's equations for flow along a stream line, momentum equation and its applications-Force on pipe bend, nozzle.

Application of Bernoulli's equation: Pitot tube, Venturimeter, Orifice meter.

UNIT - IV:

Viscous Flow: Navier-Stokes equations of motion, Laminar Fully Developed Pipe Flow, Flow between parallel plates – both plates at rest, one plate is moving and other at rest. Introduction to turbulent flows, Moody's diagram.

UNIT - V:

Closed conduit flow: Reynolds' experiment, Laws of Fluid friction, Darcy Weisbach equation, Minor losses in pipes, pipes in series, equivalent pipe, pipes in parallel.

Dimensional Analysis: Need for dimensional analysis, dimensional homogeneity, methods of dimensional analysis, similitude, types of similitude, dimensionless numbers, model analysis.

UNIT - VI:

Boundary Layer Theory: Introduction, Development of boundary layer along a thin flat plate, Boundary layer thickness, Displacement thickness, Momentum thickness, Energy thickness, Laminar sub layer, boundary layer separation, Drag and lift forces on submerged bodies.

Text Books

1. Frank M. White, "Fluid Mechanics", McGraw-Hill Companies, Inc., New York. 7th Edition.
2. S K Som, Gautam Biswas & Suman Chakraborty, "Introduction to Fluid Mechanics and Fluid Machines" Tata McGraw Hill Education Pvt Ltd. 3rd edition.

Reference Books

1. P.N. Modi, S.M. Seth, "Hydraulics and Fluid Mechanics Including Hydraulics Machines", Rajsons publication Pvt Ltd.
2. Yunus A. Cengel & John M. Cimbala, "Fluid Mechanics Fundamentals and Applications" Tata McGraw Hill Education Pvt Ltd. (SIE) 2nd edition.
3. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering" S.K. Kataria & Sons.

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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

- familiarize with 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 Das and 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, Arunkumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books

1. Surveying Theory and Practice, James M Anderson and Edward, 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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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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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: Dielectric 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, bimetallic 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 Materials, Radioactive Materials, Galvanization 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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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, Wiley Studio Edition, 4th Edition. Feed back and control system – Joseph J Distefa

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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, battery ignition system - components, Magneto ignition system, Electronic ignition system.

Electrical System: charging circuit- generator, current-voltage regulator, starting 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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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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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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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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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 XMLAJAX.

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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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

$\phi(x)$, $d(x)$, $\mu(x)$, $\sigma(x)$, Mobius inversion formula, Linear Diophantine 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 Montgomery L.H., **An Introduction to Theory of Numbers**, John Wiley and Sons (1991).

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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-concentration and 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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THERMAL ENGINEERING LAB

II Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To study experimentally the performance of IC engines, compressors, refrigeration and air conditioning systems.

Learning Outcomes

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

- conduct various performance tests on I.C engines and plot the performance characteristic curves
- conduct the load test and evaluate the performance of a reciprocating air compressor
- conduct a performance test on refrigeration and air conditioning test rigs and determine the C.O.P for the given conditions.

List of Experiments

1. Valve/port timing diagrams of a single cylinder diesel engine.
2. Disassembly / assembly of 4- stroke single cylinder petrol engine.
3. Load test on 4-stroke single cylinder diesel engine.
4. Load test on 4-stroke twin single cylinder diesel engine.
5. Load test on 2-stroke single cylinder petrol engine.
6. Morse test on 4-stroke multi cylinder petrol engine.
7. Motoring and retardation test on 4-stroke single cylinder diesel engine.
8. Draw the heat balance sheet on 4 - stroke single cylinder diesel engine.
9. Load test on 4 - stroke single cylinder variable compression ratio petrol engine.
10. Performance test on reciprocating air compressor.
11. Performance test on Refrigeration test rig.
12. Performance test on Air conditioning and Heat Pump test rig.

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MANUFACTURING PROCESSES LAB

II Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To impart hands on training in the areas of casting, welding, press working and processing of plastics.

Learning Outcomes

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

- design a pattern.
- test the properties of sand and prepare a casting.
- perform pre welding operations.
- perform Arc welding, Spot welding, TIG welding and Plasma Welding operations.
- understand the features of simple, compound and progressive dies.
- perform blanking, piercing and bending operations.
- operate injection and blow moulding machines to manufacture plastic components.

List of Experiments

1. Pattern making for the given specifications.
2. Testing of molding sand properties.
3. Manufacturing of the given component using casting.
4. Preparation of lap and butt joints using arc welding.
5. Preparation of lap and single strap butt joints using spot welding.
6. Preparation of butt joints using Plasma welding.
7. Preparation of butt joints using TIG welding.
8. Preparation of lap joints using brazing.
9. Blanking and piercing operations using hydraulic press.
10. Preparation of a component using injection moulding.
11. Study of preparation of a bottle using blow moulding.
12. Study of gas welding process.

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MACHINE DYNAMICS LAB

II Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To demonstrate the experimental determination of dynamic response of machine elements.

Learning Outcomes

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

- determine the whirling speed of shaft.
- determine the natural frequency of beam and rotor.
- determine gyroscopic effect of a rotating body.
- perform dynamic balancing of rotating and reciprocating masses.
- determine the centrifugal force and equilibrium speed acting on the governors.
- perform modal analysis on beam and plate like structure.

List of Experiments

1. Whirling speed of shaft.
2. Torsional vibrations of a shaft (a) without damping (b) with damping
3. Longitudinal Vibrations of a beam (a) without damping (b) with damping
4. Modal analysis of structural beams by using FFT Analyzer
5. Motorized Gyroscopic Couple Apparatus
6. Balancing of Rotating Masses
7. Determination of centrifugal force at different speeds by using Governor apparatus
8. Balancing of Reciprocating Masses
9. Forced vibrations of beam
10. Determination of Friction and Wear.
11. Determination of moment of inertia of bifilar and trifilar systems.
12. Natural frequency of single and two rotor systems.

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Optional Elective - I

CONTROL SYSTEMS

II Year – II 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 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 as a pre-requisite to advance control systems.

Course 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- 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. 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, Wiley Studio Edition, 4th Edition.
4. Feed back and control system – Joseph J Distefa.

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NANO TECHNOLOGY

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with principles of quantum mechanics on which nano materials behave
- To elucidate applications of nanotechnology.

Learning Outcomes

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

- analyze the concepts and preparation methods of Nano materials
- understand the nano material properties and their behavior
- use various techniques for investigating nano material
- know the importance of Nano Technology for advanced materials processing.

Course Content

UNIT - I:

Introduction: Basics of quantum mechanics, harmonic oscillator, magnetic phenomena ,band structure in solids, mossbauer and spectroscopy , optical phenomena bonding in solids ,anisotropy. process of synthesis of nano powders , electro deposition , important nano materials.

UNIT - II:

Silicon carbide: Application of silicon carbide , nano materials preparation ,sintering of sic,x-ray diffraction data ,electron microscopy sintering of nano particles.

Nano Particles Of Alumina And Zirconia: Nano materials preparation , charecterization ,wear materials and nano composites.

UNIT - III:

Mechanical Properties: Strength of nano crystalline SiC , preparation for strength measurements, mechanical properties , magnetic properties

Electrical Properties: Switching glasses with nano particles, electronic conduction with nano particles.

Optical properties: optical properties , special properties and the coloured glasses.

UNIT - IV:

Investigating And Manipulating Materials In The Nano Scale: Electron microscopies , scanning probe microscopic ,optical microscopic for nano science and technology, X-ray diffraction.

UNIT - V:

Nanobiology: Interaction between biomolecules and nanoparticle surface. Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies. Application of nano in biology,nano probe for analytical applications- new methodology in medical diagnostics and biotechnology,future perspectives of nanobiology , nanosensors.

UNIT - VI:

Nanomedicines: Developing of nanomedicines nano systems in use, protocols for nanodrug Administration , nanotechnology in diagnostics applications, materials for used in diagnostics and therapeutic applications, molecular nanomechanics , molecular devices , nanotribology , studying tribology at nanoscale , nanotribology applications.

Text Book

1. A.K.Bandyopadhyay , "Nano materials" , New Age publishers.

Reference Book

1. T.Pradeep, "Nano Essentials", TMH publications.

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DIGITAL LOGIC DESIGN

II Year – II Semester

Lecture : -

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, Mux and De-Mux.
- 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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NUMERICAL AND STATISTICAL METHODS

III Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the various numerical techniques.
- To introduce the concepts of probability and statistics.
- To know the importance of the correlation coefficient & lines of regression
- To know sampling theory and principles of hypothesis testing.

Course 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 polynomial for unequal intervals using Lagrange's interpolation.
- compute probabilities in different situations.
- use probability distribution in appropriate scenario.
- measure of correlation between variables and obtain lines of regression.
- construct sampling distribution and calculate its mean and standard deviation
- apply the appropriate tests to give valid inference.

Course Content

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, backward and central difference operators – relation between operators, Newton's formulae for interpolation – Lagrange's interpolation.

UNIT - III: Numerical Solutions of 1st Order Ordinary Differential Equations

Solution by Taylor's series, Euler, modified Euler methods and fourth order Runge-Kutta method.

UNIT - IV: Probability and Expectation of Random Variable

Introduction to probability, additive, conditional and multiplicative laws of probability and their applications, applications of Baye's Theorem.

Introduction to random variables (discrete and continuous), concept of expectations (mean and variance) and properties, probability distributions and related applications.

UNIT - V: Probability distributions and Correlation & Regression

Review on Binomial and Poisson Distributions; normal distribution and its properties (statements only); applications of uniform and exponential distributions; introduction to Correlation and Linear Regression.

UNIT - VI: Sampling and Statistical Inference

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

Introduction to statistical inference-test for means and proportions (one sample and two samples when sample size is large); exact sample tests- Chi-Square test (goodness of fit) and F-test (test for population variances), introduction to t-test.

Text Books

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi
2. Ravindranath. V, and Vijayalaxmi. A., A Text Book on Mathematical Methods, Himalaya Publishing House.
3. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V. S. S. N. Prasad, Probability and Statistics, S. Chand & Company Ltd.
4. Miller, John E. Freund, Probability and Statistics for Engineers, PHI.

Reference Books

1. Dr. T. K. V. Iyengar, Dr. B. Krishna Gandhi, S. Ranganatham and Dr. M.V. S. S. N. Prasad, Mathematical Methods : 6th edition, S. Chand & Company Ltd.
2. B.V.Ramana, Engineering Mathematics : 4th Edition, Tata McGraw Hill, 2009, New Delhi.
3. Erwin Kreyszig, Advanced Engineering Mathematics : 8th edition, Maitrey Printech Pvt. Ltd, 2009, Noida.
4. S.C. Gupta & V.K. Kapoor, Fundamentals of Mathematical Statistics, S.Chand & Company Ltd.

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METAL CUTTING AND MACHINE TOOLS

III Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To expose the students to the mechanics of metal cutting, so as to equip them with adequate knowledge about elements of metal cutting process.
- To emphasize upon the prominent theories, concepts and constructional features of machine tools related to turning, shaping, planning, drilling, milling and grinding operations.

Learning Outcomes

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

- apply principles of metal cutting in machining operations.
- calculate force, work done and power in metal cutting process using theories of machining process.
- explain the components and operations of lathe machine.
- select appropriate machine tool to process prismatic parts.
- use principles of drilling, boring and milling in machining various components.
- distinguish grinding, lapping and honing operations.

Course Content

UNIT - I:

Theory of Metal Cutting : Importance of material removal , elements of metal machining , tool, work, chip, fluid - types of cutting tools & tool materials , nomenclature of single point tool , systems of tool nomenclature , nomenclature of multi point tools ,milling cutter, drill, broach tool , orthogonal & oblique cutting , chip formation ,velocity relationships, types of chips , chip breakers.

UNIT - II:

Mechanics of orthogonal cutting : Modern theories in Mechanics of cutting , review of Merchant and Lee Shaffer theories , stress, strain, workdone and power required in cutting , forces in turning, drilling and milling , cutting force measurement techniques ,dynamometers, machining parameters ,tool life ,effect of parameters on tool life ,tool failure.

UNIT - III:

Machine tools : Introduction , classification of machine tools , generating and forming ,methods of generating surfaces , basic elements of machine tools.

Centre lathe – constructional features ,specifications , operations , taper turning methods , thread cutting methods , tool and work holding devices , speed, feed, depth of cut , material removal rate , machining time calculations, capstan and turret lathes , difference between turret lathes and centre lathe.

UNIT - IV:

Shaping, Slotting, and Planning machines: Principle of working , principal parts , specifications, types , operations performed , machining time calculations.

UNIT - V:

Drilling & Boring Machines: principle of working , specifications , types , operations performed , machining time calculations.

Milling Machine: Principle of working , specifications ,types , operations performed, types of cutters , methods of indexing.

UNIT - VI:

Grinding: Theory of grinding , classification of grinding machines ,grinding wheel , characteristics , specification and selection of a grinding wheel , methods of grinding , cutting speed, feed, depth of cut and machining time calculations.

Lapping and Honing : Working principle ,comparison of lapping, honing and grinding.

Text Books

1. R.K. Jain and S.C. Gupta, “Production Technology”, Khanna Publications.
2. P.N.Rao “Manufacturing Technology: Metal Cutting and Machine Tools”, Volume 2, 3rd Edition, Tata McGraw-Hill Education.

Reference Books

1. M.C.Shaw, “Metal cutting Principles”, Oxford University Press.
2. Winston A.Knight, Geoffrey Boothroyd, “Fundamentals of Metal cutting and Machine Tools”, 3rd Edition, TMH publications.
3. B.S.Raghuwanshi, “A course in Workshop Technology”, Vol II(Machine Tools), 2nd edition, Dhanapat Rai publications.
4. K.C Jain & A.K Chitale, “Production Engineering”, PHI Publishers.

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TURBO MACHINERY

III Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the principles of hydraulic turbines and pumps, steam turbines and compressors along with their performance characteristics.

Learning Outcomes

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

- understand the fundamental principles and operation of rotating machines.
- illustrate the working of hydraulic turbines and pumps and draw their performance characteristics
- select a suitable hydraulic turbine and pump for the given conditions
- design the hydraulic turbines for the given conditions
- evaluate the performance of impulse and reaction steam turbines
- assess the performance of dynamic compressors.

Course Content

UNIT - I: Basics of Turbo Machinery

Impulse momentum principle, Euler's equation of motion, force exerted by jet on stationary and moving plates, velocity diagrams, energy conversion in turbo-machinery, concept of degree of reaction, application of model testing, work done and efficiency.

UNIT - II: Centrifugal Pumps

Introduction, classification, working principle, work done by the Impeller, Head of pump - static head, manometric head, losses and efficiencies. Minimum starting speed, specific speed, model testing of pumps. Multistage Pumps– pumps in series and parallel. Performance characteristic curves, NPSH, cavitation.

UNIT - III: Hydraulic Turbines

Elements of hydro-electric power plant, classification of hydraulic turbines, Pelton wheel, Francis turbine and Kaplan turbine - working principle, work done, efficiencies, hydraulic design. Draft Tube - theory, function and efficiency.

Performance of hydraulic turbines under unit head - unit quantities, performance under specific conditions, Performance characteristic curves.

UNIT - IV: Steam Turbines and Impulse Turbines

Steam Turbines: Principle of operation of steam turbine, Classification of steam turbines.

Impulse Turbines: Mechanical details, velocity diagrams, combined velocity diagram, effect of friction, power developed, axial thrust, blade efficiency, condition for maximum efficiency. Methods to reduce rotor speed - compounding of turbines.

Reaction Turbine: Mechanical details, principle of operation, velocity diagram for impulse reaction turbine, degree of reaction, velocity diagram, Parson's reaction turbine – condition for maximum efficiency.

UNIT - V:

Rotary compressors (positive displacement type): Mechanical details and working - Roots blower, vane blower.

Centrifugal Compressors: Mechanical details and principle of operation – velocity and pressure variation. Ideal energy transfer, blade shapes and velocity triangles, analysis of flow through the compressors, slip factor, performance parameters - power input factor, pressure coefficient, compressor efficiency. Surging and choking.

UNIT - VI:

Axial Flow Compressors: Mechanical details and principle of operation – stage velocity triangles, work input to the compressor, work done factor, compressor stage efficiency, degree of reaction, comparison of centrifugal and axial compressors. Surging and stalling.

Text Books

1. S L Dixon and C A Hall, “Fluid Mechanics and Thermodynamics of Turbo-machinery” 7th edition.
2. S M Yahya, “Turbines, compressors and fans”, Mc Graw Hill Education, 4th edition.

Reference Books

1. R Yadav “Steam and Gas Turbines and Power Plant Engineering,” Vol. II, Central publishing house, 7th Edition, Allahabad.
2. P.N. Modi, S.M. Seth, “Hydraulics and Fluid Mechanics Including Hydraulics Machines”, Rajsons publication Pvt Ltd.
3. G.Goplakrishnan & D.Prithvirah , “A Treatise on Turbo Machines” Scitech Publications (India) Pvt. Limited.
4. V Ganesan, “Gas Turbines”, Mc Graw Hill Education, 3rd edition.

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NON CONVENTIONAL SOURCES OF ENERGY

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on 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

- significance of renewable energy and describe the principles of solar radiation
- analyze various solar collectors.
- know the various storage methods and application of solar energy.
- understand the concept of converting wind energy into electrical energy using both horizontal and vertical axis wind machines.
- know biomass disasters, functional operation of geothermal systems.
- generalize the operation of ocean, tidal and wave energy systems.
- understand the operating principle of direct energy conversion systems and to recognize the need and ability to engage in lifelong learning for further developments in this field.

Course Content

UNIT - I: Introduction

Energy sources and their availability- commercial and non commercial energy sources. Need of Renewable Energy Sources (RES), classification of RES, Role and potential of RES in India.

Solar Radiation: Structure of the sun, Solar constant, environmental impact of solar radiation, Radiation at the earth surfaces, solar radiation Geometry, extraterrestrial and terrestrial solar radiation, Spectral Distribution of Extraterrestrial Radiation, solar radiation on tilted surfaces and Empirical equations for predicting the availability of solar radiation at any given location. Solar energy - Thermal applications.

UNIT - II: Solar Collectors

Principle of solar energy conversion into heat, classification of solar collectors, Flat plate collectors, basic energy balance equation, collector efficiency, thermal analysis of flat plate collector. Concentrating collectors and its advantages and disadvantages. Performance analysis of concentrating collectors, selection of absorber coating materials.

UNIT - III: Solar Energy Storage and Applications

Solar Energy Storage: Different storage methods- sensible, latent heat and stratified storage, solar ponds.

Solar Energy Applications: Solar water, space heating /cooling, solar thermal electric conversion, direct solar electric power generation- solar photovoltaic, solar distillation, Solar Pumping, Solar furnace, Solar cooking and solar green house.

UNIT - IV: Wind Energy, Biomass Energy Conversion Systems and Geothermal Thermal Energy

Wind Energy: Working principle of wind energy conversion, Wind patterns, Components of wind energy conversion system (WECS), Types of Wind machines – horizontal axis and vertical axis, Betz coefficient.

Biomass Energy Conversion Systems: Biomass Energy: Fuel classification – Pyrolysis – Different digesters and sizing.

Geothermal Thermal Energy: Classification – Dry rock and aquifer – Energy analysis

UNIT - V: Ocean Thermal Energy, Tidal Power System and Wave Energy

Ocean Thermal Energy: Methods of Ocean Thermal Electric power generation- Open cycle systems, closed cycle systems

Tidal Power System: Working principle, components of Tidal Power plant, single basin and double basin tidal energy system advantages and limitations .

Wave Energy: Wave energy conversion Devices-wave energy conversion by floats, high level reservoir wave machine and dolphin type wave power machine. Advantages and disadvantages

UNIT - VI: Direct Energy Conversion, MHD Power Generation and Fuel Cell

Direct Energy Conversion (DEC): Need for DEC, limitations, principles of DEC. Thermoelectric Power – Seebeck, Peltier, Joule -Thomson effects, Thermo-electric Power generators

MHD Power Generation: Principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion.

Fuel Cell: working principle, classification – Efficiency – VI characteristics.

Text Books

1. SP Sukhatme, “Solar Energy: Principles of thermal collection and storage” Tata McGraw Hill
2. Tiwari and Ghosal, “Renewable energy resources”, Narosa

Reference Books

1. B.H.Khan “Non – conventional Energy Resources” Tata McGraw Hill education Pvt. Ltd.
2. G.D. Rai, “Non-Conventional Energy Sources”, Dhanpat Rai and Sons
3. Twidell & Weir, “Renewable Energy Sources “.

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MECHANICAL VIBRATIONS

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the concepts of mathematical model and solution methods for vibrations of the mechanical systems.

Learning Outcomes

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

- appreciate the need and importance of vibration analysis in mechanical design of machine parts that operate in vibratory conditions.
- analyze the mathematical model of a linear vibratory system to determine its response
- model single degree and two degree vibratory systems and determine their responses
- determine the natural frequencies and mode shapes of continuous vibratory systems using numerical methods
- choose appropriate instrument to measure the vibrations

Course Content

UNIT - I: Fundamentals of Vibration

Introduction, Elements of vibrating system, types of vibrations, methods of vibration analysis, spring elements, mass or inertia elements, damping elements, simple harmonic motion.

UNIT - II: Free Vibrations of Single Degree of Freedom Systems

Undamped Free Vibrations: Governing differential equation, Newton's method, Energy method, Rayleigh's method, torsional system – equations of motion and solution.

Damped Vibrations: Governing differential equation, critical damping coefficient and damping ratio, damped natural frequency, logarithmic decrement, energy dissipated in viscous damping.

UNIT - III: Forced Vibrations of Single Degree of Freedom Systems

Sources of Excitation, Equations of motion, Response of undamped system under harmonic excitation, Total response, beating phenomenon, Response of

damped system under harmonic excitation, frequency response , quality factor and band width , response under harmonic excitation of the base, vibration isolation, transmissibility, force transmission to foundations, response of a damped system under rotating unbalance.

UNIT - IV: Two Degree of Freedom Systems

Vibrations of undamped system , torsional system , damped free vibrations, forced harmonic vibration , coordinate coupling and principal coordinates , torsional vibration absorber , centrifugal pendulum absorber

UNIT - V: Vibrations of Continuous Systems

Lateral Vibrations of springs, longitudinal vibrations of bars , transverse vibrations of beams.

UNIT - VI: Vibration Measurement

Transducers - variable resistance transducers , piezoelectric transducers, electro dynamic transducers, linear variable differential transformer, transducer vibration pickups- vibrometer, accelerometer , velometer , frequency measuring instruments , vibration exciters- mechanical exciters, electrodynamic shaker , signal analysis- spectrum analyzers

Text Books

1. S. S. Rao , Mechanical Vibrations , 4th Edition, Pearson-Prentice Hall
2. William T. Thomson and Marie Dillon Dahleh ,Theory of Vibration with Application,Pearson New International Edition,5th Edition.

References Books

1. G.S. Grover &S.P.Nigam ,Mechanical Vibrations ,Nem Chand & Bros, 8th edition,
2. V.P.Singh ,Mechanical vibration,Dhanpat Rai & Co ,4th Edition.
3. Mechanical vibration Schaum Series , McGraw Hill ,2nd Edition.

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MECHANICS OF COMPOSITE MATERIALS

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the composite materials and their mechanical behaviour.

Learning Outcomes

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

- explain the concepts of composite materials.
- select a best technique for fabrication of composite material.
- analyze macro and micro mechanical behaviour of a lamina.
- develop governing equations for bending, buckling and vibrations in laminated plates.
- analyze and design composite structures used in automobile and aerospace applications.

Course Content

UNIT - I: Introduction to Composite Materials

Introduction, What is a composite material, Current and potential advantages of fibre reinforced composites, Applications of composite materials, Military, civil, space, automotive and commercial applications.

UNIT - II: Fabrication of Composites

Fabrication of Metal Matrix Composites, Fabrication of Polymer Matrix Composites, Fabrication of ceramic matrix composites, Fabrication of nano-composites.

UNIT - III: Macro and Micro Mechanical Behaviour of a Lamina

Stress strain relations for anisotropic materials, Restrictions on engineering constants, Strengths of an orthotropic lamina, Biaxial strength criteria for orthotropic lamina.

UNIT - IV: Micro Mechanical Behaviour of Lamina and Laminates:

Mechanical of material approach to stiffness, Elasticity approach to stiffness, Classification lamination theory, Special cases, strength of laminates

UNIT - V: Bending, Buckling and Vibration of Laminated Plates

Governing equations for bending buckling and vibration of laminated plates, Deflection of simply supported laminated plates, Vibration of simply supported laminated plates

UNIT - VI: Design of Composite Structures

Introduction, design philosophy, Anisotropic analysis, Bending extension coupling, Micromechanics, Non linear behaviour, Interlaminar stresses, transverse shearing, Laminate optimization.

Text Books

1. Ronald F. Gibson, Principles of composite material mechanics, CRC Press, 2011.
2. Robert M Jones, Mechanics of Composite Materials, Taylor & Francis, 2000V.

Reference Book

1. Lawrence E. Nielsen, Nielson, Paul Nielsen, Mechanical Properties of Polymers and Composites, Second Edition, CRC press, 2000.

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DATA STRUCTURES

III Year – I Semester

Lecture : 4

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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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, 4th Edition, B.S.Publications.
2. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman , 7th Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5th 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, Filariasis, 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 assess 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 University, available online, accessed, 7, 2008.
2. David F.Griffiths, October (2012) “An introduction to MATLAB” the University of Dundee, available online, Accessed, 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 overhead 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 gases-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 rods, 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 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.

Course Content

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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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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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, fluorescence 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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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.

Web link

www.statlearning.com

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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”, Wiley Publications, 2003.
2. Steve Suchring, “MySQL Bible”, John Wiley, 2002

Reference Books

1. Rasmus Lerdorf 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. Vikram Vaswani, “MySQL: The Complete Reference”, 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.

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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 No Punishment.

UNIT - II: Cyber Crime and Criminal Justice

Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber fraud and Cyber Cheating, Virus on Internet Deformation, Harassment and E- mail Abuse

UNIT - III: Cyber Criminality Strategies and Trends

Network Service Providers, Jurisdiction and Cyber Crimes, 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 Event of Digital Signature compromise, E - Governance in the India. A Warning to Babudom, Are Cyber Consumers Covered under the Consumer Protection, Goods and Services, Consumer Complaint Defect in Goods and Deficiency in Services Restrictive and Unfair Trade Practices

UNIT - V: Traditional Computer Crime

Early Hacker and Theft of Components Traditional problems, Recognizing and Defining Computer Crime, Phreakers: Yesterday's Hackers, Hacking, Computers as Commodities, Theft of intellectual Property.

UNIT - VI: Web Based Criminal Activity

Interference with Lawful Use of Computers, Malware, DoS (Denial of Service) and DDoS (Distributed Denial of Service) Attacks, Spam, Ransomware and Kidnapping of Information, Theft of Information, Data Manipulation, and Web Encroachment Online Gambling Online Fraud, Securities Fraud and stock Manipulation, Ancillary crimes

Text Books

1. Vivek Sood, "Cyber Law Simplified", 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. Degeneracy in TP and resolving it.

UNIT - VI: Assignment and Sequencing Problems

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 and 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: Reliability and Life Testing
3. S. M. Ross: Probability Models, Harcourt India Pvt. Ltd.
4. D. C. Montgomery: 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, 4th Edition.

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FLUID MECHANICS AND TURBO MACHINERY LAB

III Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- Determine experimentally the co-efficient of discharge of various flow measuring devices and study the performance of various turbo machines.

Learning Outcomes

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

- measure the fluid flow using different flow measuring devices
- conduct a performance test on turbomachines at different operating conditions.

List of experiments

1. Determine coefficient of discharge of Venturimeter/orifice meter.
2. Determination of friction factor for a given pipe line.
3. Determine the type of flow through a pipe line using Reynolds Apparatus.
4. Verification of Bernoulli's theorem.
5. Determine the efficiency of jet.
6. Performance Test on Pelton Wheel.
7. Performance Test on Francis Turbine.
8. Performance Test on Kaplan Turbine.
9. Performance Test on Single Stage Centrifugal Pump.
10. Performance Test on Reciprocating Pump.
11. Performance test on centrifugal blower.
12. Performance test on Axial flow compressor.

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MACHINE TOOLS LAB

III Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To impart hands on training in the operation of basic machine tools.

Learning Outcomes

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

- operate lathe machine to carry out step turning, taper turning, knurling, thread cutting, drilling and boring operations.
- perform drilling operation and distinguish tap set and perform tapping operation.
- perform shaping and planing operations.
- perform indexing operation to prepare gear on milling machine.
- carry out cylindrical and surface grinding operations.
- carry out grinding operation on single point cutting tool to obtain different tool angles.

List of Experiments

1. Step turning on lathe machine.
2. Taper turning on lathe machine.
3. Thread cutting and knurling on lathe machine.
4. Drilling and boring on lathe.
5. Drilling using radial drilling machine and tapping.
6. Shaping.
7. Planing.
8. Slotting.
9. Spur Gear cutting on milling machine.
10. Helical Gear cutting on milling machine.
11. Cylindrical grinding.
12. Grinding of tool angles.

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COMPUTER AIDED MACHINE DRAWING LAB

III Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To impart hands on training for drafting , modeling and assembly of machine parts using modeling package.

Learning Outcomes

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

- draft different views of machine elements and parts
- model individual parts and assemble them.

List of Experiments

1. Drafting of Cotter joint
2. Drafting of Coupling
3. Drafting of bearing
4. Drafting of riveted joint
5. Modeling of Stuffing Box parts.
6. Modeling of Steam engine cross head parts.
7. Modeling of Lathe single way tool post parts.
8. Modeling and Assembly of Knuckle joint parts.
9. Modeling and Assembly of Plummer Block parts
10. Modeling and Assembly of Screw Jack parts
11. Modeling and Assembly of IC engine piston parts
12. Modeling of parts of Eccentric and generation of orthographic views.

Text Books

1. S.Trymbaka Murthy , Computer Aided Machine Drawing Using Solid Edge , CBS Publishers & Distributors-New Delhi.
2. K.L.Narayana, P.Kannaiah & K. Venkata Reddy, "Machine Drawing", New Age Publications.
3. Solid works 2017 for Designer by Prof. Sham Tickoo, BPB Publications; 15th Edition edition (2017)
4. Reference Manual on Solid Edge fundamentals , Siemens Product Lifecycle Management Software Inc.

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Optional Elective - III

COMPUTER GRAPHICS

III Year – I Semester

Lecture : -

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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Optional Elective - III

FUZZY LOGIC SYSTEMS

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on fundamentals of fuzzy sets and defuzzification.
- To familiarize with the Fuzzy Logic systems

Learning Outcomes

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

- describe applications regarding fuzzy mathematics.
- describe and develop decision making mechanism with fuzzy logic.
- analyze fuzzy logic sets to develop fuzzy logic controllers.
- analyze fuzzy logic system components to develop fuzzy logic controllers.

Course Content

UNIT - I:

Introduction – Fuzzy subsets – Lattices and Boolean Algebras – L fuzzy sets.

Operations on fuzzy - α levels sets – properties of fuzzy subsets of a set.

UNIT - II:

Algebraic product and sum of two fuzzy subsets – properties satisfied by addition and product – Cartesian product of fuzzy subsets.

UNIT - III:

Algebra of fuzzy relations – logic – connectives, Fuzzy invariant subgroups - fuzzy subrings.

UNIT - IV:

Fuzzy sets, Membership, operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT - V:

Fuzzification, Membership value assignment, development of rule base and decision making system,

UNIT - VI:

Defuzzification to crisp sets, Defuzzification methods. Fuzzy Logic

Text Books

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Neural Networks and Fuzzy logic System by Bart kosko, PHI Publications
3. Recommended Text S.Nanda and N.R.Das “Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi.

Reference Books

1. Fuzzy Logic with Engineering Applications, Second Edition, Wiley Publications, Timothy J.Ross.
2. Fuzzy Set Theory and Its Applications, Fourth Edition, Yes Dee Publishing Pvt. Ltd., Springer, H.-J. Zimmermann.

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Optional Elective - III

MICRO PROCESSORS AND INTERFACING

III Year – I Semester

Lecture : -

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-Variation 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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ENGINEERING ECONOMICS AND ACCOUNTANCY

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the concepts of managerial economics and accountancy principles.

Course Outcomes

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

- apply managerial economic concepts in business decision making.
- identify the influencing factors of Demand for a product.
- categorize Production with respect to time and cost.
- relate the market structures and pricing to a product.
- establish the suitable business organisation with available resources
- analyze the investment patterns to minimize the risk.

Course Content

UNIT - I: Introduction to Engineering Economics

Definition, Nature and Scope of Managerial Economics – Relation of Managerial Economics with other disciplines, Concept of Engineering Economics.

Demand Analysis: Demand Determinants, Law of Demand and its exceptions, Significance & Types of Elasticity of Demand, Factors governing demand forecasting- 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. Production function, Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts & BEP Analysis Break-Even Point (simple problems)

UNIT - III: Introduction to Markets & Pricing strategies

Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition and Oligopoly.

Pricing strategies: Methods of Pricing: Cost based pricing, Demand based pricing, Competition based pricing and Strategy based pricing.

UNIT - IV: Introduction to Business Organizations

Characteristics and features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types.

UNIT - V: Financial Accountancy

Introduction to Accountancy, Types of Accounts, Journal, Ledgers, Trial Balance, Introduction to Final Accounts and Problems, Problems with simple adjustments.

UNIT - VI: Capital Budgeting and Financial Analysis

Introduction to capital budgeting - traditional methods and discounted cash flow methods (simple problems). Introduction to financial Analysis, Interpretation of financial statements through ratios.

Text Books

1. Aryasri , Managerial Economics and Financial Analysis TMH.
2. H. Craig Peterson & W. Cris Lewis , Managerial Economics PHI.

Reference Books

1. Ambrish Gupta , Financial Accounting for Management, Pearson Education, New Delhi.
2. Varshney & Maheswari, Managerial Economics, S Chand Publications.
3. Suma Damodaran , Managerial Economics, Oxford University Press.
4. Lipsey & Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui & A. S. Siddiqui , Managerial Economics & Financial Analysis, New Age International Space Publications.
6. Domnick Salvatore , Managerial Economics in a Global Economy, Thomson.
7. Narayanaswamy , Financial Accounting - A Managerial Perspective: PHI.

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METROLOGY AND INSTRUMENTATION

III Year – II Semester

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

Course Objectives

- To impart the principles of measurement of dimensional and geometric parameters of mechanical elements.
- To introduce working of various temperature, pressure, flow and strain measuring instruments.

Learning Outcomes

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

- determine tolerances and allowances to realize interchangeable manufacture.
- design of limit gauges.
- distinguish between line standards and end standards.
- apply the principles of interferometry in measurement of flatness and straightness.
- evaluate the surface roughness parameters.
- elaborate the basic principles of measurement systems.
- choose the appropriate instrument to measure the physical parameters like pressure, temperature, force, torque, displacement, speed and strain.

Course Content

UNIT - I:

Systems of limits and fits: Introduction, normal size, tolerance limits, deviations, allowance, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – Interchangeability, deterministic & statistical tolerance, selective assembly. International Standard system, limits and fits.

Limit Gauges: Taylor's principle – Design of go and No go gauges, plug, ring, snap, gap, taper, profile and position gauges.

UNIT - II:

Linear Measurement: Length standard, line and end standard, slip gauges – calibration of the slip gauges, Dial indicator, micrometers. Measurement of Angles and Tapers: Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate, rollers and spheres used to determine the tapers.

Optical Measuring Instruments: Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses. Interference of light, Michelson's interferometer, NPL flatness interferometer and NPL gauge interferometer.

UNIT - III:

Flat Surface Measurement: Measurement of flat surfaces – instruments used – straight edges – surface plates – auto collimator. Surface Roughness Measurement : Differences between surface roughness and surface waviness-Numerical assessment of surface finish – CLA, R.M.S, Rz values, Methods of measurement of surface finish – profilograph, Talysurf

UNIT - IV:

Measuring Instruments – Measurement systems, generalized configuration and functional descriptions of measuring instruments, Static and Dynamic performance characteristics, sources of error - Classification and elimination of error.

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers.

UNIT - V:

Measurement of Temperature: Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor , Thermocouple , RTD, Optical and total radiation pyrometers.

Flow Measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical Tachometers, Electrical tachometers, Stroboscope.

UNIT - VI:

Measurement of Force: Elastic force meters, load cells.

Measurement of Strain: Various types of strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge – bending, torque, compressive and tensile load, Strain gauge Rosettes.

Text Books

1. R.K. Jain, “Engineering Metrology”, Khanna Publishers.
2. BeckWith, Marangoni,Linehard, “ Mechanical Measurements”, 6th edition, PHI / PE.

Reference Books

1. Mahajan, ”Engineering Metrology “, Danpath Rai Publications.
2. D.S.Kumar, “Measurement Systems: Applications & design”, Anuradha Agencies.
3. I.C.Gupta ,”Engineering Metrology”, Danpath Rai Publications.
4. Connie Dotson “Fundamentals of Dimensional Metrology 4e “, Thomson Publications.
5. Doebelin Earnest. O. Adaptation by Manik and Dhanesh, ”Measurement systems: Application and design”, Tata Mc Graw Hill Publications.
6. S.Bhaskar, “Instrumentation and Control systems “, Anuradha Agencies.

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DESIGN OF MACHINE MEMBERS

III Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the knowledge of the basic engineering design against static and fluctuating loads by considering strength and rigidity.

Learning Outcomes

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

- apply the concepts of design to perform stress analysis on members under the action of static and fluctuating forces
- design structural members having riveted, bolted and welded joints
- design various mechanical elements like cotter joints, bearings, springs.

Course Content

UNIT - I: Introduction

General considerations in the design of engineering materials and their properties – selection – manufacturing consideration in design, BIS codes of steels - preferred numbers.

Simple Stresses- axial, bending, shear, principal stresses, theories of failure.

UNIT - II: Design for Fatigue Strength

Fluctuating stresses – Introduction to cyclic loading, fatigue failure, S-N curve - endurance limit – estimation of endurance strength, stress concentration – theoretical stress concentration factor, fatigue stress concentration factor, notch sensitivity, design for finite and infinite life-Goodman's line, Soderberg's line, modified Goodman's line.

UNIT - III: Riveted Joint, Welded Joint and Bolted Joint

Riveted Joint: Types, efficiency of a riveted joint, eccentrically loaded riveted joints.

Welded Joint: Types, strength of parallel and transverse fillet weld, strength of welded joint subject to bending, Torsion, eccentrically loaded welded joints.

Bolted Joint – design of bolts with pre-tension – design of joints under eccentric loading

UNIT - IV: Design of Cotter and Knuckle Joints

Cotter joints-spigot and socket, sleeve and cotter, gib and cotter joints, knuckle joint.

UNIT - V: Journal Bearings, Ball and Roller Bearings

Journal Bearings: classification of bearings, journal bearing materials – full and partial bearings- lubrication – bearing modulus —heat dissipation of bearings – design of journal bearing.

Ball and Roller Bearings: classification and selection of ball and roller bearings, static and dynamic load rating, bearing life- reliability, load-life relations.

UNIT - VI: Springs

Springs: Classification, Stresses and deflections of helical springs – open and closed coiled springs– springs subjected to fatigue loading, co-axial springs, leaf springs.

Text Books

1. Joseph Edward Shigley, Charles R.Mischke , “Mechanical engineering design”, TMH Publishers.
2. V.B.Bandari “Introduction to Machine Design”, TMH Publishers.

Reference Books

1. Robert L.Norton, “Machine Design – An integrated approach”, 2nd edition, Pearson education India
2. Dr. N.C. Pandya& Dr. C. S. Shah “Machine design” Charotar Publishing House Pvt. Limited.
3. Sadhu Singh, Design of Machine Elements, Khanna Publishers

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HEAT TRANSFER

III Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce various modes of heat transfer and their significance in the design of various heat transfer equipment.

Learning Outcomes

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

- determine the rate of heat transfer through simple geometries in steady state and find the critical radius of insulation in case of steam pipes and electrical cables
- evaluate the rate of heat transfer from a finned surface and the time of cooling or heating in transient heat conduction problems
- compute convective heat transfer coefficients in forced and natural convection, both for internal and external flows
- find the convective heat transfer coefficient in boiling and condensation
- design a heat exchanger using LMTD or NTU method
- calculate the radiation heat exchange between the surfaces and interpret the significance of radiation shields.

Course Content

UNIT - I:

Introduction: Modes of heat transfer, Basic laws of heat transfer, applications of heat transfer.

Conduction Heat Transfer: Fourier Law of Heat conduction, General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates. Simplification and forms of the field equation, steady, unsteady heat transfer, Initial and boundary conditions.

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders and spheres, Electrical Analogy, Composite slabs, cylinders and spheres, Thermal Contact Resistance, Critical radius of insulation, Variable Thermal conductivity, systems with heat generation.

UNIT - II

Extended surface (fin) Heat Transfer: Long Fin, Fin with insulated tip and Short Fin, Efficiency and effectiveness of fins.

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance, Significance of Biot and Fourier Numbers, Chart solutions of transient conduction systems.

UNIT - III

Convective Heat Transfer: Classification of Convective Heat Transfer, Dimensional analysis- Buckingham Pi Theorem for forced and Natural convection, Continuity, Momentum and Energy Equations.

Forced convection: Concepts of hydrodynamic and thermal boundary layer, use of empirical correlations for forced convective heat transfer -Internal flows and External flows.

UNIT - IV

Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate, Use of empirical relations for Vertical plates and cylinders.

Heat Transfer with Phase Change:

Boiling: Pool boiling, Regimes - Nucleate boiling and Film boiling, Critical Heat flux, Flow boiling.

Condensation: Film wise and drop wise condensation, Film condensation on vertical and horizontal cylinders, using empirical correlations.

UNIT - V

Heat Exchangers: Classification, overall heat transfer Coefficient, fouling factor, Design of Heat Exchangers - LMTD and NTU methods.

UNIT - VI

Radiation Heat Transfer: Basic concepts, Emission characteristics, concept of black body, laws of black-body radiation - Planck's law, Wien's displacement law, Stefan Boltzmann law, radiation incident on a surface, solid angle and radiation intensity, Lambert's cosine law, heat exchange between two black surfaces, shape factor, heat exchange between non-black surfaces, radiosity, electrical analogy for radiation networks, radiation shields.

Text Books

1. Yunus Cengel, Afshin Ghajar, "Heat and Mass Transfer", Tata McGraw Hill, 6th Edition.
2. P.K.Nag, "Heat And Mass Transfer", Tata Mc Graw Hill Publications, 3rd edition.

Reference Books

1. Incropera & Dewitt, "Fundamentals of Heat Transfer & Mass Transfer", John Wiley Publications, 6th edition.
2. J.P.Holman, "Heat transfer", Mc Graw Hill, 8th edition.
3. Ozisic M.Necati- "Heat transfer- A basic Approach", McGraw Hill company.

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Professional Elective - II

PRINCIPLES OF FINITE ELEMENT METHODS

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the basic concepts of finite element method and its applications to structural and heat transfer problems

Learning Outcomes

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

- derive displacement and stress-strain relationships and solve differential equations by variational and weighted residual methods.
- determine the elongation, stresses and strains in one dimensional bars and trusses subjected to different loads.
- determine the deflections in beams subjected to concentrated and distributed loads.
- compute stress and strains in two dimensional problems using constant strain triangle and iso parametric elements.
- analyze plate bending problems using bending elements.
- evaluate the temperature distribution in one dimensional thin plates and fins

Course Content

UNIT - I:

Introduction: stress and equilibrium, strain – displacement relations, stress – strain relations, plane stress and plane strain conditions, variational Rayleigh-Ritz and Galerkin weighted residual methods

Finite Element Method: Discretization, types of elements, interpolation functions, local and global coordinates, steps in finite element method, applications of finite element method.

UNIT - II:

Bars and trusses: One dimensional bar element - shape functions – stiffness matrix and load vector– assembly of matrices – treatment of boundary conditions, one dimensional quadratic element, stiffness matrix for plane truss, simple trusses problems.

UNIT - III:

Analysis of Beams: Beam element - shape functions and element stiffness matrix, load vector for concentrated and uniformly distributed load, simple problems on beams.

UNIT - IV:

Two Dimensional Problems: Finite element modeling of two dimensional problems – plane stress and plane strain , constant strain triangular element: strain and nodal displacement relations, load vectors for traction forces on the edges. isoparametric, subparametric and super parametric elements.

UNIT - V:

Plate bending elements: Bending of thin plates, formulation of triangular and rectangular elements, bending of thick plates-basic principles of formulation, shear locking.

UNIT - VI:

Steady state heat transfer analysis: One dimensional thermal analysis of thin plane walls, element conductivity matrix and load vector-assembly of matrices-treatment of boundary conditions, composite wall and analysis of a fin.

Text Books

1. Chandraputla, Ashok and Belegundu, “Introduction to Finite Elements in Engineering” Prentice – Hall.
2. JN Reddy, “Introduction to Finite Element Method”, McGrawHill Education.

Reference Books

1. S.S. Rao, “The Finite Element Methods in Engineering”, Butter Worth Hienmann Publishers.
2. Daryl L Logan, “A first course in finite element method”, Cengage Learning.
3. P.Seshu , Finite Element Analysis, Prentice Hall Publishers.

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Professional Elective - II

ROBOTICS

III Year – II Semester

Lecture : 4

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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AUTOMOBILE ENGINEERING

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on IC engines, engine systems and combustion phenomenon.
- To familiarize with the various automotive systems such as transmission system, steering system, suspension system, braking system, safety systems and hybrid vehicles.

Learning Outcomes

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

- illustrate working of IC engine components.
- analyze the combustion phenomenon in S.I and C.I engines.
- explain transmission, suspension, steering and braking , and safety systems of an automobile.
- list out various emission norms and propose various emission control methods.
- describe the importance of hybrid vehicles.

Course Content

UNIT - I:

I.C. Engine Components: Construction and working of S.I and C.I engines, Engine Systems: Simple and modern Carburettors, Fuel Injection System, Ignition, Cooling and Lubrication, Super charging and Turbo charging.

UNIT - II:

Combustion in S.I. Engines: Stages of combustion, Effect of engine variables on Ignition lag and flame propagation, abnormal combustion- pre-Ignition and knocking, effect of engine variables on Knocking, Octane rating.

Combustion in C.I. Engines: Stages of combustion, Delay period and its importance, Effect of engine variables, Diesel Knock, Cetane rating, comparison of knocking in SI and CI engines.

UNIT - III:

Automobile components: Chassis, Body, Power unit, Power transmission- front wheel drive, rear wheel drive, four-wheel drive, classification of automobiles.

Transmission system: Functions and types of 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.

UNIT - IV:

Steering System: steering geometry, condition for correct steering, steering gears, power steering.

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

UNIT - V:

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

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

UNIT - VI:

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

Hybrid vehicles: Introduction, classification of electrical drive vehicles, types of hybrid vehicles, Concepts of hybrid electric drive train, series and parallel hybrid electric drive train, merits and demerits.

Text books

1. M. L. Mathur, R. P. Sharma “A Course in Internal Combustion Engines”, Dhanpat Rai & Sons (2010).
2. Kirpal Singh, “Automobile Engineering Vol-1 & Vol-2”, Standard Publishers Distributors, 11th edition.

Reference Books

1. V. Ganesan “Internal Combustion Engines”, Tata McGraw Hill Education
2. William H Crouse & Donald L Anglin, Automotive Mechanics, Tata Mc Graw Hill Publications, 10th edition.
3. Iqbal Husain, “Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, New York, 2011.
4. Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012.

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DATABASE MANAGEMENT SYSTEMS

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize the concepts of database systems and different issues involved in the database design.
- To introduce how to write 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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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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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 Resistors

Resistivity, Range of Resistivity- free electron theory - classical theory & quantum theory. Semiconducting materials: Energy gap in solids - intrinsic semi conductors - extrinsic semi conductors - element & compound 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 susceptibility - complex dielectric 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, Reflection, 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 tilted 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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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 novel 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 diagnosis 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), evoked 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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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’Reilly 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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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 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 - 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, 2nd Edition, Dreamtech Press
- Dave Thomas, Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide, 4th Edition, Pragmatic Bookshelf
- Randal L. Schwartz,ý Brian D. Foy ,ý Tom Phoenix, Learning Perl, 6th edition, O'REILLY Publications.

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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 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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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.
- use 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 n th 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 differential 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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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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HEAT TRANSFER LAB

III Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To determine experimentally the conductive and radiating properties of materials and heat transfer coefficients in single and two phase flows.

Learning Outcomes

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

- determine conductive and radiating properties of materials and heat transfer coefficients in single and two phase flows.

List of Experiments

1. Determination of Thermal Conductivity of a given insulating powder.
2. Determination of Thermal Conductivity of a given liquid.
3. Determination of Thermal Conductivity of a lagged pipe.
4. Determination of efficiency of a pin-fin.
5. Determination of heat transfer coefficient in Transient Heat Conduction.
6. Determination of heat transfer coefficient in forced convection.
7. Determination of heat transfer coefficient in natural convection.
8. Determination of Emissivity of a test plate.
9. Determination of Stefan Boltzmann constant.
10. Determination of heat transfer coefficient in drop and film wise condensation.
11. Determination of Critical Heat flux during pool boiling.
12. Determination of overall heat transfer coefficient in a double pipe heat exchanger.

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METROLOGY AND INSTRUMENTATION LAB

III Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Any 6 experiments are to be conducted from each of the following

A) METROLOGY LAB

Course Objectives

- To impart hands on training in measuring methods and metrology instruments.

Learning outcomes

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

- operate equipment like tool maker's microscope, profile projector etc.
- use instruments like vernier callipers, bevel protractor etc.
- apply various metrology instruments in carrying out measurement of dimensional parameters.

List of Experiments

1. Measurement of lengths, heights, diameters by vernier callipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth vernier calliper for tooth thickness inspection and flange micro meter for checking the chordal thickness of spur gear.
4. Machine tool alignment test on the lathe.
5. Angle and taper measurements with bevel protractor, Sine bars, rollers and balls.
6. Use of spirit level in finding the straightness of a bed and flatness of a surface.
7. Thread inspection with two wire/ three wire method & tool makers microscope.
8. Surface roughness measurement with roughness measuring instrument.

B) INSTRUMENTATION LAB

Course Objectives

- To impart hands on training on calibration of various measuring instruments.

Learning outcomes

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

- calibrate the measuring instrument.

List of Experiments

1. Calibration of pressure gauge.
2. Calibration of LVDT transducer for displacement measurement.
3. Calibration of strain gauge.
4. Calibration of thermocouple.
5. Calibration of tachometer using photo pickup and magnetic pickup.
6. Calibration of resistance temperature detector.
7. Calibration of rotameter.

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COMPUTER AIDED ENGINEERING ANALYSIS LAB

III Year – II Semester

Practical : 2

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To impart hands on training for analysis of structural , vibration and fluid flow problems using analysis package.

Learning Outcomes

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

- analyze structural , vibration ,fluid flow and heat transfer problems using analysis package.

List of Experiments

1. 2- D truss analysis.
2. Static Analysis of Beam.
3. Static Analysis of 3-D structure.
4. Analysis of Axisymmetric Problem.
5. Analysis of Plane Stress problem.
6. Vibration analysis of beam.
7. Analysis and validation of laminar Flow / Turbulent flow through a Pipe.
8. Boundary layer Phenomenon over a flat plate.
9. Heat transfer through composite wall.
10. One-dimensional heat transfer through pin fin.
11. Forced convection with constant temperature / constant heat flux boundary condition.
12. Radiation and natural convection.

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Optional Elective - V

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

III Year – II Semester

Lecture : -

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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MECHATRONICS

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on design of complex engineering systems using sensors, actuators, controllers.
- To familiarize with the intelligent systems used in Mechatronics.

Learning Outcomes

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

- identify the elements of Mechatronic Systems
- select suitable sensors, actuators and controllers to meet specific requirements
- draw a parallelism between crisp set operations and fuzzy set operations through the use of characteristic and membership functions respectively.

Course Content

UNIT - I:

Introduction: Definition of Mechatronics, Mechatronics in manufacturing, Products, and design. Comparison between Traditional and Mechatronics approach, advantages and disadvantages of Mechatronics systems.

UNIT - II:

Sensors and Transducers: Types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature, light sensors and micro sensors.

UNIT - III:

Review of fundamentals of electronics. Data conversion devices, signal processing devices, relays, contactors and timers. Microprocessors, microcontrollers and PLCs.

UNIT - IV:

Actuators: Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, and transfer systems. Description of PID Controllers.

UNIT - V:

Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, and pumps. Design of hydraulic circuits.

Pneumatics: Production, distribution and conditioning of compressed air, system components and graphic representations.

Electro hydraulic, Electro pneumatic and hydro pneumatic servo systems.

UNIT - VI:

Fuzzy Set Theory: Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Properties of membership function, Fuzzy extension principle, Fuzzy Systems: fuzzification and defuzzification and fuzzy controllers.

Text Books

1. Bolton. W, "Mechatronics", Addison Wesley, 4th Edition, New Delhi.
2. Dan Nesulescu, "Mechatronics", 3rd Edition, Pearson Education
3. Michael B. Histanand David G. Aliatore, " Introduction to Mechatronics and Measurement Systems", McGraw-Hill

Reference Books

1. Devadas Shetty, Richard A Kolk, "Mechatronics System Design",
2. B.P. Singh (2002), "Advanced Microprocessor and Microcontrollers" New Age International Publisher.
3. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 2nd Ed, Prentice Hall, 2003.
4. H.J.Zimmermann, Fuzzy Set Theory and Its Applications, 2nd Ed., Kluwer Academic Publishers, 1996.
5. S.N. Sivanandam and S.N.Deepa, "Principles of Soft Computing" Second Edition, Wiley India Pvt.Ltd.

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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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INDUSTRIAL ENGINEERING AND MANAGEMENT

IV Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize the significance of industrial engineering and its tools to enhance productivity of the systems.
- To introduce the principles and techniques for effective project management and personal management.

Learning Outcomes

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

- calculate the productivity of a system and use industrial engineering tools for enhancing productivity.
- choose a suitable inventory control policy and design suitable plant layout for a given application.
- determine the standard time of the job, interpret process charts, simo chart, and design appropriate workplace layout in light of principles of motion economy and ergonomics.
- evaluate the production process by applying the techniques of SQC.
- differentiate between job evaluation and merit rating and determine the earnings of the worker under various wage payment plans.
- determine the project duration, floats slack, probability of meeting the project schedule and crash the networks to find out optimum duration and optimum cost of the project.

Course Content

UNIT - I: Concepts of Industrial Engineering

Production, productivity, measures of productivity, definition of I.E, genesis and growth of industrial engineering. Significance of I.E, tools of I.E, Principles of scientific management, principles of modern management. functions of management.

UNIT - II: Materials management

Introduction, inventory- types of inventory, purchasing or procurement, buying techniques, the purchasing procedure, associated costs. **Inventory Control**- objectives, functions, inventory models- EOQ model (simple problems), ABC and VED analysis. **Plant layout**: principles of scientific layout, flow patterns, types of plant layout, features, applications and techniques for optimal design of layout.

UNIT - III: Work study

Concept – importance – genesis and growth of work study role of work study in productivity enhancement, work measurement – standard time and its computation,

rating factor and techniques – types of elements in job breakdown, techniques of work measurement – time study, synthesis from elemental data, PMTS, analytical estimating, work sampling – applications of techniques, concepts of method study and motion study – procedure – recording techniques and tools, micro motion study – principles of motion economy – Therbligs-ergonomics.

UNIT - IV: Quality governance

Quality – significance, quality control-inspection– types of inspection- statistical quality control– significance-types of statistical quality control – techniques of SQC – control charts – importance – features of control charts – control charts for variables and attributes with numerical examples, sampling inspection – advantages – types of acceptance sampling plans – OC curve-process capability, fundamentals of TQM- ISO-9000.

UNIT - V: Human resource management

Personnel management Vs HRM, functions of human resource management – manpower planning, job analysis, recruitment, selection, induction, training and development, placement, wage administration, performance appraisal, transfer / promotion / dismissal, welfare administration, grievance handling and conflict management job evaluation objectives – types -applications. merit rating – objectives – types- applications. motivational theories- Maslow's hierarchy of needs theory, Herzberg's motivation theory, Douglas Mc-Gregor's Theory X and Y.

UNIT – VI: Project Management

Importance of project management –applications-bar charts & milestone charts – limitations – terminology-network rules-various network techniques-PERT and CPM-differences between CPM and PERT, critical path, determination of floats, standard deviation, variance and probability of completion of project-project crashing and numerical examples

Text Books

1. O.P.Kanna, "Industrial Engineering & Management ", Dhanpat Rai Publications.
2. Joseph G.Monks "Operations Management", Tata MC - Graw Hill.
3. T.R Banga N.K Agarwal, S.C Sharma," Industrial Engineering & Management Science" Khanna Publications.

Reference Books

1. Jack R. Meredith, Samuel J. Mantel, "Project management- A managerial approach" Wiley India Pvt Ltd.
2. Elwood S.Buffa and Rakesh K.Sani, "Modern production management" John Wiley & Sons Inc.
3. N.V.S. Raju," Industrial Engineering & Management", CENGAGE Learning.
4. Introduction to work study- ILO, 4th Revised Edition, 1992.
5. L.S. Srinath "PERT And CPM Principles And Applications" Affiliated East-West Press (Pvt.) Ltd.

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CAD / CAM

IV Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To present the role of computers in design and manufacture

Learning Outcomes

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

- justify the role of computers in design and manufacturing.
- analyze the product cycle in the light of CAD/CAM.
- apply various transformations to manipulate a geometric model.
- illustrate various entities of wire frame, surface, and solid models.
- distinguish between a CNC machine and a conventional machine.
- develop part programs for CNC machine.
- formulate manufacturing cells based on similar attributes of parts.
- propose trends in manufacturing to improve the productivity

Course Content

UNIT - I:

Introduction: Brief review of conventional design process. Computers in design and Manufacturing, Product cycle in light of CAD / CAM, Hardware for CAD.

UNIT - II:

Computer Graphics: Raster scan graphics coordinate system, transformation of geometry, 3D transformations, mathematics of projections, line clipping, hidden surface removal, database requirements for CAD/CAM systems.

UNIT - III:

Geometric modeling: Requirements, types of geometric models, entities of wire-frame model-mathematical representation of line and circle. Significance of efficient algorithm to generate a curve. Synthetic curves-cubic spline and Bezier curves-continuity of curves Types of surfaces-brief treatment. Solid modeling-sweep representation, constructive solid geometry and boundary representation

UNIT - IV:

Numerical control: NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming-manual part programming, and computer aided part programming.

UNIT - V:

Group Technology: Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

Flexible manufacturing systems: Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, FMS benefits.

UNIT - VI:

Trends in manufacturing: Industrial Internet of things (IIoT), Cobotics, 3D printing, big data analytics.

Text Books

1. Zimmers & P.Groover, "CAD/CAM", Pearson Education.
2. Ibrahim Zeid, "CAD / CAM Theory and Practice" Tata McGraw Hill Publication
3. The 3D Printing Handbook: Technologies, design and applications, by Ben Redwood, Filemon Schoffer Brian Garret – 3D Hubs
4. Industry 4.0 Industry Internet of things-Gilchrist, Alasdair

Reference Books

1. Groover, "Automation , Production systems & Computer integrated Manufacturing", Pearson Education Publications.
2. Radhakrishnan and Subramanian, "CAD/CAM/CIM", New Age International publications.

URL's

IIoT :

1. http://www2.itif.org/2016-ezell-iiot-smartmanufacturing.pdf?_ga=1.261819661.1089858538.1464487061
2. <https://www.newgenapps.com/blog/8-uses-applications-and-benefits-of-industrial-iiot-in-manufacturing>
3. <https://www.i-scoop.eu/internet-of-things-guide/internet-of-things-in-manufacturing/>
4. <https://www.happiestminds.com/Insights/industrial-iiot/>

Cobotics :

1. <http://www.vinci-energies.com/en/its-already-tomorrow/towards-smart-industry/cobotics-when-people-and-robots-work-together/>
2. <https://fja.sciencesconf.org/conference/fja/Moulieres.pdf>
3. <http://jlaw.staff.shef.ac.uk/index.php/cobotics/>
4. <https://www.hcltech.com/blogs/cobotics-emergence-robots-ai-driven-business-transformation>

Big Data Analytics:

1. www.allerin.com/blog/5-big-data-use-cases-in-the-manufacturing-industry
2. <https://www.liaison.com/blog/2017/09/20/big-data-analytics-tools-manufacturing-industry/>

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OPTIMIZATION TECHNIQUES

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce quantitative techniques to solve resource management problems.
- To know how to formulate allocation problems as LPP, transportation problem and assignment problems and locate solution.
- To familiarize with the concepts of queuing theory.
- To understand game theory concepts.

Course 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 $2 \times n$ and $m \times 2$ games.

Text Books

1. Kanthi Swarup, P.K.Gupta and Man Mohan, Operations Research, 14th edition, 2008, S. Chand & Sons New Delhi.
2. S.D. Sharma and Himanshu Sharma Operations Research, 15th edition, Kedarnath Ramnath Publishers, 2010.

Reference Books

1. Hamdy A. Taha, Operations Research, 8th edition, PHI Publications, 2008.
2. Billy E. Gillett, Introduction to Operations Research : A Computer-oriented Algorithmic Approach, Tata McGraw-Hill.

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Professional Elective - III

REFRIGERATION AND AIR CONDITIONING

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the basic cycles of various refrigerating systems, their performance evaluation along with details of system components and refrigerant properties.
- To impart knowledge of psychrometric properties, processes which are used in air-conditioning systems for comfort and industrial applications.

Learning Outcomes

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

- describe the working of air refrigeration cycle and its application in aircrafts
- analyze various refrigeration cycles and evaluate their performance under various operating conditions
- classify various components of a refrigeration system
- select the most appropriate refrigerant for a given application and understand the impact of refrigerants on the environment
- estimate the psychrometric properties and analyze the psychrometric processes
- calculate the load acting on an air-conditioning system and select the appropriate process and equipment for the required comfort and industrial air-conditioning.

Course Content

UNIT - I:

Introduction: Need and Applications of refrigeration, Unit of refrigeration and C.O.P, Methods of refrigeration, Ideal and actual cycles of refrigeration.

Air Refrigeration: Bell Coleman cycle, Open and Dense air systems, Actual air refrigeration system. Refrigeration needs of Aircrafts - Air craft refrigeration systems - working and their analysis

UNIT - II:

Vapor Compression Refrigeration: Working principle and essential components of the plant, actual cycle, effect of sub-cooling, super-heating, evaporator and condenser pressures on system performance – use of p-h charts. Cascade refrigeration cycles - A two-stage cascade refrigeration system.

UNIT - III:

Refrigerants: Desirable properties, classification, Nomenclature, Ozone Depletion, Global Warming.

System Components: Classification and working of Compressors, Condensers, Evaporators and Expansion devices.

UNIT - IV:

Vapor Absorption System: Description and working of NH_3 – water system, Calculation of maximum COP and Description and working of Li Br –water (Two shell & Four shell) System, principle of operation of three fluid absorption system, salient features.

Steam Jet Refrigeration System - Working Principle and basic components and its analysis

Non conventional Refrigeration systems: (i) Thermoelectric refrigerator (ii) Vortex tube

UNIT - V:

Psychrometry & Psychrometric Processes:

Review of Psychrometric Properties, Psychrometric Processes: Sensible heating, sensible cooling, humidification and de-humidification, cooling and de-humidification, cooling with adiabatic humidification, heating and humidification, adiabatic mixing of two air streams.

Requirements of human comfort, concept of effective temperature, Comfort chart, Classification of equipment for cooling, heating, humidification and dehumidification.

UNIT - VI:

Design of Air-Conditioning systems: Characterization of Sensible and latent heat loads, Need for Ventilation, Consideration of Infiltration, Load concepts of RSHF, GSHF- Problems, Concept of ESHF and ADP. Comfort Air conditioning - summer air conditioning, winter air conditioning, Requirements of Industrial air conditioning, Air conditioning Load Calculations.

Text Books

1. C P Arora, "Refrigeration and Air Conditioning", Tata McGraw-Hill Education, 3rd edition.
2. S C Arora & Domkundwar, "A Course in Refrigeration and Air conditioning", Dhanpat Rai publications, 5th edition.
3. Manohar Prasad, "Refrigeration and Conditioning", New Age publications, Revised 2nd edition.

Reference Books

1. Dossat, "Principles of Refrigeration", Pearson Education.
2. Anantha Narayanan, "Basic Refrigeration and Air-Conditioning", Tata McGraw-Hill Education, 4th edition.

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UNCONVENTIONAL MACHINING PROCESS

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart the principles of non-traditional machining methods.

Learning Outcomes

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

- justify the need of non-traditional machining methods.
- elaborate the principle and mechanism of metal removal of various unconventional machining processes.
- interpret the various process parameters and their effect on Material Removal Rate of various unconventional machining processes.
- select appropriate unconventional machining process based on mechanism of metal removal.
- summarize the applications of different Unconventional Machining Methods.

Course Content

UNIT - I: Introduction

Need for non-traditional machining methods, classification of modern machining processes – considerations in process selection, applications. Ultrasonic machining – Elements of the process, mechanics of material removal, MRR process parameters, economic considerations, applications and limitations.

UNIT - II: Electro – Chemical Machining

Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate, fundamentals of chemical, machining, advantages and applications, Electrostream drilling, shaped tube electrolytic machining.

UNIT - III: Thermal Metal Removal Processes

General principle and applications of Electric Discharge Machining, Electric Discharge Grinding and wire EDM – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric

fluids, surface finish and machining accuracy, characteristics of spark eroded surface.

UNIT - IV: Exotic Machining Processes

Electron Beam Machining, Laser Beam Machining - Basic principle and theory, mechanics of material removal, process parameters, efficiency & accuracy, applications

UNIT - V: Plasma Machining

Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

UNIT - VI: Mechanical Methods

Abrasive jet machining, Water jet machining and abrasive water jet machining- Basic principles, equipments, process variables, mechanics of material removal, MRR, application and limitations. Magnetic abrasive finishing, abrasive flow finishing.

Text Books

1. Benedict, Non-traditional machining methods, CRC Press.
2. VK Jain , Advanced machining processes, Allied publishers.

Reference Books

1. Pandey P.C. and Shah H.S, Modern Machining Process TMH.
2. Bhattacharya A, New Technology , The Institution of Engineers, India.

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TRIBOLOGY

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the selection of lubricating system for different machine components

Learning Outcomes

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

- select the appropriate bearing materials.
- select the rolling element bearing for the given conditions.
- design hydrostatic, hydrodynamic and air lubrication systems used in bearings.
- minimize the boundary friction and dry friction.

Course Content

UNIT - I:

Introduction: Viscosity, flow of fluids, viscosity and its variation -absolute and kinematic viscosity, temperature variation, viscosity index determination of viscosity, different viscometers used.

Lubrication: Choice of lubricants, types of oil, grease and solid lubricants-additives- lubrication systems and their selection.

UNIT - II:

Selection of Rolling Element Bearings: Nominal life, static and dynamic capacity-equivalent load, probabilities of survival- cubic mean load -pre loading of bearings, conditioning monitoring using shock pulse method.

UNIT - III:

Hydrostatic Bearings: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

UNIT - IV:

Hydrodynamic bearings: Hydrodynamic theory of lubrication: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions -Effects of

side leakage – Reynolds equation in three dimensions, Friction in sliding bearing, hydro dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti-friction bearing..

UNIT - V:

Air lubricated bearing: Advantages and disadvantages application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect

UNIT - VI:

Types of bearing materials and bearing oil pads: Hydrostatic bearing wick oiled bearings, oil rings, pressure feed bearing, partial bearings -externally pressurized bearings. General requirements of bearing materials, types of bearing materials.

Text Books

1. Basu, SenGupta and Ahuja , Fundamentals of Tribology, PHI
2. Sushil Kumar Srivatsava , Tribology in Industry, S. Chand &Co.

Reference Books

1. Neale MJ, (Editor) “Tribology hand Book” ,Neumann Butterworths,1975.
2. Connor and Boyd , “Standard hand book of lubrication engineers” ASLE, McGraw Hill Book & Co.,1968.
3. Shigley J, E Charles, “Mechanical Engineering Design”, McGraw Hill Co.,6th Edition.

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Professional Elective - IV

TOTAL QUALITY MANAGEMENT

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the concepts of Total Quality Management

Learning Outcomes

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

- investigate and analyze quality management issues in both manufacturing and service industry
- apply total quality management tools like Six sigma , QFD, Taguchi methods etc to improve quality and productivity.

Course Content

UNIT - I: Introduction

Quality and improvement, History and Stages of Evolution, Quality assurance, quality loss function, link between quality and productivity

UNIT - II: Quality Systems

Quality System – Elements, Quality Standards –Need of standardization- Bodies of standardization, ISO 9000- series - ISO 14000 series, Requirements and Benefits.

UNIT - III: Concepts of TQM

Definitions, Philosophy of TQM, Customer focus, Organization, Top management commitment, Contributions of Deming, Juran and Crosby to TQM

UNIT - IV: TQM systems

Quality policy deployment, Quality function deployment, Statistical Process Control-process chart-preparing and using control charts.

UNIT - V: TQM Tools and Techniques I

The seven traditional tools of quality, New management tools-Quality Circles, Bench Marking, KAIZEN, 5S, JIT.

UNIT - VI: TQM Tools and Techniques II

Taguchi analysis- loss function- Six Sigma approach-Application of six sigma approach to various industrial situations – Quality Function Development (QFD)- elements of QFD.

Text Books

1. Dale H. Besterfield, et., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).
2. Total Quality Management by Rose, J.E., Kogan Page Ltd., 1993.

Reference Books

1. The Essence of Total Quality Management by John Bank, PHI, 1993
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
3. Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. Janakiraman, B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd.

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COMPUTATIONAL FLUID DYNAMICS

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To equip students with the knowledge that is essential for application of computational fluid dynamics to solve engineering flow problems.
- To provide the essential numerical background for solving the partial differential equations governing the fluid flow.

Learning Outcomes

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

- analyze the mathematical representation of the governing equations of fluid flow.
- classify the partial differential equations
- express derivatives to difference equations through discretization techniques and solve the algebraic equations using iterative techniques
- transform the equations for grid generation and apply implicit/explicit techniques for solving partial differential equations
- solve one dimensional diffusion problems and convection - diffusion problems using finite difference techniques and finite volume method.

Course Content

UNIT - I:

Introduction: Computational Fluid Dynamics as a Research and Design Tool, Applications of Computational Fluid Dynamics.

Governing Equations of Fluid Dynamics: Introduction, Models of the flow - finite control volume, infinitesimal fluid element, Substantial Derivative, Divergence of Velocity, Three dimensional continuity, momentum and energy equations in differential and integral forms. Physical boundary conditions.

UNIT - II:

Mathematical behavior of partial differential equations: Introduction, Classification of Quasi-Linear Partial Differential Equations - Cramer's rule, Eigen value method, behavior of the different classes of differential equations - hyperbolic, parabolic and elliptical equations.

UNIT - III:

Basics Aspects of Discretization: Introduction to Finite Difference approach, Difference Equations, Explicit and Implicit Approaches, Errors and Stability Analysis, introduction to finite volume approach.

Solution Techniques for System of Algebraic Equations: iterative solution methods, direct method with Gaussian elimination, direct method with Tri-diagonal matrix algorithm.

UNIT - IV:

Grid Generation Techniques: Introduction, general transformation of the equations, Metrics and Jacobians, Stretched grids, Boundary - fitted coordinate systems

UNIT -V:

Applications of Finite Difference Method: Diffusion problem - One dimensional steady state heat conduction, transient heat conduction, One dimensional convection diffusion problems.

UNIT - VI:

Applications of Finite Volume Method: Diffusion problem - One dimensional steady state heat conduction, transient heat conduction, One dimensional convection diffusion problems.

Text Books

1. John D. Anderson, JR “Computational fluid dynamics The basic with applications”, Mc Graw Hill international .
2. H. Versteeg, W Malalsekra , “An Introduction to Computational Fluid Dynamics The finite volume method”, Pearson Publishers, 2nd Edition.

Reference Books

1. T. J. Chung - “Computational fluid dynamics”, Cambridge university press.
2. Suhas V. Patankar, “Numerical heat transfer and fluid flow” Butter-worth Publishers
3. T. K Sengupta, “Fundamentals of Computational Fluid Dynamics”, University Press.

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CONDITION MONITORING

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the importance of types of maintenance with their limitations and the methods of condition monitoring in different industrial sectors.

Learning Outcomes

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

- apply different maintenance strategies for the need of plant maintenance to reduce the maintenance cost
- analyze the machine condition with the aid of measuring instruments
- select appropriate test for fault identification of given application
- carry out lubrication oil analysis and temperature analysis for given applications
- analyze the case study including the fault identification and root causes of malfunction.

Course Content

UNIT - I:

Maintenance: Introduction, maintenance strategies, introduction to condition monitoring. rotating machinery - machine faults and root causes, ISO Standards for vibration analysis.

UNIT - II:

Vibration Monitoring: Types and benefits of vibration analysis, vibration signature analysis, **Vibration Measuring Instruments :** Vibration transducers – displacement, velocity and acceleration transducers. vibrometer- introduction, laser vibrometer. accelerometers – piezo resistive, capacitive and inductive type.

UNIT - III:

Non-destructive Testing: Various techniques for fault detection, introduction to non-destructive testing, role of non-destructive testing in condition monitoring.

Flaw Detection: Discontinuity – origin and classification, ultrasonic testing and magnetic particle inspection.

UNIT - IV:

Wear Debris Analysis: Wear mechanisms, wear particles, wear process monitoring techniques – Ferrography - Applications, advantages and limitations, spectrometric oil analysis program (SOAP)

UNIT - V:

Temperature monitoring: Need for temperature monitoring, thermography, active and passive thermography, IR thermography, applications, advantages and limitations.

UNIT - VI:

Case studies: Gear box, induction motor, transformer, roller bearings, wind mill

Text Books

1. R.A. Collacott ,” Mechanical Fault Diagnosis and Condition Monitoring “,John Wiley and Sons.

Reference Books

1. Isermann R., “Fault Diagnosis Applications”, Springer-Verlag, Berlin, 2011.
2. Rao, J S., “Vibration Condition Monitoring”, Narosa Publishing House, 2nd Edition, 2000.
3. Allan Davies,”Handbook of Condition Monitoring”, Chapman and Hall, 2000.

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DESIGN OF TRANSMISSION ELEMENTS

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the design of various machine elements for effective power transmission.

Learning Outcomes

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

- design the transmission elements like belts, ropes, chain drives, shafts, couplings gears, gearbox, power screws under different loading conditions.

Course Content

UNIT - I:

Flat belt Drives and Pulleys: Introduction to belt drives, belt materials, belt tensions, transmission of power by flat belt, design of flat belt drive and pulley.

V-Belt, Rope and Chain Drives: Design and selection of V- belt drives and rope drives, design of pulley for V-belt and rope drive, design of Chain drives.

UNIT - II:

Design of Shafts: Introduction- shaft sizes – BIS code - design of solid and hollow shafts for strength and rigidity – design of shafts for combined loading-torsion, bending and axial.

Design of Keys: Design of keys-stresses in keys.

Design of couplings: Muff, split muff, flanged and bushed pin coupling.

UNIT - III:

Design of power screws: Design of screw - Square, ACME, Buttress screws, design of nut, compound screw, differential screw.

UNIT - IV:

Design of Spur and Helical Gear Drives: Spur gears and helical gears – Forces, Lewis beam strength Equation, Wear load and Dynamic load.

UNIT - V:

Design of Bevel and Worm Gear Drives: Bevel gears and Worm gears – Forces, Lewis beam strength Equation, Wear load and Dynamic load.

UNIT - VI:

Gear box Design- Introduction – types – ray diagram, no. of speed calculation, design of multi speed gear box

Text Books

1. N.C. Pandya and C. S. Shah “Machine design” Charotar Publishing House Pvt. Limited.
2. V.B.Bandari “Introduction to Machine Design”, TMH Publishers.

Reference Books

1. Joseph Edward Shigley, Charles R.Mischke , “Mechanical engineering design”, TMH Publishers
2. Robert L.Norton, “Machine Design – An integrated approach”, 2nd edition, Pearson education India.
3. T.V. Sundaraja Murthy, “Machine Design” Anuradha Publications.
4. Sadhu Singh, “Design of Machine Elements” Khanna Publishers.

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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 agencies and 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; skills and strategies; rescue, relief reconstruction. Case Studies: Lessons and Experiences from Various Important Disasters in India

UNIT - III: Flood and Drought Disaster

Raising flood damage, assessing flood risk, flood hazard assessment, flood impact assessment, flood risk reduction options. Drought and development, relief management and prevention, drought mitigation and management-integrating technology and people.

UNIT - IV: Landslide and Earthquake Disaster

Land slide hazards zonation mapping and geo environmental problems associated with the occurrence of landslides. The use of electrical resistivity method in the study 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 safety and 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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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, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic 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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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 algorithms 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-point, 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 occurred.

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, Earthing – 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. Refrigeration 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
- assess 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.,

Course Content

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 (IoT).
- To famialize 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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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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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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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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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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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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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, lambda 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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SIMULATION LAB

IV Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To provide hands on experience in MATLAB and to write simple codes to implement the numerical methods.
- To demonstrate the simulation of manufacturing processes using simulation package.
- To demonstrate the working principle and operation of CNC lathe, CNC Mill, Robot and 3D printer.

Learning Outcomes

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

- write MATLAB code for numerical methods used in solving ordinary and partial differential equations
- simulate manufacturing processes and produce simple components using CNC lathe, CNC Mill and 3 D printer.
- operate Robot and write code for Palletization of components.

List of Experiments

1. Determination of roots of the Algebraic equations using Newton Raphson Method.
2. Implementation of Newton's Forward Interpolation formula.
3. Implementation of Gauss Backward Interpolation formula.
4. Implementation of Langranges Interpolation formula.
5. Implementation of Numerical Differentiation methods.
6. To plot variation of displacement, velocity and acceleration of coupler and output link for four bar mechanism.
7. Solving boundary value and initial value problem differential equations with simulink model.
8. Simulation of manufacturing Processes.
9. Machining of Components using CNC Lathe.
10. Machining of Components using CNC Mill.
11. Palletization of objects using pick and place Robot.
12. Manufacturing of simple components using 3D Printer.

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BIG DATA ANALYTICS

IV Year – I Semester

Lecture : -

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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COMPUTER ORGANIZATION AND ARCHITECTURE

IV Year – I Semester

Lecture : -

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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Optional Elective - VII

CRYOGENICS

IV Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To study various fluid properties, applications, gas liquefaction systems, air separation techniques, Insulating materials, vacuum pumps used in cryogenics.

Learning Outcomes

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

- discuss various properties of fluids used in cryogenic industry
- describe various gas liquefaction systems
- analyze various gas separation systems
- explain various cryocoolers, heat exchangers
- analyze various vacuum pumps and list various insulating materials
- describe various instruments and sensors used in cryogenics field.

Course Content

UNIT - I:

Introduction to cryogenic engineering, Properties of cryogenic fluids - Hydrogen, Helium, Properties of materials at cryogenic temperature - Mechanical, Electrical, Thermal, super conducting properties.

UNIT - II:

Basics of Refrigeration and Liquefaction, Joule Thomson effect, J – T expansion of a real gas, Adiabatic expansion, Comparison of J – T and Adiabatic expansions, Gas liquefaction systems, Effect of heat exchanger effectiveness on liquefaction systems and Figure of merit.

UNIT - III:

Basics of Gas Separation, Ideal Gas Separation System , Properties of Mixtures and the Governing Laws , Principles of Gas Separation ,Rectification and Plate Calculations.

UNIT - IV:

Cryocoolers : Cryocooler fundamentals, Different types and their applications , Stirling, Pulse Tube, Gifford – McMahon Cryocoolers , Regenerators, Heat exchangers, Compressors.

UNIT - V:

Need of Vacuum in Cryogenics ,Vacuum Fundamentals, Conductance and Electrical Analogy, Pumping Speed and Pump Down Time, Classification and Types of Vacuum Pump, Cryogenic Insulators.

UNIT - VI:

Need of Cryogenic Instrumentation, Measurement of Thermo physical Properties, Various Sensors. Need for Safety, Basic Hazards, Protection from Hazards.

Text books

1. Randall F. Barron, “Cryogenics Systems”, Second Edition, Oxford University Press, New York (1985).
2. Timmerhaus, Flynn, “Cryogenic Process Engineering “, Plenum Press, New York (1989).
3. Pipkov, “ Fundamentals of Vacuum Engineering “, Mir Publishers, Moscow.

References Books

1. Thomas M. Flynn, “Cryogenic Engineering”, second edition, CRC press, New York (2005).
2. G.M Walker. “Cryocooler- Part 1 Fundamentals” Plenum Press, New York (1983).
3. G.M Walker. “Cryocooler- Part 2” Plenum Press, New York (1983).

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DESIGN FOR MANUFACTURING AND ASSEMBLY

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the design considerations for manufacturing and assembly.

Learning Outcomes

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

- apply the principles of design for manufacturing processes
- estimates the cost of dies, molds and machined components based on die life
- employ the design principles for manual assembly and automated assembly
- design typical assemblies using principles of design for X concepts
- use the design rules for machining with single point and multi point cutting tools.

Course Content

UNIT - I: Design for Manufacturing

Overview of the DFM Process, Reduce the cost of manufacturing process, understanding the process and constraints, standard components and process, consider the impact of DFM decisions and other factors.

UNIT - II: Design Consideration in Metal Casting

Mold and gating system design, directional solidification, trouble shooting and ease of assembly and automation.

UNIT - III: Design Considerations for Welding and Forging

Consideration of defects, minimization of the residual stresses and ease of assembly and automation.

UNIT - IV: Design Considerations for Sheet Metal and Powder Metal Process

Consideration of defects, minimization of the residual stresses and ease of assembly and automation.

UNIT - V: Design Considerations in Machining

By considering machinability, geometric factors, cutting conditions and ease of assembly and automation.

UNIT - VI: Selection of Materials

Selection of materials for engineering applications using properties, process, shape, charts, ranking and choice.

Text Books

1. George E. Dieter, "Engineering Design", McGraw Hill International, 4th Edition.

Reference Books

1. Geoffrey Boothroyd, Peter Dewhurst, "Product Design for Manufacture and Assembly", CRC Press, 3rd Edition.
2. O. Molloy, "Design for Manufacturing and Assembly: Concepts, Architectures and Implementation", Chapman and Hall, 1st Edition.

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PRODUCTION PLANNING AND CONTROL

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To elucidate the objectives and functions of PPC department for effective running of a production system.

Learning Outcomes

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

- explain the objectives and functions of PPC.
- appraise different forecasting techniques and estimate the future demand of the product.
- optimize the inventory parameters to minimize the total variable cost.
- determine optimum production schedule.
- illustrate the duties of dispatcher and functions of follow up and outline the role of computers in PPC.
- apply modern management tools for effective planning of a production system.

Course Content

UNIT - I: Introduction

Definition-objectives and functions of production planning and control-elements of production control-organization of production planning and control department-internal organization of PPC department, types of production.

UNIT - II: Forecasting

Forecasting-importance of forecasting-types of forecasting, their uses-general principles of forecasting-forecasting techniques-qualitative methods and quantitative methods.

UNIT - III: Inventory Management

Inventory management-functions of inventories-relevant inventory costs-EOQ models-inventory control systems-P-System and Q-System - ABC analysis-VED analysis

UNIT - IV: Routing, Scheduling and Sequencing

Routing-definition-routing procedure, factors affecting routing procedure, Scheduling-definition-difference with loading, scheduling policies & techniques, standard sequencing methods, Johnson's algorithm (n job two m/c and n job three m/c).

UNIT - V: Dispatching and Follow-up

Dispatching-activities of dispatcher-dispatching procedure, Follow-up-definition-functions-types of follow up, Applications of computer in production planning and control.

UNIT - VI: Modern Production Management Tools

MRP, ERP, overview of JIT, Push/Pull production, Kanban system, Kaizen system, SCM.

Text Books

1. Samuel Eilon "Elements of Production Planning and Control" Collier Macmillan Ltd.
2. R. Panneerselvam "Production and Operations Management", 5th edition, PHI.

Reference Books

1. S.N.Chary " Production and Operations Management" 5th Edition, McGraw Hill
2. Mukhopadhyay,S.K. "Production Planning and Control Text and Cases", PHI.
3. John E. Biegel "Production Control A Quantitative Approach" Prentice Hall.
4. Daniel Sipper and Robert Bulfin "Production Planning, Control and Integration" McGraw Hill.

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POWER PLANT ENGINEERING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the working of various power plants.
- To familiarize with estimation of unit power cost and factors affecting it.

Learning Outcomes

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

- identify the various conventional energy resources.
- explain the working principles of various power plants used in electric power generation.
- estimate unit power cost under specified conditions.
- list out power plant effluents and their impact on environment.

Course Content

UNIT - I:

Introduction to the Sources of Energy – Resources and Development of Power in India.

Steam Power Plant: Plant Layout, Components, Working of different Circuits.

Coal Handling Systems: Types of fuels, Coal handling, Choice of coal handling equipment.

Air handling system: Induced and forced draught systems.

UNIT - II:

Combustion Process: Methods of Coal firing, Overfeed and Underfeed stoker firing - Principles and types of stoker firing systems, Pulverized fuel firing - Principle, Types of burners and Mills, Fluidized Bed Combustion, Cyclone Burner.

Ash and Dust handling: Types of Ash handling systems, Working principles of various Dust collectors.

Cooling towers: Types of Cooling towers and their working.

UNIT - III:

Gas Turbine Plant: Introduction, Types of Gas Turbine Plants, Layout with auxiliaries, Principles of working of Closed and Open Cycle Gas Turbines. Combined cycle Gas Turbine power plants, Cogeneration.

Diesel power plant: Introduction- Plant layout with auxiliaries, Fuel supply system, Lubrication and Cooling system.

UNIT - IV:

Nuclear Power Station: Nuclear fuel, Nuclear Chain Reaction, Breeding and fertile materials, Nuclear reactor- Reactor Operation.

Classification of Nuclear Reactors: Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast Breeder Reactor, CANDU Reactor, Homogeneous Reactor, Gas cooled Reactor.

Radiation Hazards and Shielding, Radioactive Waste Disposal.

UNIT - V:

Hydrology: Water power, Hydrological cycle, run off measurement, Hydrographs, drainage area characteristics.

Hydroelectric Power Plant: Classification of Hydroelectric Power Plants, Typical Layouts, Plant auxiliaries, Classification of dams and spill ways.

UNIT - VI:

Power Plant Economics: Capital cost, investment of fixed charges, operating costs, Load curves, and load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor and related exercises.

Environmental Aspects of Power Generation: Effluents from power plants and their impact on environment, Pollutants and Pollution standards, Methods of Pollution control.

Text Books

1. G.D. Rai, "An Introduction to Power Plant Technology", Khanna Publishers, 2004, 3rd Edition.
2. P.K.Nag, "Power Plant Engineering", 2nd Edition, Tata McGraw-Hill Education, 2014, 4th Edition.

Reference Books

1. S.C. Arora and S. Domkundwar "A Course in Power Plant Engineering", Dhanpat Rai & Co. (P) Limited, 2014.
2. R. K. Rajput, "A Text Book of Power Plant Engineering", Laxmi Publications, New Delhi, 2016, 4th Edition.
3. M.M.El-Wakil, "Power Plant Technology", Tata McGraw-Hill Education, Revised 2nd edition.

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THEORY OF ELASTICITY

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the basic concepts of theory of elasticity

Learning Outcomes

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

- determine stress distribution and strain components for simple and symmetric problems
- analyze three dimensional problems using equilibrium and compatibility equations
- determine stresses induced in beams of different cross sections
- apply concepts of plasticity to determine the shear stresses and strain energy.

Course Content

UNIT - I:

Elasticity: Introduction: Elasticity - notation for forces and stress - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - differential equations of equilibrium - boundary conditions – Strain Displacement Relations - compatibility equations - stress function

UNIT - II:

Two dimensional problems in rectangular coordinates - solution by polynomials - Saint Venants principle - determination of displacements - bending of simple beams – Simple Supported and Cantilever Beam.

UNIT - III:

Two dimensional problems in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress distributions Edge Dislocation - general solution of two-dimensional problem in polar coordinates - application to Plates with Circular Holes – Rotating Disk.

UNIT - IV:

Analysis of Stress and Strain in Three Dimensions: Analysis of stress and strain in three dimensions - principal stress - stress ellipsoid - director surface - determination of principal stresses Stress Invariants - max shear stresses Stress Tensor – Strain Tensor- Homogeneous deformation - principal axes of strain-rotation.

General theorems: Differential equations of equilibrium - conditions of compatibility - determination of displacement - uniqueness of solution - reciprocal theorem Strain Energy.

UNIT - V:

Bending of Prismatic Bars: Stress function - bending of cantilever beam - beam of rectangular cross-section - beams of circular cross-section.

UNIT - VI:

Torsion of Circular Shafts - Torsion of Straight Prismatic Bars – Saint Venants Method - torsion of prismatic bars - bars with elliptical cross sections - membrane analogy - - solution of torsional problems by energy method - torsion of shafts, tubes , bars etc. Torsion of Rolled Profile Sections.

Text Books

1. S.P. Timoshenko & J.K Goodier , “Theory of Elasticity”, McGraw-Hill,3rd Edition.
2. “Applied Elasticity” by C.T. Wang.

Reference Books

1. Theory of Plasticity by J.Chakarbarthy, McGrawhill Publications.
2. E.P. Unksov ,”An Engineering Theory of Plasticity”, Butterworths scientific publications,1961.
3. Hoffman and Sacks , “Theory of Plasticity” , McGraw-Hill, New York, 1953.

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RAPID PROTOTYPING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with rapid prototype tools and techniques for design and Manufacturing.

Learning Outcomes

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

- assess the need of RPT in Product development.
- use appropriate RT Software for development of Prototype model.
- judge the correct RP Process for Product/Prototype development.
- predict the technical challenges in 3D printing.
- list the applications of RPT.

Course Content

UNIT - I:

Introduction to Rapid Prototyping: Introduction to prototyping, traditional prototyping Vs. rapid prototyping (RP), need for time compression in product development, usage of RP parts, generic RP process, distinction between RP and CNC, other related technologies, classification of RP.

UNIT - II:

RP Software: Need for RP software, MIMICS, magics, surgiGuide, 3D-doctor, simplant, velocity2, voxim, solidView, 3Dview, etc., software.

Software Issues of RP: Preparation of CAD models, problems with STI, files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

UNIT - III:

Photopolymerization RP Processes: Stereolithography (SL), SL resin curing process, SL scan patterns, microstereolithography, applications of photopolymerization processes.

Powder Bed Fusion RP Processes : Selective laser sintering (SLS), powder fusion mechanism and powder handling, SLS metal and ceramic part creation, electron beam melting (EBM), applications of powder bed fusion processes.

UNIT - IV:

Extrusion-Based RP Systems: Fused deposition modelling (FDM), principles, plotting and path control, applications of extrusion-based processes.

Printing RP Processes: 3D printing (3DP), research achievements in printing deposition, technical challenges in printing, printing process modeling, applications of printing processes.

UNIT - V:

Sheet Lamination RP Processes: Laminated Object Manufacturing (LOM), ultrasonic consolidation (UC), gluing, thermal bonding, LOM and UC applications.

Beam Deposition RP Processes: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), processing – structure - properties, relationships, benefits and drawbacks.

UNIT - VI:

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, classification of rapid tooling, direct and indirect tooling methods, soft and hard tooling methods.

Errors in RP Processes: Pre-processing, processing, post-processing errors, part building errors in SLA, SLS, etc.,

RP Applications: Design, engineering analysis and planning applications, rapid tooling, reverse engineering, medical applications of RP.

Text Books:

1. Chua Chee Kai., Leong KahFai., Chu Sing Lim, “Rapid Prototyping: Principles and Applications in Manufacturing”, World Scientific

Reference Books

1. Ian Gibsn., David W Rosen., Brent Stucker., “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 2010.
2. Pham, D.T, Dimov, S.S, Rapid Manufacturing, Springer, 2001.

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GAS DYNAMICS AND JET PROPULSION

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To analyze and solve basic problems of Subsonic and Supersonic flows of compressible fluids with Friction and Heat transfer.
- To estimate the thrust and specific impulse of a propeller engine from fluid and thermodynamic principles.

Learning Outcomes

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

- explain the physics involved in the equations of compressible one dimensional flows
- analyse one dimensional flows including shock wave with heat addition and friction.
- analyse the effect of shock waves on compressible flows
- classify propulsion engines and describe their working
- analyze the working principle of Jet and rocket engines and draw its performance characteristics.

Course Content

UNIT - I:

Definitions and basic Relations: Energy equation for flow processes, stagnation-pressure, density, temperature, velocity, Mach number, Critical Mach number, Mach Cone, Mach angle, effect of Mach number on compressibility.

Basic Equation of compressible Flow: Energy and Momentum equations for compressible fluid flow, type of waves, Wave propagation, Velocity of Sound, Subsonic and Supersonic Flow.

UNIT - II:

Steady -one dimensional Flow: Fundamental Equations, Discharge from a Reservoir, Stream tube, Area–Velocity Relation, De-laval Nozzle, diffusers, dynamic head, Measurement in Compressible Flow, Pressure Coefficient.

UNIT - III:

Normal Shock Waves: Equation of Motion for Normal Shock Waves, Normal Shock Relations, total pressure across the shock wave, determination of Mach number of supersonic flows

Oblique Shock Waves: Nature of flow through Oblique shock wave, Relations, Prandtl's equation, variation of flow parameters, Oblique Shock Relations from the normal shock equation,

UNIT - IV:

Flow with Friction: Flow in constant area duct with friction, Fanno line, Fanno flow equations, variation of flow properties,.

Flow with Heat Transfer: Flow with heating or cooling in ducts, Rayleigh line, Fundamental Equations, Rayleigh flow relations, variation of flow properties.

UNIT - V:

Propulsion: Air craft propulsion- types of jet engines- energy flow through jet engines, thrust, thrust power and propulsive efficiency, turbojet components- diffuser, compressor, combustion chamber, turbines, exhaust systems.

UNIT - VI:

Performance of Jet Propulsion Engines: Performance of turbo propeller engines, ramjet and pulsejet, scramjet engines.

Rocket propulsion- types of rocket engines, solid and liquid propellant rockets- hybrid propellant rockets, nuclear propellant rockets, propellants, analysis of rocket propulsion.

Text Books

1. S.M. Yahya, "Fundamentals of compressible flow", New Age international publications, 3rd edition.
2. E Rathakrishnan, "Gas Dynamics", Prentice Hall of India, 6th edition.

Reference Books

1. Bird G A, "Molecular Gas Dynamics and the Direct Simulation of Gas Flows", Vol-I, Oxford University, Clarendon Press.
2. Zucrow M.J. and Hoffman J.D. "Gas Dynamics", Vol-I & Vol-II, John Wiley and Sons Inc.
3. Yahya. S.M., "Fundamental of compressible flow with Aircraft and Rocket Propulsion" New Age International (p) Ltd., New Delhi, 4th edition.

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AUTOMATION IN MANUFACTURING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce various strategies of automation in manufacturing.

Learning Outcomes

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

- explain automation strategies and transport mechanisms in automated flow lines.
- analyze the automated flow lines with and without buffer storage.
- choose appropriate material handling system for a given application.
- explain the principles of AS/RS and carousel storage systems.
- describe the ACO and ACC strategies to reduce the machine time.
- demonstrate the automated inspection methods.

Course Content

UNIT - I: Introduction

Production system – Automation in Production System – Elements of automated system – Levels of automation - Types of Automation – Automation principles and strategies. Automated Flow Lines: Configurations of AFL - Methods of part transport - Transfer mechanism - Buffer storage – System design considerations

UNIT - II: Analysis of Automated Flow Lines

General terminology and analysis of transfer Lines without buffer storage – upperbound approach and lowerbound approach - analysis of automated flow lines with buffer storage – analysis of two stage transfer line – analysis of more than two stages - partial automation – analysis – cost calculations.

UNIT - III: Automated Material Handling

Introduction – Design considerations in material handling - Types of equipment - Material transport equipment – AGVS – Conveyors – Hoists and cranes - analysis of material transport systems – vehicle based systems – conveyor analysis.

UNIT - IV: Automated Storage Systems

Automated storage and retrieval systems – Reasons for automating storage operations – Types of AS/RS – Applications of AS/RS – Carousel storage systems – Analysis of storage systems.

UNIT - V: Adaptive Control Systems

Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in Machining operations. Use of various parameters such as cutting force, temperature, vibration and acoustic emission.

UNIT - VI: Automated Inspection

Fundamentals of Inspection – Types of inspection – Inspection procedure – Automated inspection – Off line and On-line inspection - Fundamentals types of inspection methods and equipment – CMM - Machine vision.

Text Books

1. Groover.M.P, "Automation, Production Systems and Computer Integrated Manufacturing", Pearson Publications.

Reference Books

1. Yoram Coren, "Computer Control of Manufacturing Systems", Tata McGraw Hill.
2. P. Radhakrishnan & N.Subhramanyan, "CAD/CAM/CIM", Digital Design Publications.
3. W. Buekinsham, "Automation", PHI Publications, 3rd edition.
4. D.Y Pham & S.S Dimav Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, Springer Publication.

* * *

NON DESTRUCTIVE TECHNIQUES

IV Year – II 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.,

Course Content

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, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, 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.

* * *

ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION 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 leading centre of education and research in Electronics and Communication Engineering, making the students adaptable to changing technological and societal needs in a holistic learning environment.

Articulations

- * To be a leading centre of education and research hub in Electronics and Communication Engineering with holistic learning environment.
- * Students to be adaptable for the changes in technology and societal needs.

- * Students to be recognized and valued for their commitment to excellence and enthusiasm for learning.

Mission

- * To produce knowledgeable and technologically competent engineers for providing services to the society.
- * To have a collaboration with leading academic, industrial and research organizations for promoting research activities among faculty and students.
- * To create an integrated learning environment for sustained growth in electronics and communication engineering and related areas.

Articulations

- * To craft the graduates knowledge and technologically competent engineers for providing services to the society.
- * To have alliance with leading academicians, industries and research organizations and encourage the faculty and students for performing research activities.
- * To develop a multidiscipline learning environment for continuous growth in electronics and communication engineering and its associated fields.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of the Electronics and Communication Engineering program will

- * demonstrate a progression in technical competence and leadership in the practice/field of engineering with professional ethics.
- * continue to learn and adapt to evolving technologies for catering to the needs of the society.

IV. PROGRAM OUTCOMES (POs)

The ECE Graduates will be equipped with the ability of

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)

The ECE Graduates will be equipped with the ability of

- * designing electrical, electronics and communication systems in the domains of VLSI, embedded systems, signal processing and RF communications, and applying modern tools.
- * applying the contextual knowledge of Electronics and Communication Engineering to assess societal, environmental, health, safety, legal and cultural issues with professional ethics.

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 internship / 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:

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

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:

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

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 reevaluate 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)	24	15.00	10 - 20
4	Professional Core (PC)	57	35.62	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 & 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	MA2501	Linear Algebra & Differential Equations	4	1	-	4
3	EN2502	Engineer & Society	3	-	-	2
4	PH2504	Solid State Physics	4	-	-	3
5	CT2502	Problem Solving through Computer Programming	4	-	-	3
6	EG2502	Functional English Lab	-	-	2	1
7	PH2505	Solid State Physics Lab	-	-	2	1
8	CT2503	Computer Programming Lab	-	-	4	2
Total			19	1	8	19

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	MA2504	Integral Transforms and Vector Calculus	4	1	-	4
3	CH2503	Applied Chemistry	3	-	-	2
4	EN2501	Environmental Studies	3	-	-	2
5	EE2504	Linear Electrical Networks	3	-	-	2
6	MA2505	Numerical Methods & Complex Analysis	3	1	-	3
7	ME2501	Engineering Drawing	1	-	4	3
8	EG2504	Professional Communication Lab	-	-	4	2
9	CH2504	Applied Chemistry Lab	-	-	2	1
Total			20	2	10	21

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	EC2524	Probability Theory and Stochastic Process	3	1	-	3
2	EC2525	Electronic Devices	4	-	-	3
3	EC2508	Signals and Systems	3	1	-	3
4	BA2501	Engineering Economics and Project Management	3	-	-	2
5	EC2526	Electromagnetic Field Theory	4	-	-	3
6	EE2505	Elements of Electrical Engineering	3	-	-	2
7	EC2527	Electronic Devices Lab	-	-	4	2
8	EE2507	Networks and Electrical Technology Lab	-	-	2	1
Total			20	2	6	19
9	NS2501	NSS / Fine Arts / Yoga / Self Defense (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	EC2528	Transmission Lines and Waveguides	4	-	-	3
2	EC2529	Analog Circuits	4	-	-	3
3	EC2530	Analog Communications	3	-	-	2
4	EC2505	Digital Circuit Design	3	1	-	3
5	CS2501	Fundamentals of Data Structures	3	-	-	2
6		Open Elective-I (see list of Open Electives)	4	-	-	3
7	EC2533	Analog Circuits Lab	-	-	4	2
8	EC2506	Digital Circuit Design Lab	-	-	4	2
Total			21	1	8	20
9	SG2501	Sports and Games / Cultural (Mandatory Non-Credit Course)	-	-	2	-
10		Optional Elective - I	-	-	-	3
	CS2502	i) Introduction to Python Programming				
	CT2513	ii) Database Management Systems				
	EC2534	iii) Electronic Switching Systems				
11	EC2535	Optional Elective - II (MOOCs) Student shall opt from the list of MOOCs given by the Department)	-	-	-	2

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	EC2536	Linear Integrated Circuits Applications	3	1	-	3
2	EC2537	Digital Communications	3	-	-	2
3	EC2538	Antennas and Wave Propagation	4	-	-	3
4	EC2539	Principles of VLSI Design	3	-	-	2
5		Professional Elective - I	4	-	-	3
6		Open Elective-II (see list of Open Electives)	4	-	-	3
7	EC2545	Linear Integrated Circuits Applications Lab	-	-	4	2
8	EC2546	Analog and Digital Communications Lab	-	-	4	2
Total			21	1	8	20
9		Optional Elective - III	-	-	-	3
	CT2528	i) Data Warehousing and Data Mining				
	ME2549	ii) Mechatronics				
	EC2544	iii) Introduction to MEMS				
10	EC2547	Optional Elective - IV (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

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	EC2511	Digital Signal Processing	4	-	-	3
2	EE2512	Control Systems	3	1	-	3
3	EC2510	Microprocessors, Microcontrollers and Applications**	3	-	1	3
4	EC2548	Microwave and Optical Communications	3	-	-	2
5		Professional Elective - II	4	-	-	3
6		Open Elective-III (see list of Open Electives)	4	-	-	3
7	EC2515	Microprocessor and Microcontroller Interfacing Lab	-	-	4	2
8	EC2552	Digital Signal Processing Lab	-	-	4	2
9	EC2553	VLSI Lab	-	-	4	2
Total			21	1	13	23
10		Optional Elective - V	-	-	-	3
	CT2534	i) Big Data Analytics				
	EC2554	ii) Cognitive Radio Networks				
	CT2533	iii) Cryptography and Network Security				
10	EC2555	Optional Elective - VI (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

**** Project Based Theory Course**

L : Lecture

T : Tutorial

P : Practical

IV Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	EC2517	CMOS Digital IC Design	4	-	-	3
2	EC2512	Embedded System Design	3	-	-	2
3	EC2556	Electronic Measurements and Instrumentation	3	-	-	2
4		Professional Elective - III	4	-	-	3
5		Professional Elective - IV	4	-	-	3
6		Open Elective-IV (see list of Open Electives)	4	-	-	3
7	EC2564	Microwave and Optical Communications Lab	-	-	4	2
8	EC2565	Mini Project on Smart Applications	-	-	4	2
9	EC2566	Internship / Industrial Training / Practical Training	-	-	-	2
Total			22	-	8	22
9		Optional Elective - VII	-	-	-	3
	EE2554	i) Digital Control Systems				
	CT2521	ii) Artificial Intelligence				
	EC2567	iii) Transform Techniques				
10	EC2568	Optional Elective - VIII (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

IV Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Professional Elective - V	4	-	-	3
2		Professional Elective - VI	4	-	-	3
3	EC2577	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			No. of Credits
			L	T	P	
		Professional Elective - I	4	-	-	3
	EC2540	i) CAD for VLSI				
	EC2541	ii) Computer Organization				
	EC2542	iii) Computer and Communication Networks				
	EC2507	iv) Biomedical Engineering				
		Professional Elective - II	4	-	-	3
	EC2549	i) Analog IC Design				
	EC2516	ii) Nano Electronics				
	EC2550	iii) Smart Antennas				
	EC2551	iv) Coding Theory				
		Professional Elective - III	4	-	-	3
	EC2557	i) Mixed Signal IC Design				
	EC2558	ii) Cellular and Mobile Communications				
	EC2559	iii) Digital TV Engineering				
	EC2514	iv) DSP Processors and Architectures				
		Professional Elective - IV	4	-	-	3
	EC2560	i) System on Chip Design				
	EC2561	ii) Wireless Sensor Networks				
	EC2562	iii) Satellite Communication				
	EC2518	iv) Digital Image Processing				
		Professional Elective - V	4	-	-	3
	EC2569	i) Low Power VLSI Circuits				
	EC2570	ii) Real Time Operating Systems				
	EC2571	iii) Speech Processing				
	EC2572	iv) Adaptive Signal Processing				
		Professional Elective - VI	4	-	-	3
	EC2573	i) ASIC Design				
	EC2574	ii) Embedded C				
	EC2575	iii) RADAR Engineering				
	EC2576	iv) Multi Rate Signal Processing				

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 conversation **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 & DIFFERENTIAL EQUATIONS

(Common to CE, EEE, ME & ECE)

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 know the procedures to find the solutions of first and second order differential equations.
- To understand different procedures to solve first order linear & non-linear partial differential equations.

Learning Outcomes

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

- use the concepts of eigenvalues and eigenvectors in solving engineering problems.
- apply 1st & 2nd order differential equations to solve various engineering problems.
- apply the techniques of partial differentiation to find maxima and minima of two/three variables.
- solve first order linear & non-linear partial differential equations.

Course Content

UNIT– I: System of Linear Equations

Rank of a matrix - Echelon form, Normal form, System of equations - consistence and inconsistency, solving non-homogeneous system of equations by LU-Decomposition.

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: First order ordinary Differential Equations

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

UNIT– IV: Higher Order Linear ordinary Differential Equations

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*, $e^{ax} v(x)$, $xv(x)$ and Euler-Cauchy equation.

UNIT– V: Partial Differentiation

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

UNIT– VI: First order P.D.E

Forming PDE by eliminating arbitrary functions. Solutions of linear PDE (by Lagrange's subsidiary equation). Solutions of Non-linear PDE by Charpit's method.

Text Books

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

Reference Books

1. U.M.Swamy, A Text Book of Engineering Mathematics – I & II, 2nd Edition, Excel Books, New Delhi, 2011.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 8th edition, Maitrey Printech Pvt. Ltd, Noida, 2009.

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ENGINEER AND SOCIETY
(Common to CE, EEE & ECE)
I Year – I 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.

Course Content

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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SOLID STATE PHYSICS

I Year – I Semester

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

Course Objectives

The course is designed to make the students to learn the conditions for propagation of laser light in guided medium 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.
- identify conductivity mechanism in semiconductors
- determine types of polarization and classius-mosotti relation
- Differentiate classical and quantum free electron theories
- derive orbital and spin contribution for magnetism

Course Content

UNIT– I: Laser

Spontaneous and stimulated emission - Einstein's coefficient and their relations - basic characteristics of laser - Basic Requirements of laser - Helium-Neon laser - Semiconductor laser - CO₂ laser - Applications 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: Physics of Semiconductor

Properties of Fermi Dirac energy distribution function - Concentration of carriers in conduction band , valance band - Intrinsic carrier concentration - Drift and diffusion currents - Einstein's relations - Hall effect - Applications of hall effect

UNIT– IV: Dielectrics

Expression for local field - Classius mosotti relation - Types of polarization - Frequency response curve of dielectrics - Dielectric loss - Dielectric strength - Loss tangent

UNIT– V: Free electron and band theory of metals

Classical free electron theory - Drawbacks of classical free electron theory – Fermi level and Fermi Dirac energy distribution function - Quantum free electron theory – Band theory-Bloch function - Kronig -penney model

UNIT– VI: magnetic materials

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

Text Books

1. S.O.Pillai, Solid state physics, (7th Edition), New Age International. (unit - 3,4,5,6)
2. Dr.M.N. Avadhanulu, Dr. P.G.Kshirsagar, Engineering Physics (9th Edition), S.Chand Publications (unit-1,2)

Reference Books

1. A.J.Dekker, Solid state physics, Published by Macmillan India.
2. Charles Kittel, Introduction to solid state physics, Wiley India Pvt. Ltd.
3. B.B. Laud, Laser and Non-Linear Optics, New Age international publishers
4. P.K. Palanisamy, Engineering Physics , SciTech publications

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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, pointers and arrays, pointers and functions, 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, 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, Second 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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SOLID STATE 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.
- Understand the behaviour and characteristics of various active and passive components.
- To learn utilization of laser source for optical fiber communication

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 thermistor
- 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 bending losses in optical fiber
2	Determination of numerical aperture of an optical fiber
3	Determination of energy band gap of a semiconductor
4	Determination of thermal resistance by thermistor
5	Determination of time constant of RC circuit
6	Determination of resonance frequency of LCR circuit in series and parallel
7	Study of the characteristics of a zenar diode.
8	Determination of magnetic field along the axis of circular disc by using Stewart and Gee's Apparatus
9	Study normal modes in string using forced vibrations in rods-Melde's experiment.
10	Determination of Frequency of A.C supply by sono meter.
11	Determination of Hall coefficient by Hall effect
12	Draw Hysteresis curve of a ferro magnetic material

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.

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 $\text{area} = (s(s-a)(s-b)(s-c))^{1/2}$ 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 from 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(), strev()

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-written e-mail message and doing the following task:(Compulsory)

- a. Analyzing the reasons for the 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 them.

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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INTEGRAL TRANSFORMS AND VECTOR CALCULUS

(Common to EEE & ECE)

I Year – II Semester

Lecture : 4 Tutorial : 1

Internal Marks : 40

Credits : 4

External Marks : 60

Course Objectives

- To gain the knowledge of Laplace and inverse transforms.
- To understand the concepts of Fourier series and Fourier Transforms.
- To find the solutions of integral problems using vector concepts.

Learning Outcomes

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

- apply Laplace transforms to find the solutions of ordinary differential equations.
- express a function in Fourier series and in Fourier integral form.
- apply the concepts of vector differentiation and integration to the surface and volume integrals.

Course Content

UNIT-I: Laplace Transforms

Laplace transforms of standard functions – Shifting Theorems - Multiplication and division by t , transforms of derivatives and improper integrals – Unit step function – Dirac Delta function.

UNIT– II: Inverse Laplace Transforms

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

Application: Solution of ordinary differential equations.

UNIT–III: Fourier Series

Fourier series: Determination of Fourier coefficients (without proof) – Fourier series – Fourier series in an arbitrary interval– Half-range sine and cosine series

UNIT– IV: Fourier Transforms

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

UNIT–V: Vector Differentiation

Vector Differentiation: Gradient- Divergence- Curl - Laplacian operator

UNIT–VI: Vector Integration

Line, surface and volume integrals.

Integral theorems: Greens - Stokes - Gauss Divergence Theorems (Without proof) and related problems. Applications: Work done, flux across the surface

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 , II, III: 11th edition, S. Chand Publishers, 2012, New Delhi.

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APPLIED CHEMISTRY

I Year – II Semester

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

Course Objectives

- To impart the knowledge of batteries, solar cells, sensors and bio-sensors and boiler troubles with hard water.
- To impart the knowledge of advanced materials viz., LCD, nano materials, polymers and instrumental methods of analysis.

Learning Outcomes

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

- explain the working of lead acid battery, nickel – cadmium battery, lithium ion battery and fuel cells and to explain the applications of sensors and bio-sensors.
- explain about new generation photo voltaic cells.
- apply a suitable method of water treatment depending on the quality requirement.
- explain the methods of synthesis of liquid crystals, nano materials properties and applications of CNTs and quantum dots.
- explain properties and engineering applications of fibre reinforced plastics, conducting polymers and bio degradable polymers.
- explain the principles and working of spectrophotometer and flame photometer for the determination of a given ion in a given solution.

Course Content

UNIT–I: Electrochemical Energy Systems and Sensors

- (a) Differences between primary cells and secondary cells, Construction, electro chemical reactions and applications of secondary cells- Ni-Cd battery, 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.
- (b) Sensors and Bio-Sensors – principle, description of electro chemical sensor –applications – working of glucometer – applications of bio-sensors.

UNIT–II: Solar Energy Devices

Photo Voltaic cells – Working principle – Applications – New generation Solar cells (Thin film Solar cells, organic solar cell, dye sensitized solar cells) – Solar reflectors – Solar trough, Solar dish, Solar tower - Solar water heater.

UNIT–III: Hard Water and Boiler Troubles

Hardness of water – calculation of hardness- disadvantages of using hard water in boilers – priming and foaming – sludge and scale formation – caustic embrittlement – boiler corrosion. Treatment of boiler feed water – Zeolite process, Ion exchange process – Internal treatment – Calgon conditioning – Phosphate conditioning – Colloidal conditioning – Desalination of Brackish water by RO method.

UNIT–IV: Nano Materials and Liquid Crystals

Nano materials : Concept of Nano materials - synthesis of nano materials – Sol-gel, Thin film preparation by Chemical vapour deposition method, carbon nano tubes (CNTs) – types, properties, applications of CNTs, quantum dots – applications.

Liquid crystals - types, properties, applications, working of LCD

UNIT–V: Polymers

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, applications- OLED, poly aniline, Bio-Degradable Polymers— PHBV.

UNIT–VI: Instrumental Methods of Analysis

Electronic transition in molecules – Absorption Spectra, Beer Lambert's Law, UV spectrophotometer - principle and working – determination of Ferric Iron by spectrophotometry - Flame photometry – principle and working, estimation of sodium by flame photometry.

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., 12th Edn.,2010.
2. Engineering Chemistry by J.C.Kuriscose and J.Rajaram. volumes 1 & 2, Tata Mc Graw-Hill Publishing.

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ENVIRONMENTAL STUDIES
(Common to CE, EEE & ECE)
I Year – II 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)

Course Content

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. Ltd.(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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LINEAR ELECTRICAL NETWORKS

I Year – II Semester

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

Course Objectives

- To understand basic laws and theorems of Electrical circuits.
- To familiarize with the steady state behaviour of DC and single phase AC circuits.
- To familiarize the concepts of electrical resonance.
- To familiarize the students to two port networks.

Learning Outcomes

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

- apply various circuit laws to analyze the electrical circuits.
- analyze the steady state behavior of DC and AC circuits.
- apply network theorems to analyze the electrical circuits.
- analyze the behavior of electrical resonance
- evaluate different two port network parameters.

Course Content

UNIT-I: Introduction To Electrical Engineering

Network elements classification, Circuit concepts –Resistor(R) - Inductor(L) - Capacitor(C) -Voltage and Current Sources (Ideal and Non-Ideal)- Independent and Dependent Sources- Voltage - Current relationship for passive elements.

UNIT-II: Methods Of Analysis

Ohm's law - Kirchhoff's laws – Source transformation - Network reduction techniques series, parallel, series parallel, star-to-delta or delta-to-star transformation, Nodal analysis, mesh analysis, super node and super mesh for D.C excitations.

UNIT-III: Introduction To Single Phase Ac Circuits

Generation of alternating sinusoidal quantities - R.M.S, Average values and form factor for different periodic wave forms – sinusoidal alternating quantities – Phase and Phase difference – Complex and polar forms of representations, J Notation,

UNIT–IV: Sinusoidal Steady State Analysis & Resonance

Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation-Concept of Reactance, Impedance, Susceptance and Admittance-Power Factor and significance of Real and Reactive power, Complex Power.

Resonance - series, parallel circuits, concept of band width and Q factor.

UNIT– V: Network Theorems

Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's, Tellegen's and compensation theorems for D.C and sinusoidal excitations.

UNIT–VI: Two Port Networks

Two port network parameters – Z, Y, ABCD, hybrid, Inverse transmission and inverse hybrid parameters and their relations, Cascaded networks.

Text Books

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, McGraw Hill Company, 6th edition
2. Theory & Problems of Electric Circuits by Joseph A. Edminister- Schaum series, 6th edition.
3. Fundamentals of Electric Circuits by Alexander & Sadiku, 2nd edition.

Reference Books

1. Network Analysis by Van Valkenburg, Prentice-Hall of India Private Ltd., 8th edition.
2. Network Analysis and Synthesis by Kuo, Franklin. F, John Wiley Publishers, 2nd edition.

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NUMERICAL METHODS & COMPLEX ANALYSIS

I Year – II Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the various numerical techniques.
- To introduce the complex functions, complex differentiation and complex integration
- To introduce the concepts of conformal and bilinear transformations of standard functions.

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.
- compute interpolating polynomial for the given data.
- find derivatives and integrals by using numerical techniques.
- test the differentiability(analyticity) of a complex function
- find the complex integration with the use of Cauchy's integral formula.
- apply the concepts of conformal and bilinear transformations of standard functions.

Course Content

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: Numerical Solutions of Ordinary Differential Equations

Taylor's Series Method, Euler Method, Modified Euler Method, Runge – Kutta Fourth order Method

UNIT–V: Complex differentiation & Integration (without proofs)

Introduction of the complex functions, derivative of $f(z)$, analytic functions, C-R equations in polar coordinates, harmonic functions and orthogonal systems.

Introduction of line integral and evaluation along the path, Cauchy's integral theorem-statement, Cauchy's generalized integral formula.

UNIT–VI: Conformal mapping

Transformation by e^z , $\ln z$, Z^2 , Z^n ($n \in \mathbb{Z}^+$), $\sin Z$, $\cos Z$, $Z + \frac{1}{Z}$, Translation, rotation, Inversion and Bilinear transformation, Fixed points, Cross-ratio properties.

Text Book

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 , II, III: 11th edition, S. Chand Publishers, 2012, New Delhi.
4. S.Armugam, A. Thangapandi Isac, A. Soma Sundaram, Numerical Methods, Scitech Publications.

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ENGINEERING DRAWING

I Year – II Semester

Lecture : 1 Practical : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To highlight the significance of universal language of engineers.
- To introduce the concepts of drawing 3-D objects in 2-D planes and vice versa with proper dimensioning and scaling.

Learning Outcomes

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

- apply principles of drawing in representing dimensions of an object.
- construct polygons and conical curves.
- draw projections of points, lines and planes.
- draw projections of solids in different positions.
- convert orthographic views into isometric views and vice-versa.

Course Content

UNIT–I: Introduction

Geometrical Constructions

Conic Sections: Ellipse, parabola, hyperbola – general method.

UNIT–II: Orthographic Projections

Introduction to Orthographic Projections, Projections of Points, Projections of Straight Lines parallel to both planes, Projections of Straight Lines-Parallel to one and inclined to other plane.

UNIT–III: Projections of Straight Lines

Projections of Straight Lines inclined to both planes.

UNIT–IV: Projections of Planes

Regular Planes Perpendicular / parallel to one Reference Plane and inclined to other Reference Plane, inclined to both the Reference Planes.

UNIT–V: Projections of Solids

Regular solids with axis perpendicular to one reference plane, axis inclined to one reference plane and perpendicular to other reference plane.

UNIT–VI: Transformation of Projections

Conversion of Isometric Views to Orthographic Views and orthographic to Isometric Views.

Semester End Examination Pattern

Semester end examination paper consists of eight questions out of which five questions are to be answered. All questions carry equal marks.

Text Books

1. N.D. Bhatt (2014), Engineering Drawing, 53rd edition , Chariot Publications.
2. K.VenuGopal (2016), Engineering Drawing and Graphics, 5th edition , New Age International (p) Ltd Publishers.

Reference Books

1. B.V.R.Gupta and M.Raja Roy(2016),Engineering Drawing with Autocad,3rd edition , I.K. Publishers.
2. M. B. Shah and B. C. Rana(2009),Engineering Drawing , 2nd edition,Pearson Education.
3. Dhanunjay A Jolhe (20014),Engineering Drawing , 2nd edition,Tata Mc GrawHill Publishers.

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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 Andhra Pradesh.

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

I Year – II Semester

Practical : 2

Internal Marks : 40

Credits : 1

External Marks : 60

Course Objectives

- To impart the skill on chemical and instrumental methods of analysis of various parameters for determining the quality of water.
- To impart the skill on preparation of synthetic materials.

Learning Outcomes

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

- test the quality parameters of water by volumetric and instrumental methods.
- to operate the sensors for testing the water quality.
- synthesize phenol – formaldehyde resin (Bakelite).
- operate spectrophotometer and determine the concentration of Ferric Iron in a given solution.

Course Content

Introduction to Chemistry Lab (the teachers are expected to teach fundamentals like Primary, Secondary Standard Solutions, Normality, Molarity, Molality etc and laboratory ware used, error, accuracy, precision, Theory of indicators, use of volumetric titrations).

1. Practice experiment-Determination of the amount of HCl using standard Na_2CO_3 .
2. Determination of alkalinity of a given water sample.
3. Determination of acidity of a given water sample.
4. Determination of total hardness of the water sample by EDTA method.
5. (a) Determination of pH of different water samples by using pH meter.
(b) Determination of conductivity of different water samples by digital conductivity meter.
6. Determination of concentration of the given acid by using standard base conductometrically.
7. Construction of an Electro Chemical Cell.
8. Determination of rate of corrosion of carbon steel metal in acid medium in the absence and presence of Thiourea inhibitor by gravimetric method.
9. Preparation of polyaniline.
10. (a) Preparation of Printed Circuit Board. (b) Preparation of Phenol - Formaldehyde resin.
11. Determination of concentration of Ferric Iron in a given solution spectrophotometrically.

Lab Manual

1. Vogel's Textbook of Quantitative Chemical Analysis, Fifth edition, John Wiley & Sons, Inc., New York
2. Engineering chemistry laboratory manual & record by Srinivasulu .D, Parshva publications.
3. Engineering Chemistry Lab Manual by K.Mukkanti, B.S publications,2009.

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PROBABILITY THEORY AND STOCHASTIC PROCESS

II Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize concepts of probability and random variables.
- To impart the moment generating and characteristic functions.
- To introduce the concepts of correlation functions and power spectral density.

Learning Outcomes

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

- determine and understand probability, statistics of random variables and their functions.
- decide statistics of random vectors and their functions.
- calculate statistics of random sequences, random processes, and their input and output relationships and statistics in linear systems.
- apply the concepts of probability, random variables / processes to analyze statistical problems in Electronics and communication Engineering field.
- apply the concepts of filtering and prediction of a random process

Course Content

UNIT - I: Review Of Probability

Sets and set operations and events, probability space, axiomatic definition of probability, joint, conditional, total probabilities and Bayes theorem.

UNIT - II: Random Variables

Random variables, probability distribution of a random variable, discrete and continuous random variables, and functions of a random variable, moments of a distribution function, generating functions and characteristic function.

UNIT - III: Multiple Random Variables

Multiple random variables, independent random variables, functions of random variables, covariance, correlation, moments, central limit theorem.

UNIT - IV: Random Process (Temporal Characteristics)

Discrete and continuous time processes with examples, mean, autocorrelation and auto covariance functions, Stationary: strict-sense stationary (SSS) and wide-

sense stationary (WSS) processes, autocorrelation function of a real WSS process and its properties, cross-correlation function, ergodicity and its importance.

UNIT - V: Random Process (Spectral Characteristics)

Power spectral density, properties of power spectral density, cross-power spectral density and properties, auto-correlation function and power spectral density of a WSS random sequence, relationship between power spectral density and auto correlation functions.

UNIT - VI: Linear Systems With Random Inputs

Linear time-invariant system with a WSS process as an input: stationary of the output, auto-correlation and power-spectral density of the output, examples with white-noise as input.

Text Books

1. P. Peebles Jr. "Probability, Random Variables, and Random Signal Principles", 4th Edition, McGraw-Hill.
2. Henry Stark and John W. Woods, "Probability, Statistics, and Random Processes for Engineers", Prentice Hall, 4th Edition.

Reference Books

1. A.Papoulis and S.Unnikrishana Pillai, "Probability, Random Variables and Stochastic Processes", 2nd Edition, McGraw Hill.
2. B.P.Lathi, "Modern Analog and Digital Communications", Oxford University Press.

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ELECTRONIC DEVICES

II Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the operation and characteristics of electronic devices.
- To learn about the use of diodes for various applications.
- To know about the biasing of MOSFETs and BJTs, their small-signal operation.

Learning Outcomes

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

- analyze the carrier transport in junctions.
- analyze the behaviour of electronic devices.
- study the models for diodes and use them for various applications.
- design power supply using junction diode and Zener voltage regulator.
- characterize the current flow in BJTs and MOSFETs.
- bias the BJTs and MOSFETs for amplifier applications.
- analyze the behaviour of BJTs and MOSFETs under small-signal conditions.

Course Content

UNIT - I: Junctions

Diffusion and recombination, the continuity equation, equilibrium conditions, forward and reverse-biased junctions, reverse-bias breakdown, the ideal diode, terminal characteristics of junction diodes, metal-semiconductor junctions, ideal MOS capacitor, MOS capacitance-voltage analysis, special diodes.

UNIT - II: Diode Models and Applications

Modelling the diode forward characteristic, Zener diode model, use of the Zener as a shunt regulator, temperature effects, design of Zener voltage regulator, the spice models for junction and Zener diodes, diode logic gates, diode as a rectifier, design of power supply using bridge rectifier; limiting and clamping circuits.

UNIT - III: MOS Field-Effect Transistors (MOSFETS)

Device structure and physical operation, current-voltage characteristics, MOSFET operation as a switch and as a linear amplifier, the depletion type MOSFET.

UNIT - IV: Bipolar Junction Transistors (BJTS)

Device structure and physical operation, current-voltage characteristics, BJT operation as a switch and as an amplifier.

UNIT - V: Biasing Of MOSFET and BJT

Biasing of BJTs, bias stabilization, design of voltage-divider bias circuit from bias stability considerations, biasing of MOSFETs, design of voltage-divider bias circuit.

UNIT - VI: Small - Signal Models of MOSFET and BJT

MOSFET small-signal models, SPICE MOSFET models, BJT small-signal models, SPICE Ebers-Moll model and Gummel-Poon model.

Text Books

1. Ben G. Streetman and Sanjay Kumar Banerjee, "Solid State Electronic Devices", PHI Learning Private Limited, Sixth Edition, 2009 (Unit- I).
2. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", Oxford University Press Inc., Fifth Edition, 2004 (Units- I, II, III, IV & VI).
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education Inc., Eleventh Edition, 2013 (Unit-V).

Reference Books

1. J. Millman and A. Grabel, "Microelectronics", McGraw Hill International, 1987.
2. D. A. Neamen, "Semiconductor Physics and Devices" (IRWIN), Times Mirror High Education Group, Chicago, 1997.
3. R.T. Howe and C.G. Sodini, "Microelectronics: An Integrated Approach", Prentice Hall International, 1997.
4. K. Radha Krishna Rao, "Electronics for Analog Signal Processing - I", NPTEL Video Course.
5. S. Karmalkar, "Solid State Devices", NPTEL Video Course.

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SIGNALS AND SYSTEMS

II Year – I Semester

Lecture : 3	Tutorial : 1	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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ENGINEERING ECONOMICS AND PROJECT MANAGEMENT

II Year – I Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To illustrate the importance of Managerial Economics and know its significant role in achieving business objectives.
- To understand and articulate the importance of Project Management in any business project

Learning Outcomes

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

- Apply economic concepts in business decision making.
- Identify the influencing factors of Demand for a given product.
- Establish the suitable business organization with available resources.
- Analyze BEP for a project and adopt appropriate pricing strategies.
- Understand the importance of project management.
- Apply network concepts in business decision making.

Course Content

UNIT - I: Introduction to Engineering Economics

Definition, nature and scope of managerial economics – relation of managerial economics with other disciplines, concept of engineering economics.

Demand Analysis: Demand determinants, law of demand and its exceptions, significance & types of elasticity of demand. factors governing demand forecasting- 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. production function, laws of returns, internal and external economies of scale.

Cost Analysis: Cost concepts & BEP Analysis, break-even point (simple problems)

UNIT - III: Introduction to Markets & Pricing strategies

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition and oligopoly.

Pricing strategies: Methods of pricing: cost based pricing, demand based pricing, competition based pricing and strategy based pricing.

UNIT - IV: Introduction to Business Organizations

Characteristic features of business, features and evaluation of sole proprietorship, partnership, joint stock company.

UNIT - V: Project Management Concepts

Concept and characteristics of a project, importance of project management. project planning: project evaluation, financial sources, feasibility studies.

UNIT - VI: PERT and CPM

Introduction, development of project network, time estimation, determination of the critical path, PERT model, measures of variability, CPM model, network cost system (simple problems)

Text Books

1. Aryasri, "Managerial Economics and Financial Analysis", TMH, 2/e 2005.
2. K.Nagarajan, "Project Management", New Age International, New Delhi, 2010

Reference Books

1. Ambrish Gupta, "Financial Accounting for Management", Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, "Managerial Economics", PHI, 4th Ed.
3. Suma Damodaran, "Managerial Economics", Oxford University Press.
4. Clifford F Gray, Erik W Larson, "Project Management-The Managerial Process", Tata Mcgraw-Hill Publishing Co Ltd
5. John M Nicholas, "Project Management For Business And Technology" Prentice Hall of India Pvt Ltd

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ELECTROMAGNETIC FIELD THEORY

II Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of Electrostatics and Magneto statics.
- To familiarize with the concepts of Electromagnetic Waves and their Propagation.

Learning Outcomes

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

- apply the concepts of electric fields and magnetic fields in different applications.
- analyze the electric and magnetic fields for different charge distributions.
- derive the wave equations in perfect dielectric and conducting media.
- calculate the energy stored in electric and magnetic fields.
- understand reflection and refraction of electromagnetic waves in different media.
- determine the power flow in electromagnetic waves.

Course Content

UNIT - I: Electrostatics-I

Coulomb's Law, charge distributions, electric field intensity, electric fields due to point charge, line charge, surface charge, volume charge, electric flux density, Gauss's law, applications of Gauss law: point charge, infinite line charge.

UNIT - II: Electrostatics-II

Energy expended in moving a point charge in an electric field, electric potential difference and potential, potential due to different charge configurations, potential gradient, electric dipole and energy density in electrostatic field, conduction and convection current, current density.

UNIT - III: Electrostatics-III

Continuity equation for current and relaxation time, conductor properties, boundary conditions for dielectric–dielectric and conductor-dielectric interfaces, capacitance-parallel plate, coaxial capacitors, Poisson's and Laplace's equations.

UNIT - IV: Magnetostatics-I

Current distributions, Biot-Savart's law, Ampere's circuital law-applications of Ampere's circuital law ; infinite line current, infinite sheet of current, magnetic

flux and magnetic flux density, magnetic scalar and vector potentials, force on a moving charge- Lorentz Force equation, force on a current element.

UNIT - V: Magnetostatics-II

Magnetic dipole and dipole moment, magnetic boundary conditions, magnetic energy.

Time Varying Fields And Maxwell's Equations: Faraday's law, transformer EMF and motional EMF, inconsistency of Ampere's law, displacement current, Maxwell's equations, time harmonic fields, Maxwell's equations using phasor notation.

Electromagnetic Waves-I: Wave equations for perfect dielectrics and conducting medium, uniform plane wave propagation, relation between E and H in a uniform plane wave.

UNIT - VI: Electromagnetic waves-II

Wave propagation in lossless medium and conducting medium, conductors and dielectrics-characterization, polarization, skin depth, Poynting's theorem and Poynting's Vector. reflection and refraction of plane waves – normal and oblique incidences for perfect conductor and perfect dielectrics- horizontal and vertical polarization, total internal reflection and Brewster angle.

Text Books

1. Mathew NO Sadiku "Elements of Electromagnetics", Oxford University Press, 2015.
2. EC Jordan and KG Balmain "Electromagnetic Waves and Radiating Systems", PHI 2003.

Reference Books

1. W H Hayt and J A Buck "Engineering Electromagnetics", 7th Edition TMH, 2011.
2. Joseph A Edminister "Theory and Problems of Electromagnetics", Schaum's Outline Series, McGraw Hill International.
3. Nathan Ida "Engineering Electromagnetics", Springer (India) Pvt. Ltd., New Delhi, 2nd Edition.

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ELEMENTS OF ELECTRICAL ENGINEERING

II Year – I Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To familiarize with the constructional details, working principle and characteristics of DC, AC machines and electrical Instruments.
- To impart knowledge on performance of AC and DC machines.

Learning Outcomes

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

- describe the performance of DC, three phase, single-phase AC machines and measuring instruments.
- determine the emf equation of DC and AC machines
- realize magnetization and load characteristics of DC machines.
- determine the characteristics of three phase and single phase induction motor.
- find the losses and efficiency of AC and DC machines.

Course Content

UNIT - I: D.C. Machines

Principle of operation of DC machines- EMF equation – types of generators

DC Motors – types of DC motors – characteristics of DC motors – 3-point starters for DC shunt motor – losses and efficiency – speed control of DC shunt motor – flux and armature voltage control methods.

UNIT - II: Transformers

Principle of operation of single phase transformer – types – constructional features – EMF equation, equivalent circuit-losses and efficiency of transformer and regulation - simple problems.

UNIT - III: Three Phase Induction Motor

Principle of operation of three-phase induction motors – slip ring and squirrel cage motors – slip-torque characteristics – efficiency calculation.

UNIT - IV: Alternators

Alternators – constructional features – principle of operation – types - EMF equation – distribution and coil span factors - regulation using synchronous impedance method.

UNIT - V: Single Phase Induction Motors

Principle of operation -shaded pole motors – capacitor motors, AC servomotor, stepper motors – characteristics.

UNIT - VI: Electrical Instruments

Basic principles of indicating instruments – moving coil and moving iron Instruments (Ammeters and Voltmeters)

Text Books

1. P.S.Bimbra, “Electrical Machines”, Khanna Publications.
2. J.B.Gupta, “Electrical machines”, S.K.Kataria & sons.

Reference Books

1. D P.Kothari, I.J.Nagarth, “Electrical machines”, Mc GrawHill Publications, 4th Edition.
2. M.S.Naidu and S.Kamaksiah, “Basic electrical engineering”, TMH Publications.

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ELECTRONIC DEVICES LAB

II Year – I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

To make the students familiarize with

- various electronic components and basic electronic lab instruments.
- conduct of experiments to obtain the characteristics of diodes, MOSFETs, and BJTs.
- the use of diodes for various applications and biasing of MOSFETs and BJTs.

Learning Outcomes

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

- identify various electronic components and basic electronic measuring instruments and other lab equipment.
- perform experiment, take observations, present the results in proper form, analyze and interpret results, draw conclusions by correlating with theory.
- use modern tools for simulation.
- verify the I-V characteristics of junction diode, Zener diode, LED, photodiode, MOSFET, BJT, and obtain their parameters.
- design, simulate, hardware implement, and test - DC power supply, Zener voltage regulator, diode clipper, clamper, and BJT and MOSFET voltage-divider bias circuits.
- verify the switching action of transistor.
- make oral presentations and prepare written reports.

List of Experiments

PART-A: Orientation of electronic components and basic electronic lab instruments.

PART-B:

1. I-V characteristics of Junction diode and breakdown characteristics of Zener diode.
2. LED and photodiode I-V characteristics.
3. DC power supply (design, simulation, hardware implementation and testing).

4. Zener voltage regulator (design, simulation, hardware implementation and testing).
5. Diode clipper – transfer characteristics / waveform generation (design, simulation, hardware implementation and testing).
6. Diode clamper (design, simulation, hardware implementation and testing).
7. MOSFET characteristics (drain, transfer characteristics and measurement of device parameters).
8. BJT characteristics (input, output characteristics and measurement of device parameters).
9. Transistor switch.
10. BJT voltage-divider bias circuit with stabilization (design, simulation, hardware implementation and testing).
11. MOSFET voltage-divider bias circuit (design, simulation, hardware implementation and testing).
12. Open-ended experiment.

Reference Books

1. Adel S. Sedra and Kenneth C. Smith, “Microelectronic Circuits”, Oxford University Press Inc., 2004.
2. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education Inc., 11th Edition, 2013.
3. K. Radha Krishna Rao, “Electronics for Analog Signal Processing - I”, NPTEL Video Course.
4. User manuals for basic electronic lab equipment.
5. Data sheets for electronic components.

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NETWORKS AND ELECTRICAL TECHNOLOGY LAB

II Year – I Semester

Practical : 2
Credits : 1

Internal Marks : 40
External Marks : 60

Course Objectives

- The ability to conduct testing and experimental procedures on Circuits.
- The capability to analyze the behavior of circuits
- The ability to conduct testing and experimental procedures on Machine.

Course Outcomes

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

- verify the applicability of network theorems to practical electrical circuits.
- specify and test RLC series and parallel resonant circuits.
- interpret /correlate physical observations and measurements involving electrical circuits to theoretical principles
- predict the efficiency of DC Shunt motor by conducting No-Load Test and able to draw performance curves by conducting brake test.

List of the Experiments

Any 10 of the following experiments are to be conducted:

1. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
2. Two port network parameters – Transmission ,Hybrid Parameters.
3. Two port network parameters – Z, Y Parameters.
4. Verification of Superposition and Reciprocity theorems.
5. Verification of maximum power transfer theorem
6. Verification of Thevenin's Theorem.
7. Verification of Norton's Theorem
8. Magnetization characteristics of DC Shunt generator. Determination of critical field resistance.
9. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator).
10. Brake test on DC shunt motor. Determination of performance characteristics.
11. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
12. Speed control of DC Shunt Motor.

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TRANSMISSION LINES AND WAVEGUIDES

II Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the transmission line concepts.
- To introduce the concepts of various wave guides for practical applications.

Learning Outcomes

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

- apply the knowledge of network theory in analyzing the concepts of transmissions lines.
- analyze the transmission lines at different frequencies.
- measure the transmission line parameters using smith chart.
- demonstrate the knowledge of wave guides and fundamental principles.
- understand different modes of propagation in wave guides.
- select an appropriate wave guide to meet specified requirements.

Course Content

UNIT - I: Transmission Lines I

Types, primary constants of transmission line, equivalent circuit of transmission line, transmission line equations, infinite length transmission line, secondary constants- characteristic impedance, propagation constant, phase and group velocities, wave length, line with any termination, input impedance, line impedance, lossless line concepts.

UNIT - II: Transmission Lines II

Distortion in transmission lines, distortion less line, telephone cable, inductance loading of telephone cables-loading types, short circuit and open circuit lines, voltage and current variations, reflection coefficient, $\lambda/4$, $\lambda/2$, $\lambda/8$ transmission lines, T and π equivalent sections of lines.

UNIT - III: Transmission Line at Higher Frequencies

Open wire line at higher frequencies- secondary constants at higher frequencies, Voltage Standing Wave Ratio, location of voltage maxima and minima. Smith chart – configuration. calculation of reflection coefficient, VSWR, input impedance

using Smith chart, impedance matching- quarter wave transform technique, single stub matching design and double stub matching (designing not required).

UNIT - IV: Guided Waves

Waves between parallel planes, transverse electric waves, transverse magnetic waves. characteristics of TE, TM, TEM waves- modes, cut-off frequencies, phase, group velocities, free space, cutoff, guided wavelengths, wave impedances.

UNIT - V: Rectangular Wave Guides

Rectangular waveguide-, transverse electric waves (TE), transverse magnetic (TM) waves. characteristics of TE, TM waves- modes, cut-off frequencies, phase, group velocities, free space, cutoff, guided wavelengths, wave impedances.

UNIT - VI: Circular Wave Guides

Solution of the field equations in cylindrical co-ordinates, transverse electric waves (TE), transverse magnetic (TM) waves. characteristics of TE, TM waves- modes, velocities, wavelengths, wave Impedance.

Text Books

1. Nathan Ida “Engineering Electromagnetics”, Springer (India) Pvt. Ltd., New Delhi, 2nd Edition.
2. C Jordan and K.G Balmain, “Electromagnetic Waves and Radiating Systems”, PHI 2nd Edition.

Reference Books

1. Samuel Y.Liao, “Microwave Devices and Circuits” 3rd Edition, Pearson publications.
2. M. N. O. Sadiku, “Elements of Electromagnetics”, 6th Edition, Oxford University Press, 2011
3. Joseph Edminister, “Electromagnetics”, Schaum’s Series TMH,
4. John D Ryder, “Networks Lines and Fields”, PHI, 2003.

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ANALOG CIRCUITS

II Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with circuit configuration and analysis of single-stage amplifiers, differential amplifiers, tuned amplifiers, feedback amplifiers, oscillators, and power amplifiers.
- To introduce inverting and non-inverting operation of op amps.
- To design op amp RC oscillators and class-B output stage.

Learning Outcomes

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

- draw, analyse, and characterize the MOS and BJT single-stage amplifiers at low and high frequencies.
- design CS and CE amplifiers at low frequencies.
- draw, analyze, and characterize - cascode, darlington, differential, feedback, power amplifiers and oscillators.
- draw and analyze the behaviour of tuned amplifiers and op amp under inverting and non-inverting configurations.

Course Content

UNIT - I: Low-Frequency Single-Stage Amplifiers

MOS amplifiers, low-frequency response of the common-source (CS) amplifier, design of CS amplifier, BJT amplifiers, low-frequency response of the common-emitter (CE) amplifier, design of CE amplifier.

UNIT - II: High-Frequency Single-Stage Amplifiers

General considerations, high-frequency response of CS and CE amplifiers, cascode amplifier, Darlington configuration.

UNIT - III: Differential Amplifiers

MOS differential pair, small-signal operation of the MOS differential pair, frequency response of resistively loaded MOS differential amplifier, BJT differential pair.

UNIT - IV: Introduction to OP-AMPS and Tuned Amplifiers

Ideal op amp, inverting and non-inverting configurations, Tuned amplifiers.

UNIT - V: Feedback Amplifiers and Oscillators

General feedback structure, some properties of negative feedback, four basic feedback topologies, series-shunt feedback amplifier, series-series feedback amplifier, shunt-shunt and shunt-series feedback amplifiers, determining the loop gain, stability problem, Basic principles of sinusoidal oscillators, op amp - RC oscillator circuits, design of op-amp RC oscillators, LC and crystal oscillators.

UNIT - VI: Output Stages and Power Amplifiers

Classification of output stages, class A output stage, class B output stage, design of class B output stage, class AB output stage, biasing the class AB circuit, power BJTs.

Text Book

1. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", Oxford University Press Inc., Fifth Edition, 2004.

Reference Books

1. R.T. Howe and C.G. Sodini, "Microelectronics: An integrated Approach", Prentice Hall International, 1997.
2. J. Millman and A. Grabel, "Microelectronics", McGraw Hill International, 1987.
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education Inc., Eleventh Edition, 2013.
4. K. Radha Krishna Rao, "Electronics for Analog Signal Processing - I", NPTEL Video Course.
5. K. Radha Krishna Rao, "Electronics for Analog Signal Processing - II", NPTEL Video Course.

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ANALOG COMMUNICATIONS

II Year – II Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To familiarize students with fundamentals of analog communication systems and various techniques for analog modulation and demodulation schemes.
- To describe the impact of noise on analog modulation schemes.

Learning Outcomes

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

- disseminate the fundamentals of analog modulation schemes.
- differentiate DSB-SC and SSB modulation schemes.
- understand the functioning of AM and FM transmitters and receivers.
- determine power relations for various modulation schemes and evaluate the impact of noise in AM and FM modulation schemes.
- compare and contrast TDM and FDM techniques.

Course Content

UNIT - I: Continuous Wave Modulation-I

Introduction, need for modulation, amplitude modulation-definition, description in time and frequency domains, power relations, generation and detection.

UNIT - II: Continuous Wave Modulation-II

DSB-SC- time-domain and frequency-domain description, generation and coherent detection, costas loop; AM SSB modulated waves- time-domain and frequency-domain descriptions, generation and demodulation; noise in AM systems; comparison of various AM techniques.

UNIT - III: AM Transmitters

Classification of transmitters, AM transmitters: high level and low level AM transmitters. FDM.

UNIT - IV: AM Receivers

Receiver types- tuned radio frequency receiver, super heterodyne receiver; image frequency and rejection ratio, RF section and receiver characteristics, AGC.

UNIT - V: FM Generation

Introduction to angle modulation, relation between frequency and phase modulations, Single tone frequency modulation, narrow band FM, wide band FM, constant average power, transmission bandwidth of FM wave, generation of FM waves: direct FM and Armstrong method.

UNIT - VI: FM Detection

Detection of FM waves: balanced frequency discriminator, FM transmitters, FM receivers, noise in FM system, pre-emphasis and de-emphasis in FM. TDM.

Text Books

1. Simon Haykin, John Wiley, "Principles of Communication Systems", 2nd Edition.
2. George Kennedy and Bernard Davis, "Electronics & Communication Systems", TMH 2004.

Reference Books

1. H Taub & D. Schilling, Gautam Sahe, "Principles of Communication Systems", TMH, 2007 3rd Edition.
2. B.P. Lathi, "Communication Systems", BS Publication, 2006
3. John G. Proakis, Masond, Salehi, "Fundamentals of Communication Systems", PEA, 2006.

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DIGITAL CIRCUIT DESIGN

II Year – II Semester

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

Course Objectives

- To familiarize with the concepts of different number systems and Boolean algebra.
- To introduce the design techniques of combinational, sequential logic circuits.
- To give a model of combinational and sequential circuits using HDLs.

Course Outcomes

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

- design various logic circuits using Boolean laws.
- design combinational and sequential logic circuits.
- gain the knowledge of PLDs.
- develop digital circuits using HDL

Course Content

UNIT - I: Boolean Algebra and Logic Gates

Number systems - binary numbers, octal, hexadecimal, other binary codes; complements, signed binary numbers, digital logic operations and gates, basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, complements of Boolean functions, two-level NAND and NOR Implementation of Boolean functions.

UNIT - II: Combinational Logic Circuits

The map method (upto four variables), don't care conditions, design procedure, adders, subtractors, 4-bit binary adder/ subtractor circuit, BCD adder, carry look-ahead adder, decoders and encoders, multiplexers, demultiplexers.

UNIT - III: Sequential Logic Circuits

Design procedure, flip-flops, truth tables and excitation tables, conversion of flip-flops, design of counters, ripple counters, synchronous counters, ring counter, Johnson counter, registers, shift registers, universal shift register.

UNIT - IV: Finite State Machines

Types of FSM, capabilities and limitations of FSM, state assignment, realization of FSM using flip-flops, Mealy to Moore conversion and vice-versa, reduction of state tables using partition technique.

UNIT - V: Programmable Logic Devices & HDL

Types of PLD's: PROM, PAL, PLA, basic structure of CPLD and FPGA, advantages of FPGA's. Introduction to Verilog - structural Specification of logic circuits, behavioral specification of logic circuits, hierarchical Verilog Code.

UNIT - VI: Digital Design Using HDLs

Verilog for combinational circuits - conditional operator, if-else statement, case statement, for loop; using storage elements with cad tools-using Verilog constructs for storage elements, blocking and non-blocking assignments, non-blocking assignments for combinational circuits, flip-flop with clear capability, using Verilog constructs for registers and counters.

Text Books

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI. (Unit I to IV)
2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGrawHill (Unit V, VI)

Reference Books

1. Charles H. Roth, Jr, "Fundamentals of Logic Design", 4th Edition, Jaico Publishers.
2. Zvi Kohavi and Niraj K.Jha, "Switching and Finite Automata Theory, 3rd Edition, Cambridge University Press, 2010.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall PTR.
4. D.P.Leach, A.P.Malvino, "Digital Principles and Applications", TMH, 7th Edition.

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FUNDAMENTALS OF DATA STRUCTURES

II Year – II Semester

Lecture : 3

Internal Marks : 40

Credits : 2

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.
- compare array and linked list representation of data structures.

Course Content

UNIT - I: Linked lists

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

Linked Lists- Single linked list, Circular linked list, Double linked list, Circular double linked list.

UNIT - II: Stacks

Representation using arrays and linked list, operations on stack, factorial calculation, evaluation of arithmetic expression.

UNIT – III: Queues

Representation using arrays and linked list, operations on queue, circular queue, queue using stack.

UNIT - IV: Trees

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

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: Sorting and Searching

Searching: Linear search, Binary search, Fibonacci search.

Sorting (Internal): Basic concepts, sorting by: insertion (Insertion sort), selection (selection sort), exchange (Bubble sort, quick sort), distribution (radix sort) and merging (merge sort).

UNIT - VI: Graphs

Basic concepts, representations of graphs, operations on graphs- vertex insertion, vertex deletion, find vertex, edge addition, edge deletion, graph traversals (BFS & DFS).

Text Books

1. Debasis samanta, Classic Data Structures, PHI, 2nd edition, 2011.
2. Richard F, Gilberg , Forouzan, Data Structures, 2nd edition, , Cengage.

Reference Books

1. Seymour Lipschutz, Data Structure with C, TMH.
2. G. A. V. Pai, Data Structures and Algorithms, TMH, 2008.
3. Horowitz, Sahni, Anderson Freed, Fundamentals of Data Structure in C, University Press, 2nd 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

- familiarize with 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 Das and 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, Arunkumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books

1. Surveying Theory and Practice, James M Anderson and Edward, 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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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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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: Dielectric 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, bimetallic 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 Materials, Radioactive Materials, Galvanization 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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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, Wiley 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, battery ignition system - components, Magneto ignition system, Electronic ignition system.

Electrical System: charging circuit- generator, current-voltage regulator, starting 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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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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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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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.

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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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

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 XMLAJAX.

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

$\phi(x)$, $d(x)$, $\mu(x)$, $\sigma(x)$, Mobius inversion formula, Linear Diophantine 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 Montgomery 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-concentration and 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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ANALOG CIRCUITS LAB

II Year – II Semester

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

Course Objectives

To make the students familiarize with the

- design, simulation, and conduct of experiments to obtain the frequency response/ performance characteristics of single-stage, cascode, differential, tuned, feedback, and power amplifiers, RC and LC oscillators,.
- testing of op-amp in inverting and non-inverting configurations.

Learning Outcomes

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

- perform experiment, take observations, present the results in proper form, analyze and interpret results, draw conclusions by correlating with theory.
- use modern tools for simulation.
- design, simulate, hardware implement, test, and obtain performance characteristics of - CS, CE, BJT cascode, BJT differential, single-tuned, series-series feedback, shunt-shunt feedback, and class B complementary symmetry power amplifiers.
- verify the operation of op amp in inverting and non-inverting configurations.
- design, simulate, hardware implement, and test Wien-bridge and Colpitts oscillators.
- make oral presentations and prepare written reports.

List of Experiments

1. Common-source amplifier (design, simulation, hardware implementation and testing)
2. Common-emitter amplifier (design, simulation, hardware implementation and testing)
3. Cascode amplifier using BJTs
4. BJT differential amplifier
5. Op-amp operation in inverting and non-inverting configurations
6. Single-tuned amplifier (design, simulation, hardware implementation and testing)

7. Series-series feedback amplifier
8. Shunt-shunt feedback amplifier
9. Wien-bridge oscillator using op-amp (design, simulation, hardware implementation and testing)
10. Colpitts oscillator
11. Class -B complementary symmetry power amplifier (design, simulation, hardware implementation and testing)
12. Open-ended experiment

Reference Books

1. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", Oxford University Press Inc., 2004.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education Inc., 11th Edition, 2013.
3. K. Radha Krishna Rao, "Electronics for Analog Signal Processing - I", NPTEL Video Course.
4. K. Radha Krishna Rao, "Electronics for Analog Signal Processing - II", NPTEL Video Course.
5. User manuals for basic electronic lab equipment.
6. Data sheets for electronic components.

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DIGITAL CIRCUIT DESIGN LAB

II Year – II Semester

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

Course Objectives

- To get acquainted with the concepts of various Digital Circuits
- To familiarize with the CAD Tools.

Learning Outcomes

After the completion of course, students will be able to

- learn the digital circuit concepts.
- design the digital circuits.
- develop digital circuits using CAD tools.

List of Experiments

Part-A: To design and simulate using Electronic Workbench

1. Full adder.
2. 8:1 multiplexer.
3. SR and D flip-flop.
4. Shift register
5. Asynchronous counter.
6. Open Ended Experiment

Part B: To design and simulate using CAD tools

1. 8:3 priority encoder.
2. Ring counter.
3. Asynchronous counter.
4. Simple Datapath
5. ALU Design
6. Open Ended Experiment

Reference Books

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI.
2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGrawHill.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall PTR.

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Optional Elective - I

INTRODUCTION TO PYTHON PROGRAMMING

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with Python Programming .

Learning Outcomes

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

- outline features, history of Python programming language.
- classify literal constants, data Types and operators in python.
- demonstrate the use of data structures like lists, tuples and dictionaries in python.
- use classes, objects, methods, and inheritance to write object oriented programs.
- differentiate mutable and immutable data types.
- analyze different ways of building logic for executing programs using decision control, iterative statements.
- develop applications/programs using standard data types in Python.

Course Content

UNIT - I: Basics of Python Programming

Features and history of Python, literal constants, data types, variables, operators, input operation.

UNIT - II: Decision Control and Looping Statements

Conditional and un-conditional branching, iterative statements, nesting of decision control statements and loops.

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.

UNIT - IV: Tuples and 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.

UNIT - V: Dictionaries

Dictionaries: Creating a dictionary, adding an item, deleting items, sorting items, looping over a dictionary, basic dictionary operations, built-in functions.

UNIT - VI: OOP in Python

Classes and objects, class method and self argument, `__init__()` method, calling a class method from another class method, inheriting classes in Python.

Text Books

1. Reema Thareja, “Python Programming – Using Problem Solving Approach“, Oxford University Press, 2014 Edition.
2. Dr. R. Nageswara Rao, “Core Python Programming”, 2017 Edition.

Reference Books

1. Martin C. Brown, “Python: The Complete Reference”, 2001 Edition, Tata McGraw Hill Publishing Company Limited.
2. Kenneth A. Lambert, ‘Fundamentals of Python – first programs’, 2012 Edition, Cengage.

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Optional Elective - I

DATABASE MANAGEMENT SYSTEMS

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

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

Course Outcomes

Upon successful completion of the course, 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 concept, TMH, 3rd edition.
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rd edition, TMH.

Reference Books

1. Elmasri Navrate, 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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Optional Elective - I

ELECTRONIC SWITCHING SYSTEMS

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the operational characteristics of switching techniques.
- To introduce the concepts of working of different Switching types and networks, Digital Subscriber Access.
- To familiarize with the digital transmission systems.

Learning Outcomes

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

- distinguish different switching systems
- differentiate transmission and multiplexing systems
- understand the concepts of digital switching systems
- decimate the knowledge of fiber optic transmission systems.
- compare different interfaces of ISDN
- analyze the traffic characterization in different networks.

Course Content

UNIT - I: Introduction to Switching and Transmission Systems

Analog network hierarchy, switching systems, transmission systems, signaling, analog interfaces, digital network evolution, advantages and disadvantages of digital voice networks.

UNIT - II: Digital Transmission and Multiplexing

Pulse transmission, asynchronous versus synchronous transmission, time division multiplexing, time division multiplex loops and rings.

UNIT - III: Digital Switching

Switching functions, space division switching, time division switching, 2-d switching, digital switching in an analog environment.

UNIT - IV: Fiber Optic Transmission Systems

Fibre optic transmission system elements, wavelength division multiplexing, SONET/SDH multiplexing, SONET frame format, payload framing, virtual tributaries, SONET optical standards, SONET networks, SONET rings.

UNIT - V: Digital Subscriber Access

ISDN basic rate access architecture, S/T interface, ISDN U interface, ISDN interface, digital subscriber loops, digital loop carrier systems, hybrid fiber coax systems, voice band modems.

UNIT - VI: Digital Mobile Telephony and Traffic Analysis

Digital cellular, global system for mobile communications, CDMA cellular, traffic characterization, network blocking probabilities.

Text Books

1. John C Bellamy, "Digital telephony", 3rd Edition, Wiley 2009.
2. Marion cole, "Introduction to Telecommunications Voice, Data and the Internet", 2nd Edition.

Reference Books

1. Wayne Tomasi, "Advanced electronic communication systems", PHI, 2004.
2. Tarmo Anttalainen, "Introduction to Telecommunications Network Engineering", 2nd Edition, Artech house, INC. 2003.

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LINEAR INTEGRATED CIRCUITS APPLICATIONS

III Year – I Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the functioning of various linear ICs such as op-amp, timer, voltage regulator, voltage controlled oscillator and phase locked loop.
- To introduce the concepts of active filters, D/A and A/D convertors.

Learning Outcomes

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

- infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques.
- elucidate and design linear and non-linear applications using op-amps.
- design and analyze comparators, waveform generators and multivibrators using functional ICs.
- design active filters and regulated power supplies for various applications.
- apply the concepts of VCO and PLL in the design of demodulator circuits.
- choose appropriate A/D and D/A converters for signal processing applications.

Course Content

UNIT - I: Introduction to Operational Amplifier

The operational amplifier-circuit symbol, terminals; ideal and practical op-amp specifications, block schematic, IC 741 pin configuration and internal circuit, DC and AC characteristics of op-amp.

UNIT - II: Applications of Op-amp

Review of inverting and non-inverting configurations; summing amplifier, difference amplifier, integrator and its design, differentiator, instrumentation amplifier and precision rectifiers.

UNIT - III: Comparators and Waveform Generators

Comparator, schmitt trigger and its design, square wave generator, triangular wave generator, IC 555 Timer-pin diagram, functional description, monostable multivibrator, astable multivibrator and its design.

UNIT - IV: Active Filters

RC active filters, transformation, design of first and second order low-pass and high-pass butterworth filters, design of band-pass filters.

UNIT - V: Voltage Regulators and Phase-Locked Loops

Series op-amp regulator, IC voltage regulators, 723 general purpose regulator, switching regulator, design of regulated power supply using 3-terminal and 723 ICs, Phase-Locked Loops (PLLs) – basic principles, phase detector/comparator, Voltage Controlled Oscillator (VCO), low-pass filter.

UNIT - VI: D/A & A/D Converters

Basic DAC techniques, A-D converters, direct type ADCs, specifications of ADC/DAC.

Text Book

1. D. Roy Choudhury and Shail B.Jain, “Linear Integrated Circuits”, New Age International (p) Ltd, Second Edition, 2003.

Reference Books

1. Sergio Franco, “Design with Operational Amplifier and Analog Integrated Circuits”, TMH, Fourth Edition, 2011.
2. G.B.Clayton, “Operational Amplifiers”, Elsevier Science, Fifth Edition, 2003.
3. K.Radha Krishna Rao, “Analog ICs”, NPTEL Video Course.
4. Paul R.Gray, Paul J.Hurst, Stephen H.Lewis, and Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”, John Wiley & Sons, Inc., Fourth Edition, 2001.
5. Ramakanth A. Gayakwad, “OP-amps and Linear Integrated Circuits”, PHI, Fourth Edition, 2010.

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DIGITAL COMMUNICATIONS

III Year – I Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To introduce pulse modulation techniques.
- To acquaint with different pulse digital modulation techniques.

Learning Outcomes

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

- understand basic concepts of digital communication systems.
- distinguish PCM and DM systems.
- elucidate different digital modulation techniques.
- determine the probability error for different digital modulation techniques.
- identify error detection & correction capabilities of linear block codes.

UNIT - I: Pulse Code Modulation

Elements of digital communication systems, elements of PCM- sampling, quantizing, encoding, regeneration, decoding, reconstruction, multiplexing, synchronization, companding in PCM systems, differential PCM systems (DPCM).

Course Content

UNIT - II: Delta Modulation

Delta modulation, noise in PCM & DM systems, comparison of PCM & DM systems.

UNIT - III: PSK

Phase Shift Keying, Differential Phase Shift Keying, Quadrature Phase Shift Keying, M-ary PSK.

UNIT - IV: ASK and FSK

Amplitude shift keying, frequency shift keying, similarity of BFSK and BPSK, M-ary FSK.

UNIT - V: Data Transmission

Pass band transmission model, base band signal receiver, probability of error, the optimum filter, probability of error using matched filter, coherent reception, calculation of error probability of ASK, BPSK, BFSK, QPSK techniques using coherent detection.

UNIT - VI: Information Theory & Coding

Information and its properties, average information, entropy and its properties, Shannon's theorem, Shannon-Fano and Huffman coding, efficiency calculations, matrix description of linear block codes, error detection and error correction capabilities of linear block codes.

Text Books

1. Simon Haykin, "Digital Communications" John Wiley, 2005.
2. H. Taub and D. Schilling, "Principles of Communication Systems", TMH, 2003.

Reference Books

1. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005.
2. John Proakis, "Digital Communications", TMH, 1983.
3. B.P.Lathi, "Modern Analog and Digital Communication", Oxford reprint, 3rd Edition, 2004.

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ANTENNAS AND WAVE PROPAGATION

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with antenna parameters and radiation mechanisms, antenna arrays and its radiation patterns.
- To introduce antennas used at different frequencies UHF, VHF, microwave frequencies.
- To impart the concepts of wave propagations.

Learning Outcomes

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

- understand the fundamental concepts of Antennas.
- differentiate antennas based on their radiation mechanism.
- design basic antenna arrays using multiplication of patterns.
- analyze the performance of non resonant radiators, VHF and UHF antennas.
- compare the performance of several antennas working at high frequencies.
- distinguish wave propagations based on frequency of operation.

Course Content

UNIT - I: Antenna Fundamentals

Basic concepts and antenna parameters – radiation patterns (E & H planes), main lobe and side lobes, beam width, beam area, radiation intensity, beam efficiency, directivity and gain, resolution; aperture concepts and types – aperture area and efficiency, effective height; antenna theorems.

UNIT - II: Radiation Mechanism

Retarded potentials, radiation from small dipole, quarter wave monopole and half wave dipole, current distribution, electric and magnetic field components, radiated power, radiation resistance, directivity and aperture area.

UNIT - III: Antenna Arrays

Two element arrays – different cases; N element linear arrays – broadside and end fire arrays, characteristics and comparison; multiplication of patterns, binomial Arrays.

UNIT - IV: Non-Resonant Radiators

Introduction; travelling wave radiators – basic concepts, V antenna, rhombic antenna, construction details, design considerations.

VHF And UHF Antennas: Arrays with parasitic elements, Folded Dipoles, Yagi Uda antenna, Helical Antenna.

UNIT - V: Microwave Antennas

Plane sheet and corner reflectors; paraboloidal reflectors – characteristics, types of feeds, spill over, aperture blocking, offset feed, cassegrain feeds; horn antennas – types, characteristics, optimum horns; lens antennas – features, dielectric and metal plate lenses, applications.

UNIT - VI: Wave Propagation

Introduction, factors involved in wave propagation; ground wave propagation – characteristics, wave tilt, flat earth considerations; ionosphere – formation of layers and mechanism of propagation, reflection and refraction mechanisms; critical frequency, Maximum Usable Frequency (MUF), optimum frequency, skip distance, virtual height; space wave propagation - m curves and duct propagation, tropospheric scattering.

Text Books

1. John D.Kraus and Ronald J.Marhefka, “Antennas”, TMH, 4th Edition, 2010.
2. E.C. Jordan & K.G. Balman,” Electromagnetic Waves and Radiating Systems”, Prentice Hall of India, 2nd Edition, 2000.

Reference Books

1. Constantine A.Balanis, “Antenna Theory”, John Wiley & Sons, 2nd Edition, 2002.
2. A.R.Harish and M.Sachidananda, “Antennas and wave propagation”, Oxford University Press, 2008.
3. F.E.Terman, “Electronic and Radio Engineering”, McGrawHill, 4th Edition, 1955.

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PRINCIPLES OF VLSI DESIGN

III Year – I Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To familiarize the students with the MOSFET characteristics, CMOS processing, and VLSI circuits characterization, design, and testing.

Learning Outcomes

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

- characterize the MOS devices
- draw layouts
- apply design techniques for VLSI circuits
- apply testing and verification principles for VLSI circuits

Course Content

UNIT - I: MOS Transistor Theory

Brief history, VLSI design flow, ideal I-V characteristics, C-V characteristics, non-ideal I-V effects, DC transfer characteristics, switch-level RC delay models.

UNIT - II: CMOS Processing Technology

CMOS technologies, layout design rules, CMOS process enhancements, technology related CAD issues.

UNIT - III: Circuit Characterization and Performance Estimation

Delay estimation, logical effort and transistor sizing, power dissipation, interconnect, reliability, scaling.

UNIT - IV: Design Methodology

Design methodology, design flows, CMOS physical design styles.

UNIT - V: Special-purpose Subsystems

Packaging, power distribution, I/O, Clock.

UNIT - VI: Testing and Verification

Tests categories, testers, test fixtures, test programs, logic verification principles, silicon debug principles, manufacturing test principles, design for testability, boundary scan.

Text Book

1. Neil H.E.Weste, David Harris, and Ayan Banerjee, "CMOS VLSI Design: A Circuits and Systems Perspective", Pearson Education Inc., Third Edition, 2005 (Indian Reprint 2014).

Reference Books

1. Kamran Eshraghian, Douglas A Pucknell, and Sholeh Eshraghian, "Essentials of VLSI Circuits and Systems", PHI Learning, 2009.
2. Sung-Mo Kang, Yusuf Leblebici "CMOS Digital Integrated Circuits: Analysis and Design", TMH Education, Third Edition, 2003.
3. Carver Mead and Lynn Conway, "Introduction to VLSI Systems", Addison Wesley, First Edition, 1979.
4. Eugene D. Fabricius, "Introduction to VLSI design", McGraw-Hill International Edition, 1990.
5. IIT Bombay, "VLSI Design", NPTEL Web Course.

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CAD FOR VLSI
III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To make the students familiarize with the VLSI design methodologies, optimization of combinational circuits, layout, floorplan, and simulation and synthesis techniques.

Learning Outcomes

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

- understand various methodologies for the design of VLSI systems.
- optimize combinational circuits.
- develop algorithms for the layout optimization.
- size floor plan and solve routing problems.
- analyze different simulation and synthesis techniques.

Course Content

UNIT - I: VLSI Design Methodologies

The VLSI design problem, design domains, actions, methods, and technologies; algorithmic and system design, structural and logic design, transistor-level design, layout design, verification methods, design management tools.

UNIT - II: Combinatorial Optimization

Unit-size placement problem, backtracking and branch-and-bound, dynamic programming, integer linear programming, local search, simulated annealing, tabu search, genetic algorithms.

UNIT - III: Layout Optimization

Design rules, symbolic layout, problem formulation, algorithms for constraint-graph compaction, placement and partitioning-circuit representation, wire length estimation, types of placement problem, placement algorithms, partitioning.

UNIT - IV: Floor planning and Routing

Floor planning-concepts, shape functions and floorplan sizing, routing-types of local routing problems, area routing, channel routing, introduction to global routing, algorithms for global routing.

UNIT - V: Simulation

VLSI simulation, Gate-level modelling and simulation, switch-level modelling and simulation.

UNIT - VI: Logic Synthesis

Introduction to combinational logic synthesis, binary-decision diagrams, two-level logic synthesis, High-level synthesis-hardware models, internal representation of input algorithm, allocation, assignment, and scheduling, scheduling algorithms.

Text Book

1. S.H.Gerez, "Algorithms for VLSI Design Automation", John Wiley & Sons, 2002.

Reference Books

1. N.A. Sherwani, "Algorithms for VLSI Physical Design Automation", Kluwer Academic Publishers, 2002.
2. Sadiq M. Sait, Habib Youssef, "VLSI Physical Design Automation: Theory and Practice", World Scientific 1999.
3. Steven M. Rubin, "Computer Aids for VLSI Design", Addison Wesley Publishing 1987.
4. Prof. V. Kamakoti and Prof. Shankar Balachandran, "CAD for VLSI Design I", NPTEL Web Course, IIT Madras.
5. Prof. V. Kamakoti and Prof. Shankar Balachandran, "CAD for VLSI Design II", NPTEL Web Course, IIT Madras.
6. Coursera, "VLSI CAD Part I : Logic", Online course.
(<https://www.coursera.org/learn/vlsi-cad-logic>)
7. Coursera, "VLSI CAD Part II : Layout", Online course.
(<https://www.coursera.org/learn/vlsi-cad-layout>)

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COMPUTER ORGANIZATION

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarized with the concepts of computer components, instruction set, addressing modes and computer arithmetic.
- To impart the implementation of control unit, memory organization and various I/O data transfer schemes.

Course Outcomes

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

- learn the basic structure and operations performed by the components of a digital computer.
- know the concepts of micro-programming, micro code sequencing and pipelining techniques.
- differentiate the hierarchical memory system including cache, virtual memories and instruction level parallelism.

Course Content

UNIT - I: Computer System

Computer components, computer function, interconnection structures, bus interconnection, integer representation, floating point representation.

UNIT - II: Central Processing Unit

Process Structure and Functions - Processor organization, register organization, instruction cycle, instruction pipelining.

Instruction Sets: Characteristics and Addressing Modes – Machine instruction characteristics, types of operands and operations, addressing, instruction format.

UNIT - III: Control Unit and Micro Programmed Control

Micro-operations, control of the processor, hardwired implementation, micro programmed control – basic concepts, microinstruction sequencing, microinstruction execution.

UNIT - IV: Computer Arithmetic

Addition and subtraction, multiplication algorithms, division algorithms, floating point arithmetic operations.

UNIT - V: Memory Organization

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

UNIT - VI: Input Output Organization & Introduction to ARM

Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access.

Text Books

1. William Stallings, “Computer Organization and Architecture”, Pearson Publications, 8th edition. (Unit I-III & ARM)
2. M. Morris Mano, “Computer System Architecture”, Pearson Publications, 3rd edition. (Unit IV – VI)

Reference Books

1. Hamachar, Vranesic, “Computer Organization”, 5th edition, TMH.
2. V. Rajaraman, T. Radhakrishnan, “Computer Organization and Architecture”, PHI Learning, 2007.
3. P.Pal Chaudhuri, “Computer Organization and Design”, 3rd Edition, PHI Learning.

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COMPUTER AND COMMUNICATION NETWORKS

III Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce principles and functionality of layered network
- To familiarize with the ethical, legal, and social issues related to computer networking.

Learning Outcomes

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

- identify the topology and architecture of a computer network.
- differentiate the OSI and TCP reference models.
- apply protocols to different layers of a network hierarchy.
- understand different datalink protocols.
- identify the routing algorithm for given user application.
- understand the applications of computer networks.

Course Content

UNIT - I: Network Models

LAN, MAN and WAN, network topologies, protocols and standards, The OSI/ISO reference model- layers in the OSI model, TCP/IP protocol suite, addressing. Switching - circuit-switched networks, datagram networks, virtual-circuit networks.

UNIT - II: Data Link Control

Framing, flow and error control, error detection and correction, Stop and wait protocol, Go-back N, selective repeat, HDLC protocols.

UNIT - III: MAC Sub Layer

Random access protocols, IEEE 802.3-MAC sub layer, physical layer. IEEE 802.11 and Bluetooth.

UNIT - IV: Network Routing Algorithms

Routing algorithms- shortest path, flooding, distance vector, link state routing. IPv4 addresses-address space, notation; IPV4, IPV6, transition from IPv4 to IPv6, mapping logical to physical address, mapping physical to logical address.

UNIT - V: Congestion Control and QoS

Congestion control- open loop and closed loop congestion control; Quality of Service, techniques to improve QoS;

Transport Layer- UDP, TCP- services, features, segment, connection management, flow control, error control, and congestion control.

UNIT - VI: Application Layer

Domain name system- domain name space, distribution of name space, DNS in the internet, resolution; Electronic mail- architecture, user agent, message transfer agent, message access agent; WWW and HTTP.

Text Books

1. Behrouz. A. Forouzan, “Data Communication and Networking”, 4th Edition, Tata McGraw-hill, New Delhi, 2006.
2. Andrew .S. Tanenbaum, “Computer Networks”, 4th Edition PHI Learning Private Ltd, New Delhi, 2008.

Reference Books

1. William Stallings, “High Speed Networks and Internets”, 2nd Edition, Pearson Education Asia, New Delhi, 2002.
2. Houston. H. Carr and Charles. A. Snyder, “Data Communications and Network security”, Tata McGraw-hill, New Delhi, 2007
3. Peterson. L and Davie. B, “Computer Networks”, Morgan Kauffmann, 2008.

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BIOMEDICAL ENGINEERING

III Year – I 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 and 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 novel 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 diagnosis 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), evoked 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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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, 4th Edition, B.S.Publications.
2. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman , 7th Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5th 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, Filariasis, 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 assess 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 University, available online, accessed, 7, 2008.
2. David F.Griffiths, October (2012) “An introduction to MATLAB” the University of Dundee, available online, Accessed, 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 overhead 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 gases-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 rods, 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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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, fluorescence 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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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.

Web link

www.statlearning.com

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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”, Wiley Publications, 2003.
2. Steve Suchring, “MySQL Bible”, John Wiley, 2002

Reference Books

1. Rasmus Lerdorf 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. Vikram Vaswani, “MySQL: The Complete Reference”, 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.

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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 No Punishment.

UNIT - II: Cyber Crime and Criminal Justice

Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber fraud and Cyber Cheating, Virus on Internet Deformation, Harassment and E- mail Abuse

UNIT - III: Cyber Criminality Strategies and Trends

Network Service Providers, Jurisdiction and Cyber Crimes, 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 Event of Digital Signature compromise, E - Governance in the India. A Warning to Babudom, Are Cyber Consumers Covered under the Consumer Protection, Goods and Services, Consumer Complaint Defect in Goods and Deficiency in Services Restrictive and Unfair Trade Practices

UNIT - V: Traditional Computer Crime

Early Hacker and Theft of Components Traditional problems, Recognizing and Defining Computer Crime, Phreakers: Yesterday's Hackers, Hacking, Computers as Commodities, Theft of intellectual Property.

UNIT - VI: Web Based Criminal Activity

Interference with Lawful Use of Computers, Malware, DoS (Denial of Service) and DDoS (Distributed Denial of Service) Attacks, Spam, Ransomware and Kidnapping of Information, Theft of Information, Data Manipulation, and Web Encroachment Online Gambling Online Fraud, Securities Fraud and stock Manipulation, Ancillary crimes

Text Books

1. Vivek Sood, "Cyber Law Simplified", 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. Degeneracy in TP and resolving it.

UNIT - VI: Assignment and Sequencing Problems

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 and 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: Reliability and Life Testing
3. S. M. Ross: Probability Models, Harcourt India Pvt. Ltd.
4. D. C. Montgomery: Introduction to Statistical Quality Control, Wiley.
5. Hadly: Linear Programming, Addison – Wiley.
6. Taha: Operation Research: An Introduction, Mac Millan.
7. Wayne L. Winston: Operations Research, Thomson, India edition, 4th Edition.

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LINEAR INTEGRATED CIRCUITS APPLICATIONS LAB

III Year – I Semester

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

Course Objectives

To make the students familiarize with the

- design, conduct of experiments, and interpreting results of various op-amp based circuits.
- design, conduct of experiments, and interpreting results of 555 timer multivibrators.

Learning Outcomes

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

- perform experiment, take observations, present the results in proper form, analyze and interpret results, draw conclusions by correlating with theory.
- measure the parameters of IC 741 op-amp.
- design, hardware implement, and test op-amp adder, integrator, Schmitt trigger, square and triangular wave generators, low-pass, high-pass, and band-pass active filters.
- design, hardware implement, and test monostable and astable mutivibrator circuits using 555 timer.
- design, hardware implement, and test regulated power supply using 3-terminal / 723 IC regulators.
- verify the lock range and capture range of PLL IC 565, operation of weighted resistor / R-2R digital to analog converters, and analog to digital convertors.
- make oral presentations and prepare written reports.

List of Experiments

1. Measurement of IC 741 op-amp characteristics.
2. Design, implement, and test adder and integrator using IC 741 op-amp.
3. Design, implement, and test comparator and schmitt trigger using IC 741 op-amp.
4. Design, implement, and test square and triangular wave generators using IC 741 op-amp.

5. Design, implement, and test monostable and astable multivibrators using IC 555 timer.
6. Design, implement, and test low-pass and high-pass active filters.
7. Design, implement, and test band-pass active filter.
8. Design, implement, and test regulated power supply using 3-terminal / 723 IC regulators.
9. Verify the lock range and capture range of PLL IC 565.
10. Verify the operation of weighted resistor / R-2R digital to analog converters.
11. Verify the operation of analog to digital converters.
12. Open-ended experiment.

Reference Books

1. D. Roy Choudhury and Shail B.Jain, "Linear Integrated Circuits", New Age International (p) Ltd, Second Edition, 2003.
2. Sergio Franco, "Design with Operational Amplifier and Analog Integrated Circuits", TMH, Fourth Edition, 2011.
3. G.B.Clayton, "Operational Amplifiers", Elsevier Science, Fifth Edition, 2003.
4. K.Radha Krishna Rao, "Analog ICs", NPTEL Video Course.
5. Paul R.Gray, Paul J.Hurst, Stephen H.Lewis, and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, Inc., Fourth Edition, 2001.
6. Ramakanth A. Gayakwad, "OP-amps and Linear Integrated Circuits", PHI, Fourth Edition, 2010.
7. Datasheets of linear ICs.

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ANALOG AND DIGITAL COMMUNICATIONS LAB

III Year – I Semester

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

Course Objectives

- To familiarize with the various analog and digital modulation schemes.
- To introduce the error detection and correction capabilities of linear block codes.

Learning Outcomes

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

- verify the sampling process with different sampling rates.
- compare the operation of various analog and digital modulation schemes.
- distinguish Frequency Shift Keying and Differential Phase Shift Keying techniques.
- test linear block encoders and decoders.

List of Experiments:(Minimum 10 experiments)

1. Analyze and test AM- Modulation and Demodulation
2. Power Analysis of AM and FM signals using Spectrum Analyzer
3. Sampling Theorem verification.
4. Analyze and test DSB-SC Modulation and Demodulation
5. Analyze and test Frequency modulation and Demodulation
6. Pulse code modulation and demodulation
7. Delta modulation and demodulation
8. Frequency shift keying
9. Differential phase shift keying
10. Amplitude shift keying
11. Linear block encoder and decoder.
12. Pre-emphasis and De-emphasis
13. Time Division multiplexing
14. Open ended experiment.

Reference Books

1. Simon Haykin, "Digital Communications" John Wiley, 2005.
2. H. Taub and D. Schilling, "Principles of Communication Systems", TMH, 2003.
3. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005.
4. John Proakis, "Digital Communications", TMH, 1983.
5. B.P.Lathi, "Modern Analog and Digital Communication", Oxford reprint, 3rd Edition, 2004.

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Optional Elective - II

DATA WAREHOUSING AND DATA MINING

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce concepts of Data mining, data pre-processing and Data warehousing.
- To familiarize with 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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MECHATRONICS

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on design of complex engineering systems using sensors, actuators, controllers.
- To familiarize with the intelligent systems used in Mechatronics.

Learning Outcomes

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

- identify the elements of Mechatronic Systems
- select suitable sensors, actuators and controllers to meet specific requirements
- draw a parallelism between crisp set operations and fuzzy set operations through the use of characteristic and membership functions respectively.

Course Content

UNIT - I:

Introduction: Definition of Mechatronics, Mechatronics in manufacturing, Products, and design. Comparison between Traditional and Mechatronics approach, advantages and disadvantages of Mechatronics systems.

UNIT - II:

Sensors and Transducers: Types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature, light sensors and micro sensors.

UNIT - III:

Review of fundamentals of electronics. Data conversion devices, signal processing devices, relays, contactors and timers. Microprocessors, microcontrollers and PLCs.

UNIT - IV:

Actuators: Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, and transfer systems. Description of PID Controllers.

UNIT - V:

Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, and pumps. Design of hydraulic circuits.

Pneumatics: Production, distribution and conditioning of compressed air, system components and graphic representations.

Electro hydraulic, Electro pneumatic and hydro pneumatic servo systems.

UNIT - VI:

Fuzzy Set Theory: Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Properties of membership function, Fuzzy extension principle, Fuzzy Systems: fuzzification and defuzzification and fuzzy controllers.

Text Books

1. Bolton. W, "Mechatronics", Addison Wesley, 4th Edition, New Delhi.
2. Dan Nesulescu, "Mechatronics", 3rd Edition, Pearson Education
3. Michael B. Hstand and David G. Aliatore, " Introduction to Mechatronics and Measurement Systems", McGraw-Hill

Reference Books

1. Devadas Shetty, Richard A Kolk, "Mechatronics System Design",
2. B.P. Singh (2002), "Advanced Microprocessor and Microcontrollers" New Age International Publisher.
3. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 2nd Ed, Prentice Hall, 2003.
4. H.J.Zimmermann, Fuzzy Set Theory and Its Applications, 2nd Ed., Kluwer Academic Publishers, 1996.
5. S.N. Sivanandam and S.N.Deepa, "Principles of Soft Computing" Second Edition, Wiley India Pvt.Ltd.

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Optional Elective - II

INTRODUCTION TO MEMS

III Year – I Semester

Lecture : -

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, fluorescence 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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DIGITAL SIGNAL PROCESSING

III Year – II Semester

Lecture : 4

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 non-periodic 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

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", Pearson Education / PHI, 2013.

Reference Books

1. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", PHI
2. Andreas Antoniou, "Digital Signal Processing", TATA McGraw Hill, 2006.
3. MH Hayes, "Digital Signal Processing", Schaum's Outline series, TATA McGraw Hill, 2007.

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CONTROL SYSTEMS

III Year – II Semester

Lecture : 3 Tutorial : 1

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 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 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- 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. I. J. Nagrath and M. Gopal , “Control Systems Engineering”, New Age International Limited Publishers, 2nd edition.
2. B.C.Kuo , “Automatic control systems”, John Wiley and son's 8th edition, 2003.

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, 1998.
3. Norman S-Nice, “Control system engineering”, Wiley Studio Edition, 4th Edition.

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MICROPROCESSORS, MICROCONTROLLERS AND APPLICATIONS

III Year – II Semester

Lecture : 3 Practical : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the architecture of 8086 processor & 8051 microcontroller and assembly language programming.
- To emphasize with the concepts of I/O Interfacing with 8086 and 8051.
- To introduce the fundamentals of ARM.

Learning Outcomes

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

- recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
- identify a detailed s/w & h/w structure of the microprocessor and microcontroller
- illustrate how the different peripherals (8255) are interfaced with Microprocessor
- interface various I/O devices to the 8051 microcontroller.
- know the ARM philosophy

Course Content

UNIT - I: Basics of Microprocessor & Microcontroller

A basic microprocessor system, the CPU, memory I/O organization of microprocessor system, microprocessor architecture and its operations: microprocessor initiated operations, internal data operations, peripheral or external initiated operations, fetch and execute cycles, difference between microprocessor and microcontroller.

UNIT - II: Architecture of 8086 Microprocessor

8086 Architecture, register organization, memory organization, 8086 pin diagram: common function signals, minimum and maximum mode signals. interrupts, interrupt structure, processing, timing diagrams.

UNIT - III: Assembly language of 8086 & Interfacing

Addressing modes, classification of instructions, assembly directives, programs using data transfer arithmetic, logical, branch, string instructions, evaluation of

arithmetic expressions, strings etc. interfacing with memory & I/O, interfacing with 8255- stepper motor control.

UNIT - IV: Architecture of 8051

8051 Architecture, memory organization, ports, timers & serial communication, addressing modes, instructions set of 8051.

UNIT - V: Applications of 8051

Interfacing with display devices: LED's, 7 segment display unit, LCD unit, temperature measurement system, relay control, A/D, D/A.

UNIT - VI: ARM Processor fundamentals

The RISC design philosophy, ARM design philosophy, Embedded system hardware, registers, CPSR, pipeline, exceptions, interrupts and the vector table, core extensions, architecture revisions.

Text Books

1. D.V Hall, "Microprocessors & Interfacing", TMH, 2nd Edition, 2005. (Unit I-Unit III)
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontrollers and Embedded Systems", Pearson, 2nd Edition (Unit IV-Unit V).

Reference Books

1. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM Systems Developer's Guides- Designing & Optimizing System Software", Elsevier, 2008. (Unit VI)
2. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram Publication, 2000.
3. A. K. Ray and K.M. Bhurchandani, "Advanced Microprocessors and Peripherals", TMH, 2nd edition, 2006.
4. Barry B. Brey, "The Intel Microprocessors: Architecture, Programming, and Interfacing", PHI, 6th Edition.

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MICROWAVE AND OPTICAL COMMUNICATIONS

III Year – II Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To introduce the microwave passive components, solid state devices and procedures to measure different parameters in microwave frequency range.
- To familiarize with different types of optical fibers, light sources and detectors.

Learning Outcomes

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

- design the microwave bench setup with different wave guide components
- distinguish microwave sources based on constructional, operational and performance aspects
- demonstrate the use of microwave bench for calculating power, attenuation, frequency and VSWR.
- understand the basic concepts of fiber optics.
- design a fiber optic communication network with suitable light sources for a given application.
- design a fiber optic communication network with suitable optical detectors for a given application.

Course Content

UNIT - I: Introduction To Microwave Components

Microwave frequencies and applications, waveguide attenuators – resistive card and rotary vane types; calculation of scattering matrix for E plane, H plane, Magic Tee and directional coupler; ferrite components – Gyrator, Isolator, Circulator.

UNIT - II: Microwave Tubes

Classification of microwave tubes, two cavity Klystron – structure, velocity modulation, output power; reflex Klystron – structure, power output and efficiency; Travelling Wave Tube – structure, amplification process; 8-cavity cylindrical travelling wave magnetron operation.

UNIT - III: Microwave Solid State Devices And Measurements

Gunn diode – Principle, RWH theory; IMPATT diode, description of microwave bench, measurement of attenuation, frequency, VSWR and power using microwave bench.

UNIT - IV: Overview of Optical Fibres

The evolution of fibre optic systems, elements of an optical fibre transmission link, optical fibre structures, nature of light, basic optical laws and definitions, optical fibre modes and configurations.

UNIT - V: Optical Sources

LEDs- structures, quantum efficiency, modulation capability; Laser diodes - principle, threshold conditions, external quantum efficiency, resonant frequencies.

UNIT - VI: Photo Detectors

Photodiodes – Principle, PIN and avalanche photo diodes; comparison of photo detectors, noise in photo detectors.

Text Books

1. Samuel Y. Liao, “Microwave Devices and Circuits”, Pearson Education, 3rd Edition, 2003.
2. Gerd Keiser, “Optical Fiber Communications”, 3rd edition, McGrawHill

Reference Books

1. M.Kulkarni “Microwave and Radar engineering”, Umesh publications, New Delhi. 3rd Edition, 2008.
2. R.E. Collin, “Foundations for Microwave Engineering”, IEEE Press, John Wiley, 2nd Edition, 2002.
3. Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, “Microwave Principles”, CBS Publishers and Distributors, New Delhi, 2004.
4. Djafar K. Mynbaev and Lowell L. Scheiner, “Fiber Optic Communication Technology”, Pearson Education Asia.
5. R.S.Rao, “Microwave Engineering”, PHI New Delhi, 2nd Edition, 2016.

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Professional Elective - II

ANALOG IC DESIGN

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts and design of analog integrated circuits.
- To expose the students to various circuits like amplifiers, switched capacitor circuits, current mirrors, PLLs used in analog ICs.

Learning Outcomes

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

- Apply the knowledge of Mathematics and semiconductor theory in analyzing and designing of analog integrated circuits
- Demonstrate the knowledge and understanding of various current mirrors and switched capacitor circuits
- Describe and determine the effect of feedback on the stability of amplifier circuits.
- Select an appropriate A/D and D/A converter to meet specified performance requirements.

Course Content

UNIT - I:

Basic Mos Device Physics: Second order effects, MOS Device Models

Single Stage Amplifiers: Basic concepts, MOS amplifiers-Common Source stage, source follower, common gate stage, Cascode stage- folded cascode.

UNIT - II:

Differential Amplifiers: single ended and differential amplifiers, Basic differential pair, Common mode response, Differential pair with MOS loads.

Current Mirrors: Simple CMOS current mirror with common source amplifier, source degenerated current mirrors, High output impedance current, mirrors, Bipolar current mirrors. Cascade, Wilson, Wildar current mirrors.

UNIT - III:

Operational Amplifiers: one – stage op-amps, two stage op-amps-gains boosting stage comparison, I/P range limitations, slew rate.

Feed Back and Stability: Feedback topologies, multi pole systems, phase margin, frequency compensation.

UNIT - IV:

Switched Capacitors Circuits: Sampling switches, Switched-Capacitor Amplifiers, Switched –Capacitor Integrator.

UNIT - V:

Phased Locked Loop Design: Basic loop architecture, derivation for lock range and capture range. Charge pump PLL, small signal analysis of charge pump PLL.

UNIT - VI:

Nyquist Rate D/A Converters: Decoder based converter resistor string converters folded resistor string converter – Binary scale converters – Binary weighted resistor converters – Reduced resistance ratio ladders – R-2R based converters – Thermometer code current mode D/A converters.

Nyquist Rate A/D Converters: Integrating converters – successive approximation converters. DAC based successive approximation – flash converters time interleaved A/D converters.

Text Books

1. David A Johns, Ken Martin, “Analog Integrated circuit Design”, John Wiley & Sons (Unit: VI).
2. Behzad Razavi, “Design of Analog CMOS Integrated Circuits”, TMH, 2001 (Units: I to V)

Reference Books

1. Gray, Hurst Lewis, Meyer, “Analysis and design of Analog Integrated Circuits”, John Wiley & Sons, 2000.
2. Franco Maloberti, “Analog Design for CMOS VLSI Systems”, Kluwer Academic Publishers, 2001.

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NANO ELECTRONICS

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the limitations of silicon electronics, progress of nanoelectronics and basic concepts of nano electronics.
- To know the fabrication techniques and scaling of nanodevices.
- To study the significance of tunneling effect in nanoelectronic devices and the concepts of Coulomb blockade.

Learning Outcomes

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

- explain various aspects of nano electronics.
- explore the fabrication techniques used for nanodevices.
- identify the importance of scaling.
- list of various applications of tunneling.
- demonstrate the concepts of coulomb blockade and electron transport mechanisms.

Course Content

UNIT - I: Toward the Nanoscale

Scientific opportunities, technological motivations, improving materials on the nanoscale, fabrication techniques on the nanoscale, improvement in characterization methods for the nanoscale, new principles of device operation at the nanoscale, nanotechnology for optoelectronics.

UNIT - II: Growth and Fabrication of Nanostructures

Bulk crystal and heterostructure growth, nanolithography, etching, and other means of nanostructures and nanodevices, spontaneous formation and ordering of nanostructures, clusters and nanocrystals, methods of nanotube growth- chemical and biological methods for nanoscale fabrication, fabrication of nano-electromechanical systems.

UNIT - III: Nanoscale MOSFETs

Introduction, MOSFET scaling, short- channel effects, multiple-gate MOSFETs, FinFETs.

UNIT - IV: Tunnel Junctions and Applications of Tunneling

Tunneling through a potential barrier, potential energy profiles for material interfaces, Application of tunneling.

UNIT - V: Coulomb Blockade

Coulomb blockade in a nanocapacitor, tunnel junction excited by a current source, coulomb blockade in a Quantum Dot Circuit.

UNIT - VI: Nanostructure Devices

Resonant tunneling diode, single electron transistors, carbon nanotube transistor, transport of spin and spintronics.

Text Books

1. Vladimir V. Mitin, Viatcheslav A. Kochelap, and Michael A. Strosio, "Introduction to Nanoelectronics: Science, Nanotechnology, Engineering, and Applications", Cambridge University Press, 2008 (UNITS: I & II).
2. George W. Hanson, "Fundamentals of Nanoelectronics", Pearson Education, 2009 (UNITS: IV - VI).

Reference Books

1. Anantha Chandrakasan, "FinFETs and Other Multi-Gate Transistors", Springer, 2008 (UNIT: III).
2. Jerry G. Fossum and Vishal P. Trivedi, "Fundamentals of Ultra-Thin-Body MOSFETs and FinFETs", Cambridge University Press, 1st Edition, 2013 (UNIT: III) .

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SMART ANTENNAS

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce beamforming concepts.
- To impart angle of arrival estimation techniques

Learning Outcomes

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

- apply different windowing techniques to obtain weights for desired antenna pattern.
- make use of random variables for pre-processing of the signals.
- differentiate the performance of general antenna and smart antenna for spatial processing of the signal.
- conceptualize adaptive beamforming.
- understand the concept of angle of arrival algorithms for beamforming.
- test the received signal performance with different algorithms and can choose the suitable algorithm for the given application.

Course Content

UNIT - I: Array Weighting Fundamentals

Array weighting-Blackman weights, Hamming weights, Gaussian weights, Kaiser Bessel weights, fixed beam arrays, fixed sidelobe cancelling,

UNIT - II: Principles of Random Variables and Process

Definition of random variables, probability density functions, expectation and moments, common probability density functions, autocorrelation and power spectral density, correlation matrix.

UNIT - III: Smart Antennas

Introduction, the historical development of smart antennas, early forms of spatial processing, fixed weight beamforming basics: maximum S/I ratio, minimum mean square error, maximum likelihood, and minimum variance. diversity, sectorization.

UNIT - IV: Adaptive Beam Forming

Least mean squares (LMS), sample matrix inversion (SMI), recursive least squares (RLS), constant modulus (CM)

UNIT - V: Angle of Arrival Estimation

Fundamentals of matrix algebra, array correlation matrix, non-blind beamforming, blind beam forming, angle of arrival estimation methods: Bartlett AOA estimate, Capon AOA estimate.

UNIT - VI: Smart Antenna Performance

Beamforming array performance, receive diversity performance, combined diversity and beamforming performance, choosing a spatial processing technique.

Text Books

1. Frank B. Gross “Smart Antennas for Wireless Communications with MATLAB”, McGraw –Hill, 2005.
2. Pieter van Rooyen, Michiel Lotter and Danie van Wyk “Space Time Processing for CDMA Mobile Communications” Kluwer Academic Publishers, 2000.

Reference Books

1. Tapan K. Sarkar, Michel C. Wicks, M.S. Palma and Robert J. Bonnea “Smart Antennas”, John Wiley & Sons – 2003.
2. S.Chandran “Adaptive Antenna Arrays: Trends and Applications” Springer,2004.
3. A Paulraj, Rohit nabar and Dhananjay Gore “Introduction to Space Time Wireless Communications”, Cambridge University Press, 2003.

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CODING THEORY

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of information theory.
- To familiarize basic concepts of linear block codes and convolution codes.

Learning Outcomes

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

- develop mathematical models for practical communication channels and analyze information carrying capacity.
- understand source coding mechanism.
- analyze linear block codes and investigate the relationship between minimum distance and error correction/detection capabilities
- analyze encoder and efficient decoder algorithms for convolutional codes.
- design and implement channel encoder and decoder in hardware/ software to meet the required error performance in present day communication applications.

Course Content

UNIT - I: Information Theory

Discrete messages, concept of amount of information and its properties, average information, Entropy and its properties, information rate, mutual information and its properties.

UNIT - II: Source Coding

Shannon's theorem, Shannon-Fano coding, Huffman coding, efficiency calculations, channel capacity of a Gaussian channel, bandwidth – S/N trade off.

UNIT - III: Linear Block Codes

Introduction, matrix description of linear block codes, error detection and error correction capabilities of linear block codes, hamming codes.

UNIT - IV: Cyclic Codes

Binary cyclic codes, algebraic structure, encoding, syndrome calculation, and table look-up decoding using standard array.

UNIT-V: BCH and Reed Solomon Codes

BCH codes- decoding of BCH codes, the Berlekamp- Massey decoding algorithm.
Reed Solomon codes- generalized Reed Solomon codes, MDS codes.

UNIT - VI: Convolution Codes

Introduction, encoding of convolution codes, time domain approach, transform domain approach, graphical approach: state, tree and trellis diagram, decoding using Viterbi algorithm and sequential decoding, advantages of convolution codes over block codes.

Text Books

1. W.C. Huffman and Vera Pless, "Fundamentals of Error correcting codes", Cambridge University Press, 2003.
2. Sam Shanmugam "Digital and Analog Communication Systems", John Wiley, 2005.

Reference Books

1. Simon Haykin "Communication Systems", John Wiley, 2005
2. Sklar, "Digital Communication", Pearson Education.
3. Shu Lin and Daniel. J. Costello Jr., "Error Control Coding: Fundamentals and applications", 2nd Edition Prentice Hall Inc, 2004.
4. R.E. Blahut, "Theory and Practice of Error Control Coding", McGraw Hill 1983.

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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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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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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 Resistors

Resistivity, Range of Resistivity- free electron theory - classical theory & quantum theory. Semiconducting materials: Energy gap in solids - intrinsic semi conductors - extrinsic semi conductors - element & compound 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 susceptibility - complex dielectric 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, Reflection, 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 tilted 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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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

BIOMEDICAL 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 novel 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 diagnosis 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), evoked 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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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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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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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 - 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, 2nd Edition, Dreamtech Press
- Dave Thomas, Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide, 4th Edition, Pragmatic Bookshelf
- Randal L. Schwartz,ý Brian D. Foy ,ý Tom Phoenix, Learning Perl, 6th edition, O'REILLY Publications.

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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 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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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.
- use 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 n th 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 differential 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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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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MICROPROCESSOR AND MICROCONTROLLER INTERFACING LAB

III Year – II Semester

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

Course Objectives

- To introduce the assembly language programming concepts and interfacing with 8086 processor.
- To familiarize with the Embedded-C language programming concepts and interfacing with 8051 microcontroller.

Learning Outcomes

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

- acquire the knowledge of assembly language programming using 8086 microprocessor.
- perform various arithmetic and shift operations with 8086 based system.
- interface various I/O modules with 8086 based system.
- implement various real time applications using 8051.

List of Experiments

Part A: Assembly Language Programming Exercises / Experiments using 8086 Trainer kit

1. Implementation of simple decimal arithmetic and bit manipulation operations.
2. Implementation of code conversion between BCD, Binary, Hexadecimal and ASCII.
3. Implementation of searching and sorting of 16-bit numbers.
4. Implementation of String manipulations.

Part B: Interfacing Exercises/Experiments with 8086 trainer kit through Assembly Language Programming

1. Develop a stepper motor interface for rotating through any given sequence.
2. Develop a Digital-to-Analog Converter interface for waveform generation.
3. Develop an Analog-to-Digital Converter interface for analog signal to digital conversion.
4. Implementation of 2's complement and decoder functionalities using DIDO interface.

Part C: Assembly Language Programming Exercises/Experiments in 8051 using Keil

1. Develop a Embedded C Program to interface seven segment display to port1 and port2 and display the count from 00 to FFH
2. Implement the functionality of traffic signal controller using 8051 microcontroller.
3. Develop an Embedded C Program to display the given string on LCD.
4. Open ended Experiment

Reference Books

1. D. V. Hall, "Microprocessors and Interfacing", TMGH, 2nd edition 2006
2. Barry B. Brey, "The Intel Microprocessors", PHI, 7th edition 2006.
3. M.A. Mazidi, J.G. Mazidi, R.D. McKinlay, "The 8051 microcontroller and embedded systems", Pearson, 2nd Edition.

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DIGITAL SIGNAL PROCESSING LAB

III Year – II Semester

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

Course Objectives

- To analyze and manipulate digital signals for the representation of systems using MATALB.
- To introduce the architecture of TMS320C6711 DSP and the programming of DSP.

Learning Outcomes

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

- analyze and implement digital signal processing systems in time domain.
- compute linear and circular convolution and the discrete Fourier transform (DFT) of discrete-time signals.
- perform the frequency response of frequency-selective digital filters using Butterworth, chebyshev approximations and windows.
- implement DSP operations on TMS320C6711 DSP processor.

List of Experiments

1. Represent signal, its basic transformations, sum of sinusoidal signals and multiplication of sinusoidal signals.
2. Obtain output of LTI system (without using default functions).
3. Perform linear convolution using the circular convolution (without using default functions)
4. Obtain spectrum of the discrete time sequence (without using default functions)
5. Obtain DFT using FFT (without using default functions)
6. Verify DFT properties (without using default functions)
7. Design IIR filter using Butterworth/Chebyshev Approximations.
8. Design FIR filter using windowing techniques.
9. Obtain power density spectrum of a sequence.
10. Linear convolution implementation on DSP chips.
11. Open-ended experiment-application of filters.

Text Books

1. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications": Pearson Education / PHI, 2013.
2. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", PHI

URL'S

1. www.ti.com/cn/lit/pdf/spru509c.pdf
2. www.ti.com/lit/ug/spru301c/spru301c.pdf

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VLSI LAB

III Year – II Semester

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

Course Objectives

To make the students familiarize with the

- design of analog and digital circuits.
- usage of EDA tool to simulate, draw schematic and layout, analyze, and test of analog and digital circuits.

Learning Outcomes

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

- design analog and digital circuits.
- use EDA tools to perform simulation, draw schematic and layout, analysis, testing, and interpret results.
- write VHDL/Verilog code.
- make oral presentations and prepare written reports.

List of Experiments

A) Analog Design:

To design the circuits with given specifications and verify the following:

- (a) Schematic: (i) DC analysis and (ii) Transient analysis
- (b) Layout: (i) DRC (ii) LVS and (iii) RCX DRC – Design Rule Check; LVS – Layout Versus Schematic; RCX –RC Extraction
 1. Single-stage common-source amplifier
 2. Single-stage differential amplifier
 3. Single-stage operational amplifier
 4. 4-bit R-2R DAC using opamp

B) Digital Design:

To write VHDL/Verilog code and test bench for verification, and observe the waveform for the following:

1. Inverter (design with given specifications and verify (a) Schematic: (i) DC analysis, (ii) Transient analysis (b) Layout: (i) DRC (ii) LVS and (iii) RCX; and (c) as given above).

2. Buffer
 3. Logic gates (AND, OR, NAND, NOR, XOR, XNOR, transmission gate)
 4. Flip-flops (D, JK, T, RS)
 5. Parallel and serial adders
 6. 4-bit counters (Asynchronous and synchronous)
 7. Successive approximation register (SAR) and SAR based ADC
- C)** Open-ended experiment (shall comprise all the VLSI design flow steps)

Reference Books

1. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", McGraw-Hill Edition, 2003.
2. R. Jacob Baker, "CMOS Circuit Design, Layout and Simulation", Revised Second Edition, IEEE press, 2008.
3. Neil H.E.Weste, David Harris, and Ayan Banerjee, "CMOS VLSI Design: A Circuits and Systems Perspective", Pearson Education Inc., Third Edition, 2005 (Indian Reprint 2014).
4. Sung-Mo Kang, Yusuf Leblebici "CMOS Digital Integrated Circuits: Analysis and Design", TMH Education, Third Edition, 2003.
5. Eugene D. Fabricius, "Introduction to VLSI design", McGraw-Hill International Edition, 1990.
6. IIT Bombay, "VLSI Design", NPTEL Web Course.
7. User Manuals for EDA Tools.

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BIG DATA ANALYTICS

III Year – II Semester

Lecture : -

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

What is Big Data, characteristics of Big Data - The four Vs 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 map reduce APIs, data flow, combiner functions, running a distributed map reduce job.

UNIT - IV: How Map Reduce works

Anatomy of a map reduce 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, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss, "Hadoop for Dummies", 1st edition, John Wiley and Sons.

Reference Books

1. Dirk deRoos, Chris eaton, George Lapis, Paul Zikopoulos, Tom Deutsch "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, TMH, 2012.
2. Srinath Perera, Thilina Gunarathne, "Hadoop Map Reduce Cookbook", Packt Publishing.

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COGNITIVE RADIO NETWORKS

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce software defined radio evolution and cognitive radio.
- To make it known the characteristics of spectrum, regulation history and issues.
- To present formally communication techniques and cognitive radio network theory.

Learning Outcomes

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

- understand concepts of software defined radio.
- define physical characteristics of spectrum and regulatory challenges.
- describe the spectrum sensing and its implications.
- differentiate different spectrum sharing schemes.
- elucidate different relay communication techniques exist.
- apply the entropy concepts to find the limits on the cognitive radio networks.

Course Content

UNIT - I : Introduction

Software defined radio, evolution of software-defined radio, cognitive radio, evolution of cognitive radio, key applications, interoperability, dynamic spectrum access

UNIT - II : Radio Frequency Spectrum and Regulation

Spectrum: physical characteristics of spectrum and implications, regulatory history and successes, emerging regulatory challenges and actions, regulatory issues of cognitive access, spectrum measurements and usage, applications for spectrum occupancy data,

UNIT - III: Spectrum Sensing and Identification

Primary signal detection: energy detector, cyclo-stationary feature detector, matched filter, cooperative sensing, definition and implications of spectrum opportunity, spectrum opportunity detection, fundamental trade-offs: performance versus constraint, mac layer performance measures, global interference model,

local interference model, fundamental trade-offs: sensing accuracy versus sensing overhead.

UNIT - IV: Spectrum Access and Sharing

Unlicensed spectrum sharing, licensed spectrum sharing, secondary spectrum access, non-real-time SSA, real-time SSA, negotiated access, possibility of quality of service provisioning in a shared band, opportunistic access, overlay approach, underlay approach

UNIT - V: User Cooperative Communications

User cooperation and cognitive systems, relay channels: general three-node relay channel, wireless relay channel, user cooperation in wireless networks: two-user cooperative network, cooperative wireless network, multihop relay channel

UNIT - VI: Information Theoretical Limits on CR Networks

Types of cognitive behavior, interference-avoiding behavior: spectrum interweave, interference-controlled behavior: spectrum underlay, underlay in small networks: achievable rates, underlay in large networks: scaling laws, interference-mitigating behavior: spectrum overlay, opportunistic interference cancellation, asymmetrically cooperating cognitive radio channels.

Text Books

1. Alexander M. Wyglinski, Maziar Nekoyee, and Y. Thomas Hou, "Cognitive Radio Communications and Networks – Principles and Practice", Elsevier Inc., 2010.

References Books

1. Kwang-Cheng Chen and Ramjee Prasad, "Cognitive Radio Networks", John Wiley & Sons, Ltd., 2009.
2. Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009.
3. Joseph Mitola III, "Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000.

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CRYPTOGRAPHY AND NETWORK SECURITY

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce 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, digital signatures, digital Signature schemes.

UNIT - V: E-mail Security & IP Security

E-mail Security: PGP, S/MIME. IP Security: Overview, IP security architecture, authentication header, encapsulating security payload.

UNIT - VI: Web Security & 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" 5thedition, Pearson education 2011.
2. Bernard Menezes, "Network security and cryptography", Cengage learning 2011.

Reference Books

1. William Stallings,"Network Security Essentials", 4th Edition, Pearson education.
2. Eric Maiwald, "Fundamentals of Network Security", 1st Edition,Dreamtech press.
3. Buchmann, "Introduction to Cryptography", Springer.

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CMOS DIGITAL IC DESIGN

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize the students with the design of CMOS digital circuits.
- To make the students understand the impact of interconnects on the delay offered by digital logic circuits.

Course Outcomes

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

- characterize the behaviour of CMOS inverter
- design various combinational and sequential circuits using CMOS logic
- identify different components contributing to delay offered by interconnects
- design complex digital circuits
- design memory based array structures.

Course Content

UNIT - I: The CMOS Inverter

The static CMOS inverter, static behaviour, dynamic behaviour, power, energy and energy delay, technology scaling and its impact on the inverter metrics.

UNIT - II: Combinational Logic Design in CMOS

Static CMOS design, dynamic CMOS design, choosing a logic style, designing logic for reduced supply voltages.

UNIT - III: Sequential Logic Design in CMOS

Timing metrics for sequential circuits, classification of memory elements, static latches and registers, dynamic latches and registers, pipelining, non-bistable sequential circuits.

UNIT - IV: Interconnects

Capacitive parasitics, resistive parasitics, inductive parasitics

UNIT - V: Designing Complex Digital Integrated Circuits

Standard-cell design approach, array-based design, configurable and reconfigurable design.

UNIT - VI: Designing Memory Array Structures

Semiconductor memories, memory core, memory peripheral circuitry, design of PLA.

Text Book

1. Jan M. Rabaey, AnanthaChandrakasan, Borivoje Nikolic, "Digital Integrated Circuits: A Design Perspective", Pearson Education Inc., Second Edition.

Reference Books

1. Sung-Mo Kang, Yusuf Leblebici "CMOS Digital Integrated Circuits: Analysis and Design", TMH Education, Third Edition, 2003.
2. David A. Hodges, Horace G. Jackson, Resve A Saleh, "Analysis and Design of Digital Integrated Circuits" McGraw-Hill Higher Education; 3 edition (2003)
3. Amitava Dasgupta, "Digital Integrated Circuits", NPTEL Video Course, Department of Electrical Engineering, IIT Madras.

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EMBEDDED SYSTEM DESIGN

IV Year – I Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objective

- 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 (RTL-level), custom single purpose processor design (RTL-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) – MicroControllers 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, 2002. (Unit II to VI).
2. Shibu.K.V, “Introduction to Embedded Systems” Tata McGraw Hill Education Private Limited, 2009 (Unit I).

Reference Books

1. Raj kamal, “Embedded Systems”, TMH, 2nd Edition, 2008.
2. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier Publications, 2005.

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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

IV Year – I Semester

Lecture : 3

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To impart the basic characteristics and errors associated with the instruments.
- To familiarize with different types of electronic instruments.
- To introduce the essential components of industrial instruments and their usage.

Learning Outcomes

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

- classify the instruments based on static and dynamic characteristics.
- analyze the frequency component of a generated wave and its distortion
- learn the concepts of active and passive transducers.

Course Content

UNIT - I: Fundamentals of measurements

Performance characteristics of instruments, static characteristics- accuracy, resolution, precision, expected value, error, sensitivity, errors in measurement; dynamic characteristics- speed of response, fidelity, lag and dynamic error; DC Volt meters-multi-range, AC voltmeters- multi range, DC ammeter, Ayrton shunt, Ohmmeters -series and shunt type.

UNIT - II: Digital Instruments

Ramp technique, dual slope integrating type DVM (Voltage to Time Conversion), integrating type DVM (Voltage to Frequency Conversion), successive approximations, digital ph meter, digital measurement of frequency, phase, speed and capacitance.

UNIT - III: Signal Generators and oscilloscopes

Fixed and variable, standard and AF sine and square wave; function generators-square, pulse, sweep; random noise, Dual beam, Dual trace and digital storage Oscilloscope.

UNIT - IV: Bridges and Analyzers

Wheat stone bridge, Maxwell's bridge, Schering bridge, Wien bridge, Q-meter, wave analyzers, harmonic distortion analyzers, spectrum analyzers, FFT analyzer.

UNIT - V: Transducers

Selecting a transducer, resistive, capacitive and inductive transducers principles, frequency generating transducers, reluctance pulse pickups, photo electric transducer, flow measurement transducers.

UNIT - VI: Industrial Transducers

Strain gauges, LVDT, load cell, piezoelectric transducer, thermocouples, thermistors, resistance temperature detector, data acquisition systems.

Text Books

1. A.D. Helfrick and W.D.Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, PHI, 5th Edition, 2002.
2. H.S.Kalsi, “Electronic Instrumentation”, TMH, 2nd Edition, 2004.

Reference Books

1. David A. Bell, “Electronic Instrumentation & Measurements”, PHI, 2nd Edition, 2003.
2. A K. Sawhney , “A Course in Electrical and Electronics Measurements & Instrumentation”, Dhanpat Rai & Co., 2015.
3. Golding & Waddis, “Electrical Measurement and Measuring Instruments” Tata McGraw Hill, 2003.

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MIXED SIGNAL IC DESIGN

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

The student will be introduced to the

- basic principles of switched capacitor circuits and PLL applications.
- Understand the specifications and architectures of data converters, mixed signal layout issues.
- advanced CMOS logic design and different building blocks of digital integrated circuits.

Learning Outcomes

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

- analyze the switched capacitor circuits.
- explore the fundamentals and different architectures of ADCs and DACs, mixed signal layout issues.
- use PLLs for various applications.
- characterize various digital IC building blocks.

Course Content

UNIT - I: Introduction to Switched Capacitor Circuits

General considerations, sampling switches, MOSFET as a switch, speed considerations, precision considerations, charge injection cancellation, switched capacitor amplifiers-unity gain sampler/buffer, non inverting amplifier, precision multiply by two circuit, switched capacitor integrator, switched capacitor common mode feedback.

UNIT - II: Data Converter Fundamentals

Analog versus discrete time signals, converting analog signals to digital signals, sample and hold characteristics, digital to analog converter specifications, analog to digital converter specifications, VLSI layout, layout steps, mixed signal layout issues.

UNIT - III: DAC Architectures

Digital input code, resistor string, R-2R ladder networks, current steering, charge scaling DACs, Cyclic DAC, Pipeline DAC.

UNIT - IV: ADC Architectures

Flash, the two step flash ADC, the pipeline ADC, integrating ADCs, the successive approximation ADC, the oversampling ADC.

UNIT - V: Phase-Locked Loop

Simple PLL, phase detector, basic PLL topology, charge pump PLLs, problem of lock acquisition, phase/frequency detector and charge pump, basic charge pump PLL, jitter in PLLs, delay locked loops, applications-frequency multiplication, skew reduction, jitter reduction.

UNIT - VI: Advanced CMOS Logic Design

Domino–CMOS logic, No Race logic, differential CMOS, dynamic differential CMOS, digital integrated system building blocks-multiplexers and decoders, barrel shifters, counters, digital adders, digital multipliers.

Text Books

1. Behzad Razavi (2002), Design of Analog CMOS Integrated Circuits, TMH Edition.
2. R. Jacob Baker (2003), CMOS Circuit Design, layout and simulation, PHI
3. Ken Martin (2002), Digital integrated circuit design, Oxford university press.

Reference Books

1. David A. Johns, Ken Martin (2013), Analog Integrated Circuit Design, Wiley Student Edition.
2. R. Jacob Baker (2009), CMOS Mixed Signal Circuit Design, Wiley Wiley Student Edition.

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CELLULAR AND MOBILE COMMUNICATIONS

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce various issues of cellular radio system design.
- To expose students to different types of interferences occurred in cellular systems.
- To familiarize the students to various multiple access techniques and wireless systems.

Learning Outcomes

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

- understand the characteristics of radio environment.
- apply the concepts of frequency reuse and cell splitting to increase the capacity of cellular system.
- analyse different interferences in a cell to improve the performance of the system.
- create a cellular system model for a given region considering terrain configuration.
- design an efficient frequency management and channel assignment scheme by selecting proper handoff mechanism.
- conceptualize GSM and multiple access schemes.

Course Content

UNIT - I: Cellular Mobile Radio Systems

Introduction to cellular mobile system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, analog cellular systems.

UNIT - II: Elements of Cellular Radio System Design

Concept of frequency reuse, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular system.

UNIT - III: Interference

Introduction to co-channel interference, real time co-channel interference, design of antenna system, antenna parameters and their effects, diversity receiver, non-cochannel interference.

UNIT - IV: Cell Coverage for Signal and Traffic

Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

UNIT - V: Frequency Management and Channel Assignment

Numbering and grouping, setup, access and paging channels, channel assignments to cell sites and mobile units, channel sharing and borrowing, underlay-overlay arrangement, non fixed channel assignment.

Handoff Mechanism: Dropped call rates, types of handoff initiation, and types of handoff, and vehicle locating methods.

UNIT - VI: Digital Cellular Networks

GSM architecture, GSM channels, multiplex access schemes – FDMA, TDMA, CDMA

Text Books

1. W.C.Y. Lee, "Mobile Cellular Telecommunications", Tata McGraw Hill, 2nd Edition; 2006.(Units: I to V)
2. Theodore. S. Rapoport, "Wireless Communications", Pearson Education, 2nd Edition;2002. (Unit: VI)

Reference Books

1. Jon W. Mark and Weihua Zhqung, "Wireless Communication and Networking", PHI, 2005.
2. R. Blake, "Wireless Communication Technology", R. Blake, Thompson Asia Pvt. Ltd., 2004.

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Professional Elective - III

DIGITAL TV ENGINEERING

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the television standards and TV signal transmission.
- To introduce the concepts of digital TV engineering.

Learning Outcomes

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

- understand color Television standards and their specifications.
- conceptualize the operation of color Television system.
- find the applications of Digital TV.

Course Content

UNIT - I: Introduction to TV Standards

Standard scanning sequence, line frequency and frame frequency, Video band width, composite video signal, blanking, synchronizing and equalizing pulses. CCIR-B Standard specifications.

UNIT - II: Colour Television

Block diagram of colour TV receiver, PAL – D decoder, Separation of U and V signals, Color burst separation and Burst phase discriminator, Indent and color killer circuits, U & V demodulators, Colour signal mixing.

UNIT - III: Sync Separation and AFC

AGC, Keyed AGC and noise cancellation, Synchronous separation, K noise in sync pulses and separation of frame and line sync pulses, Deflection Oscillators.

UNIT - IV: Digital Television Transmission Standards

ATSC terrestrial transmission standard, vestigial sideband modulation, DVB - T transmission standard, ISDB-T transmission standard, channel allocations, antenna height and power, MPEG-2.

UNIT - V: Performance Objectives for Digital Television

System noise, external noise sources, transmission errors, error vector magnitude, eye pattern, interference, co-channel interference, adjacent channel interference, analog to digital TV, transmitter requirements.

UNIT - VI: Television Applications

Remote control circuit, CCTV systems, video tape recording and playback circuit, HDTV, TV via satellite, Remote Control, DTH system.

Text Books

1. R.R.Gulati, "Monochrome Television Practice, Principles, Technology and servicing." Third Edition 2006, New Age International Publishers.(Units:I toIII,VI)
2. Gerald W. Collins, "Fundamentals of Digital Television Transmission", John Wiley, 2001.(Units: IV to VI)

Reference Books

1. A.M Dhake, "Television and Video Engineering", 2nd ed., TMH, 2003.
2. R.P.Bali, "Color Television, Theory and Practice", Tata McGraw-Hill, 1994.

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Professional Elective - III

DSP PROCESSORS AND ARCHITECTURES

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the Architecture and interfacing of TMS320C54XX processors.
- Conversant with applications of DSP processors.

Learning Outcomes

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

- apply the concepts of Sampling, DFT and Filters.
- calculate DSP computational Errors.
- identify the Architectural features of DSP processors.
- interface I/O and memory devices with DSP Processors.

Course Content

UNIT - I: Computational Accuracy in DSP Implementations

Number formats for signals and coefficients in DSP systems, dynamic range and precision, sources of error in DSP implementations, A/D Conversion errors, DSP computational errors, D/A conversion errors, compensating filter.

UNIT - II: Architectures for Programmable DSP Devices

Basic architectural features, DSP computational building blocks, bus architecture and memory, data addressing capabilities, address generation unit, programmability and program execution, speed issues, features for external interfacing.

UNIT - III: Programmable Digital Signal Processors – TMS320C54XX

Data addressing modes, memory space, program control, instructions and programming, on-chip peripherals, interrupts pipeline operation.

UNIT - IV: Analog Devices Family of DSP Devices

Analog devices family of DSP devices-ALU and MAC block diagram, shifter instruction, base architecture of ADSP 2100, ADSP-2181 high performance processor.

UNIT - V: Blackfin Processor

Introduction to Blackfin processor-The Blackfin Processor, introduction to micro signal architecture, overview of hardware processing units and register files, address arithmetic unit, control unit, bus architecture and memory, basic peripherals.

UNIT - VI: Applications of Programmable DSP Devices

Introduction, DSP- based biotelemetry receiver: Pulse Position Modulation, decoding scheme for the PPM Receiver, biotelemetry receiver implementation, ECG signal processing for heart rate determination, brain tumor detection using DSP processor.

Text Books

1. Avtar Singh and S. Srinivasan –,"Digital Signal Processing" , Thomson Publications, 2004.
2. K Padmanabahan, R.Vijayarajeswaran, Ananthi. S, "A practical Approach to Digital Signal Processing", New Age International, 2006/2009

Reference Books

1. Woon-Seng Gan, Sen M. Kuo, "Embedded Signal Processing with the Micro signal Architecture", Wiley - IEEE Press, 2007.
2. B. Venkataramani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", 2004, TMH.
3. Jonatham Stein, "Digital Signal Processing", John Wiley, 2005.

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Professional Elective - IV

SYSTEM ON CHIP DESIGN

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To provide an overview on System-On-Chip design technology.
- To introduce components in a typical SoC system.
- To familiarize with the concept of different processor cores.

Learning Outcomes

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

- understand architecture designs and their design issues, Core Libraries and EDA Tools required for SoC Design.
- explore design methodology for Logic Cores, Soft and Hard Cores, Memory and Analog Cores.
- perform SoC Design validation, prototyping and verification.
- design SoCs for various applications.

Course Content

UNIT - I: Introduction to Architecture Designs

Architecture and Design Issues of SoC, Hardware Software Co-Design, Co-Design Flow, Core Libraries, EDA Tools and Web Pointers.

UNIT - II: Design Methodology for Logic Cores

SoC Design Flow, Guidelines for Design Reuse, Synchronous Design, Memory and Mixed-Signal Design, On-Chip Buses, Clock Distribution, Clear/Set/Reset Signals, Physical Design, Deliverable Models

UNIT - III: Design Process for Soft and Firm Cores

Design Flow, Design Process for Hard Cores, Sign-Off Checklist, Deliverables – Soft Core and Hard Core, System Integration – Designing with Hard Cores, Designing with Soft Cores, System Verification.

UNIT - IV: Design Methodology for Memory Cores and Analog Cores

Memory Cores: Embedded Memories and Design Methodology, Specifications of Analog Circuits, Circuit Techniques, Memory Compiler, Simulation Models.

Analog Cores: Analog-To-Digital Converter, Digital-To-Analog Converter, Phase-Locked Loops, High Speed Circuits

UNIT - V: Design Validation

Core-Level Validation, Core Validation Plan, Test Benches, Core-Level Timing Verification, Core Interface Verification, Protocol Verification, Gate-Level Simulation, SoC Design Validation, Co-Simulation, Emulation, Hardware Prototypes.

UNIT - VI: Core and SoC Design Examples

Micro Processor Cores, V830 R/AV Super Scalar RISC Core, Design Of Power PC 603e G2 Core, Memory Core Generators, Core Integration And On-Chip Bus, Examples Of Soc, Media Processors, And Testability Of Set-Top Box SoC.

Text Book

1. Rochit Raj Suman, "System-on-a-chip: Design and Test", Artech House, 2000

Reference Books

1. Jason Andrews – Newness "Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) ", BK and CDROM.
2. Prakash Rashinkar, Peter Paterson and Leena Singh L "System on Chip Verification – Methodologies and Techniques", Kluwer Academic Publishers, 2001.
3. Ricardo Reis, "Design of System on a Chip: Devices and Components", 1st Ed., Springer 2004.

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WIRELESS SENSOR NETWORKS

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the design issues in ad hoc and sensor networks.
- To familiarize the architecture, protocols of wireless sensor networks.

Learning Outcomes

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

- explain the concepts, network architectures and applications of ad hoc and wireless sensor Networks
- analyse the protocol design issues of ad hoc and sensor networks.
- design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues.
- evaluate the QoS related performance measurements of ad hoc and sensor networks.

Course Content

UNIT - I: Introduction

Fundamentals of wireless communication technology- the electromagnetic spectrum, radio propagation mechanisms, characteristics of the wireless channel, applications of Ad Hoc and Sensor networks, design challenges in Ad hoc and Sensor Networks.

UNIT - II: Physical Layer and Transceiver Design Considerations

Personal area networks, hidden node problem, exposed node problem, topologies of PAN'S, topologies of MANETS, topologies of WANETS.

UNIT - III: MAC Protocols For Ad Hoc Wireless Networks

Issues in designing a MAC Protocol- classification of MAC protocols- contention based protocols-contention based protocols with reservation mechanisms contention-based protocols with scheduling mechanisms – multi channel MACIEEE 802.11.

UNIT - IV: Routing Protocols and Transport Layer in Ad Hoc Wireless Networks

Issues in designing a routing and transport layer protocol for Ad hoc networks
proactive routing, reactive routing (on-demand), hybrid routing- classification of
transport layer solutions-TCP over Ad hoc wireless networks.

UNIT - V: Wireless Sensor Networks (WSNs) and MAC Protocols

Sensor network architecture, data relaying and aggregation strategies, MAC layer
protocols: self-organizing, hybrid TDMA/FDMA and CSMA based MAC- IEEE
802.15.4.

UNIT - VI: Sensor Network Platforms and Tools

Sensor node hardware—Berkeley motes, programming challenges, node-level
software platforms, node-level simulators, state-centric programming.

Application of WSN: Ultrawide band radio communication, wireless fidelity
systems. future directions, home automation, smart metering applications.

Text Books

1. C. Siva Ram Murthy, and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall Professional Technical Reference, 2008.
2. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005.

Reference Books

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal, “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, “Wireless Sensor Networks”, Elsevier Publication - 2002.
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks Technology, Protocols, and Applications”, John Wiley, 2007.
4. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

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SATELLITE COMMUNICATION

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce fundamentals of satellite communications, satellite launching vehicles and subsystems of the satellite.
- To familiarize link design in satellite communications, multiple access techniques and GPS.

Learning Outcomes

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

- demonstrate the knowledge of orbital parameters and satellite launching techniques.
- compare the role of various satellite subsystems.
- design satellite link for required specifications.
- understand the coordination of earth stations for efficient utilization of the satellite by means of multiple accessing techniques.
- develop a virtual satellite earth station.
- navigate the receiving station by global positioning system.

Course Content

UNIT - I: Introduction

A brief history of satellite communications, orbital mechanics and launchers: orbital mechanics, look angle determination, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication systems performance.

UNIT - II: Satellite Subsystems

Attitude and orbit control system, telemetry, tracking, command and monitoring, power systems, communication subsystems.

UNIT - III: Satellite Link Design

Basic transmission theory, system noise temperature and G/T ratio, design of down links, up link design, design of satellite links for specified C/N, system design example.

UNIT - IV: Multiple Access

Frequency division multiple access (FDMA), intermodulation, calculation of C/N. Time division Multiple Access (TDMA), frame structure, examples, satellite switched TDMA. onboard processing, DAMA, code division multiple access (CDMA), spread spectrum transmission and reception.

UNIT - V: VSAT Systems

Introduction, overview of VSAT systems, network architectures, access control protocols, basic techniques, VSAT earth station engineering.

UNIT - VI: Satellite Navigation & The Global Positioning System

Radio and satellite navigation, GPS position location principles, GPS receivers and codes, satellite signal acquisition, GPS navigation message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, differential GPS.

Text Books

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt “Satellite Communications”, 2nd Edition John Wiley India, 2006.
2. Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud “Satellite Communications Engineering”, 2nd Edition, Pearson Publications, 2003.

Reference Books

1. M. Richharia “Satellite Communications: Design Principles”, BS Publications, 2nd Edition, 2003.
2. D.C Agarwal “Satellite Communication”, Khanna Publications, 5th Edition.
3. K.N. Raja Rao “Fundamentals of Satellite Communications”, PHI, 2004
4. Dennis Roddy “Satellite Communications”, McGraw Hill, 2nd Edition, 1996.
5. G.S.Rao “Global navigation satellite systems-with essentials of satellite systems”, McGrawHill.

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DIGITAL IMAGE PROCESSING

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce fundamental concepts of image processing and different operations on image elements.
- To expose to the practical problems associated with processing of an image.
- To familiarize with advanced image processing operations.

Learning Outcomes

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

- analyze the need for image transforms, types and their properties.
- process the images for the enhancement of certain properties or for optimized use of the resources.
- explore causes for image degradation and to develop various restoration techniques.
- evaluate the image compression techniques

Course Content

UNIT - I: Fundamentals of Image Processing and Image Transforms

Introduction, fundamental steps in image processing, components of image processing system, image sensing and acquisition, image formation model, image sampling and quantization, pixel relationships, image distance measures.

Image Transforms - Need for image transforms, properties of DFT, Discrete Cosine Transform, Hadamard transform, Walsh transform, Haar transform, Slant transform.

UNIT - II: Image Enhancement

Spatial Domain: Gray level transformations, histogram processing, spatial filtering smoothing and sharpening. **Frequency Domain:** Filtering in frequency domain – smoothing and sharpening filters, homomorphic Filtering.

UNIT - III: Image Restoration

Image degradation model, noise modeling, image restoration in the presence of only noise-mean filters, order statistic filters, band reject filters, band pass filters, notch filter inverse filter, wiener filter.

UNIT - IV: Image Segmentation and Morphology

Detection of discontinuities, edge detection, threshold based segmentation, region based segmentation – region growing, region splitting and merging.

Morphology: dilation, erosion, opening and closing, hit or miss transformation, basic morphological algorithms.

UNIT - V: Image Compression

Image Compression: Fundamentals, image compression model, types of redundancy, variable length coding, arithmetic coding, LZW coding, bit-plane coding, runlength coding.

UNIT - VI: Color Image Processing

Color Image Processing: Color fundamentals, color models-RGB,CMYK and HSI, color transformations.

Applications of Image Processing: Content based image retrieval systems, digital watermarking, image mosaicing and image compositing.

Text Books

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, 2nd edition, Pearson Education, 2003.(Units: I-V except image transforms)
2. S.Sridhar, “Digital Image Processing”,Oxford University Press,2011. (Unit-I image transforms and Unit-VI).

Reference Books

1. Anil K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India,2nd edition 2004.
2. S.Jayaraman, “Digital Image Processing”, Tata McGraw-Hill Education, 2011.

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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 agencies and 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; skills and strategies; rescue, relief reconstruction. Case Studies: Lessons and Experiences from Various Important Disasters in India

UNIT - III: Flood and Drought Disaster

Raising flood damage, assessing flood risk, flood hazard assessment, flood impact assessment, flood risk reduction options. Drought and development, relief management and prevention, drought mitigation and management-integrating technology and people.

UNIT - IV: Landslide and Earthquake Disaster

Land slide hazards zonation mapping and geo environmental problems associated with the occurrence of landslides. The use of electrical resistivity method in the study 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 safety and 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, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic 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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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 algorithms 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-point, 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 occurred.

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, Earthing – 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. Refrigeration 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
- assess 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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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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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 (IoT).
- 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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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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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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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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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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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, lambda 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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MICROWAVE AND OPTICAL COMMUNICATIONS LAB

IV Year – I Semester

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

Course Objectives

- To familiarize with the behavioural aspects of various microwave sources and optical sources
- To introduce the measurement procedures of important parameters in microwave engineering and optical engineering

Learning Outcomes

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

- experiment with microwave sources like reflex klystron, Gunn diode and optical sources like LED's & Lasers.
- conduct measurements using a standard microwave test bench, analog and digital optical links for microwave and optical signal characteristics.
- develop test bench for characterizing a given microwave component.

List of Experiments

Part – A: (Minimum 7)

1. Reflex Klystron characteristics.
2. Gunn diode characteristics.
3. Attenuation measurement.
4. Directional coupler characteristics.
5. VSWR Measurement.
6. Impedance measurement.
7. Waveguide parameters measurement.
8. S matrix of Circulator.
9. S matrix of Magic Tee.

Part – B: (Minimum 5)

1. Characterization of LED.
2. Characterization of Laser diode.
3. Intensity modulation of laser output through an optical fiber.

4. Measurement of data rate for digital optical link.
5. Measurement of numerical aperture.
6. Measurement of losses in plastic fiber.

Reference Books

1. Samuel Y. Liao , “Microwave Devices and Circuits” , PHI, 3rd Edition, 1994.
2. R.E. Collin, “Foundations for Microwave Engineering”, IEEE Press, John Wiley, 2nd Edition, 2002.
3. Peter A. Rizzi, “Microwave Engineering Passive Circuits” –PHI, 1999.
4. M.L. Sisodia and G.S.Raghuvanshi, “Microwave Circuits and Passive Devices” Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
5. R. Chatterjee, “Elements of Microwave Engineering”, Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
6. Gerd Keiser, “Optical fiber communications” –3rd Edition, McGrawHill.
7. Djafar K. Mynbaev and Lowell L. Scheiner, “Fiber Optic Communication Technology” (Pearson Education Asia)
8. User manuals for Microwave Lab equipment.
9. Data sheets for optical sources.

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Optional Elective - VII

DIGITAL CONTROL SYSTEMS

IV Year – I 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 methods of evaluation – discretization of continuous – time state equations – concepts of controllability and observability – tests.

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 lead 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. K. Ogata, "Discrete Time Control systems", Pearson Education/PHI, 2nd Edition
2. M. Gopal, "Digital Control and State Variable Methods", Tata Mc Graw-Hill Companies, 1997.

Reference Books

1. Kuo, "Digital Control Systems", Oxford University Press, 2nd Edition, 2003.
2. M. Gopal, "Digital Control and State Variable Methods", TMH.

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Optional Elective - VII

ARTIFICIAL INTELLIGENCE

IV Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objective

- 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, propositional logic, natural deduction system, axiomatic system, semantic table system in propositional logic, resolution in propositional 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.

Web Links

1. https://onlinecourses.nptel.ac.in/noc18_cs19
2. https://www.tutorialspoint.com/artificial_intelligence/index.htm
3. <https://www.ibm.com/developerworks/library/cc-beginner-guide-machine-learning-ai-cognitive/index.html>

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TRANSFORM TECHNIQUES

IV Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with wavelet transforms and multi rate analysis.
- To impart the knowledge of wavelet packets and wavelet generation.

Learning Outcomes

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

- analyze various signals using Fourier and wavelet transforms.
- apply different transform techniques for the analysis of one and two dimensional signals.
- describe various filter banks and signal reconstruction techniques.
- perform different processing operations using thresholding techniques.

Course Content

UNIT - I: STFT and Introduction of Wavelet Transform Time – frequency analysis: window function, short time Fourier transform, discrete short time Fourier transform, continuous wavelet transform, discrete wavelet transform, wavelet series, interpretation of the time-frequency plot.

UNIT - II: Transforms -Walsh, Hadamard, Haar and Slant transforms, DCT, DST, KLT, singular value decomposition; definition, properties.

UNIT - III: Continuous Wavelet Transform (CWT) - Short comings of STFT, need for wavelets, wavelet basis- concept of scale and its relation with frequency, continuous time wavelet transform equation- series expansion using wavelets, CWT, tiling of time scale plane for CWT. Haar, Mexican hat, Shannon, and Daubechies wavelets.

UNIT - IV: Multi resolution analysis-Image pyramids,subband coding,multi resolution expansions, two-channel filter banks, perfect reconstruction condition, relationship between filter banks and wavelet basis.

UNIT - V: Discrete Wavelet Transform (DWT)- DWT, structure of DWT filter banks,scaling function and its properties,wavelet function and its properties, Daubechies wavelet function, applications of DWT.

UNIT - VI: Wavelet Packets and Lifting- Wavelet packet transform and algorithms, hard and soft thresholding, multidimensional wavelets, bi-orthogonal basis - B-splines, lifting scheme of wavelet generation, multi wavelets.

Text Books

1. K.P.Soman and K.I Ramachandran, "Insight into Wavelets – from theory to practice" PHI, Second Edition, 2008. (All Units)
2. Jaideva C Goswami, Andrew K Chan, "Fundamentals of Wavelets- Theory", Algorithms and Applications", John Wiley & Sons, Inc, 1999. (Units: I, III, IV, V)

Reference Books

1. Raghuveer M.Rao and Ajit S. Bopardikar, "A Wavelet Tour of Signal Processing Theory and Applications", Pearson Edu, 2003.
2. S.Jayaraman, S.Esakkirajan, T.Veera Kumar, "Digital Image Processing", Tata McGraw Hill, 2009.

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LOW POWER VLSI CIRCUITS

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To make the students familiarize with the sources of power dissipation and power minimization techniques.

Learning Outcomes

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

- identify the requirements for low power
- distinguish static and dynamic power dissipations
- apply voltage scaling approaches to reduce dynamic power
- apply various methods to minimize switched capacitance
- identify suitable leakage power minimization technique
- describe low power design methodologies such as adiabatic circuits.

Course Content

UNIT - I: Low Power Requirements

Historical background, requirements for low power, sources of power dissipation, low power design methodologies.

UNIT - II: Sources of Power Dissipation

Short circuit power dissipation, switching power dissipation, glitching power dissipation, leakage power dissipation.

UNIT - III: Supply Voltage Scaling Approaches

Device feature size scaling, architectural level approaches, voltage scaling using high-level transformations, multilevel voltage scaling.

UNIT - IV: Switched Capacitance Minimization Approaches

Hardware software trade-off, bus encoding, clock gating, glitching power minimization, logic styles for low power.

UNIT - V: Leakage Power Minimization Approaches

Variable-Threshold voltage CMOS (VTCMOS) approach, transistor stacking, Multi-Threshold-voltage CMOS (MTCMOS) approach, power gating.

UNIT - VI: Adiabatic Logic Circuits

Adiabatic charging, adiabatic amplification, adiabatic logic gates, pulsed power supply, partially adiabatic circuits.

Text Books

1. Jan M. Rabaey and Massoud Pedram, “Low Power Design Methodologies”, Kluwer Academic Publishers, 1996 (Unit-I).
2. Ajit Pal, Low Power VLSI Circuits and Systems, Springer India, 2015 Edition (Units - II to VI)

Reference Books

1. Sung Mo Kang and Yusuf Leblebici, “CMOS Digital Integrated Circuits”, Tata Mcgraw Hill, Third Edition.
2. Neil H. E. Weste and K. Eshraghian, “Principles of CMOS VLSI Design”, Addison Wesley (Indian reprint), Second Edition.
3. A. Bellamour and M. I. Elmasri, “Low Power VLSI CMOS Circuit Design”, Kluwer Academic Press, 1995.
4. Anantha P. Chandrakasan and Robert W. Brodersen, “Low Power Digital CMOS Design”, Kluwer Academic Publishers, 1995.
5. Kaushik Roy and Sharat C. Prasad, “Low-Power CMOS VLSI Design”, Wiley-Interscience, 2000.
6. Prof. Ajit Pal, Department of Computer Science and Engineering, IIT Kharagpur, Low Power VLSI Circuits & Systems, NPTEL video course.

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REAL TIME OPERATING SYSTEMS

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the basic concepts of real time operating system, skills necessary to design and develop embedded applications by means of real time operating systems.
- To get acquainted with the Unix / Linux and RTLinux basic concepts and programming.

Learning Outcomes

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

- apply the concepts of real time operating system.
- develop software for embedded systems using the system design techniques.
- identify how to port RTOS on a microcontroller based development board.
- model real-time applications using Unix/Linux and RTLinux programming.

Course Content

UNIT - I: Introduction to Real Time Operating Systems

Multiple processes and multiple threads in an application, tasks, task states, task and data, OS services, process management, timer functions, event functions, memory management, device, file and IO systems management, interrupt routines in RTOS environment and handling of interrupt source calls, Real-Time Operating Systems, basic design using an RTOS.

UNIT - II: Real Time Operating Systems

RTOS task scheduling models interrupt latency and response of the tasks as performance metrics, OS security issues, basic functions and types of RTOS for embedded systems, basic features of RTOS mCOSA-II, Vx works, Windows CE and OSEK.

UNIT - III: Target Image Creation

Off-the-shelf operating systems, operating system software, target image creation for Windows XP embedded, porting RTOS on a micro controller based development board.

UNIT - IV: Programming in Linux

Overview and programming concepts of Unix/Linux, shell programming, system programming – fork demo, semaphores and Mutex.

UNIT - V: Programming in RTLinux

Overview of RT Linux, Core RT Linux API, program to display a message periodically, Semaphore management, Mutex management.

UNIT - VI: Case Studies-Program Modeling with RTOS

Case study - digital camera hardware and software architecture, coding for sending application layer byte streams on a TCP/IP network using RTOS Vx works. Case study of embedded systems - for an adaptive cruise control system in a car and for a smart card.

Text Books

1. Rajkamal: “Embedded Systems-Architecture, Programming and Design”, Tata McGraw Hill Publications, 2nd Edition, 2008 (For units: I, II & VI).
2. Dr. K.V.K.K. Prasad: “Embedded/Real-Time Systems”, Dream Tech Publications, 2003. (For units: I, III, IV & V)

Reference Books

1. Jean J.Labrosse, “Embedding system building blocks”, CMP publishers, 2nd Edition.
2. Rob Williams, “Real time Systems Development”, Butterworth Heinemann Publication, 2006.

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SPEECH PROCESSING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with speech production, speech analysis and speech processing.
- To introduce the concepts of coding of speech, speech enhancement, speech and speaker recognition systems

Learning Outcomes

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

- understand how speech is produced.
- perform speech analysis and homomorphic processing of speech signals.
- code the speech signals using linear predictive analysis.
- enhance the speech signals and recognize speech as well as speaker.

Course Content

UNIT - I: Speech Production

Anatomy and Physiology of Speech organs- Lungs, Larynx and vocal tract, Articulatory Phonetics, Acoustic Phonetics, Acoustic theory of speech production, Lossless Tube Models, Digital Models for Speech Signals.

UNIT - II: Speech Analysis

Short-Time Speech Analysis: Windowing, Spectra of Windows, Time domain parameters- Signal analysis in time domain, Short time average energy, magnitude, zero-crossing rate and auto correlation function, Frequency domain (Spectral) Parameters : Short-Time Fourier Transform Analysis, Spectral Displays, Formant Estimation and Tracking, Energy separation.

UNIT - III: Homomorphic Speech Processing

Homomorphic systems for Convolution, Complex cepstrum of speech, Pitch detection, formant estimation, Homomorphic Vocoder.

UNIT - IV: Linear predictive coding (LPC) of Speech

Basic principles of Linear predictive Analysis, Computation of Gain, Solution of LPC Equation- Cholesky Decomposition solution for covariance method and Durbin's Recursive Solution for the Autocorrelation Equations, Prediction error

Signal, Frequency domain interpretation of mean squared prediction error, Applications of LPC parameters –pitch detection and Formant analysis using LPC parameters.

UNIT - V: Speech enhancement

Nature of interfering sounds, Spectral subtraction, Filtering and adaptive noise cancellation, Multi-Microphone Adaptive Noise Cancellation.

UNIT - VI: Networks for speech recognition

Hidden Markov Model (HMM), training and testing using HMMs, adapting to variability in speech.

Speech Recognition Systems: Isolated Digit Recognition system and continuous Digit Recognition system, LPC Distance measures .

Speaker Recognition Systems: Verification vs Recognition, Speaker verification system and speaker identification system

Text Books

1. Douglas O Shaughnessy, “Speech Communications”, Second Edition, Oxford University Press, 2000 (Units I, II, V, VI).
2. L.R. Rabiner and S.W. Schafer, “Digital Processing of Speech Signals”, Person Education (Units I, III, IV, VI).

Reference Books

1. Thomas F. Quatieri , “Discrete –Time Speech signal Processing Principles and Practice”, Person Education.
2. Dr. Shaila D. Apte, “Speech and Audio Procesing” , WILEY Precise Textbook.
3. Claudio Becchetti and Klucio Prina Ricotti, “Speech Recognition Theory and C++ Implementation”, WILEY.

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ADAPTIVE SIGNAL PROCESSING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of Wiener and Kalman filtering.
- To familiarize with the concepts of linear and non-linear adaptive signal processing techniques.

Course Outcomes:

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

- understand the concept of adaptive filters.
- apply Wiener and Kalman filters for signal processing applications.
- apply LMS and RLS algorithms for adaptive filter applications.
- understand the concepts of linear and non-linear adaptive signal processing techniques.

Course Content

UNIT - I: Introduction To Adaptive Filtering

Introduction to stochastic processes, linear adaptive filter structure, real and complex forms of adaptive filter, non-linear adaptive filter, adaptation approaches: Wiener filter theory method of least squares.

UNIT - II: Optimal Wiener Filtering

Mean-Square Error criterion, linear optimum filtering statement, principle of orthogonality, Wiener-Hopf equation, error performance surface, numerical examples, channel equalization, linear constrained minimum variance filter.

UNIT - III: Kalman Filtering

Statement of Kalman filtering problem, estimation of state using innovation, variance of Kalman filtering, extended Kalman filtering.

UNIT - IV: Linear Adaptive Filtering

Method of steepest descent, stability of steepest descent, least mean square algorithm, adaptive prediction, adaptive equalization, robustness of LMS algorithm, block adaptive filter, fast LMS algorithm, unconstrained frequency-domain adaptive filtering, methods of least squares.

UNIT - V: Recursive Least Squares

Matrix inversion lemma, weighted recursive least squares algorithm, adaptive noise canceller, convergence analysis of RLS algorithm, adaptive equalization, state-space formulation of RLS problem, adaptive beam-forming, order recursive adaptive Filter.

UNIT - VI: Non-Linear Adaptive Filtering

Introduction to blind de-convolution, back-propagation learning, radial basis function learning, stochastic gradient approach, Markov model, singular value decomposition.

Text Books

1. Simon Haykin, "Adaptive Filter Theory", Prentice Hall International", 3rd Edition., 2002.
2. Bernard Widrow and Samuel Stearns, "Adaptive Signal Processing", Pearson Education, 2nd Edition., 1995.

Reference Books

1. Ali H. Sayed, "Fundamentals of Adaptive Filtering", Wiley, 1st Edition., 2003.
2. Farhang-Boroujeny B., "Adaptive Filters Theory and Applications", John Wiley & Sons, 1st Edition., 1998.
3. Mohamed Ibnkahla (Edited), "Adaptive Signal Processing in Wireless Communications", CRC Press, Taylor & Francis Group, 1st Edition., 2009.

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ASIC DESIGN

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce design issues and tools related to ASIC.
- To familiarize placement and routing algorithms.

Learning Outcomes

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

- understand the different types of ASICs and its Design Flow.
- analyze the Characteristics and Performance of Programmable ASICs, Logic cells, I/O Cells and Interconnects.
- measure goals and objectives related to Floor planning, Placement and Routing.

Course Content

UNIT - I: Programmable ASICs and ASIC Logic Cells

Programmable ASICs: Antifuse, Static RAM, EPROM and EEPROM Technology.

Programmable ASIC Logic Cells: Actel ACT and Xilinx LCA

UNIT - II: Programmable ASIC I/O Cells and Interconnect

Programmable ASIC I/O Cells: DC Output, AC Output, DC Input, AC Input, Clock Input and Power Input.

Programmable ASIC Interconnect: Xilinx LCA and Xilinx EPLD.

UNIT - III: ASIC Construction

Physical Design, CAD Tools, System Partitioning, Estimating ASIC Size and Power Dissipation

UNIT - IV: Floorplanning

Floorplanning Goals and Objectives - Measurement of Delay in Floorplanning - Floorplanning Tools - Channel Definition - I/O and Power Planning - Clock Planning.

UNIT - V: Placement

Placement Terms and Definitions, Placement Goals and Objectives – Measurement of Placement Goals and Objectives - Placement Algorithms - Timing-Driven Placement Methods, A Simple Placement Example.

UNIT - VI: Routing

Global Routing - Goals and Objectives - Measurement of Interconnect Delay - Global Routing Methods - Global Routing Between Blocks – Timing Driven Methods

Detailed Routing - Goals and Objectives - Measurement of Channel Density – Left Edge Algorithm - Constraints and Routing Graphs - Area Routing Algorithms - Multilevel Routing

Special Routing - Clock Routing - Power Routing

Text Books

1. M.J.S. Smith, “Application – Specific Integrated Circuits” Pearson Education, India.
2. H.Gerez, “Algorithms for VLSI Design Automation”, John Wiley, 1999.

Reference Books

1. J.M.Rabaey, A. Chandrakasan, and B. Nikolic, “Digital Integrated Circuit Design Perspective (2/e)”, PHI 2003
2. D. A.Hodges, “Analysis and Design of Digital Integrated Circuits (3/e)”, MGH 2004.

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EMBEDDED C

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the basic concepts of embedded systems, processors, and programming languages.
- To familiarize with various interfaces, memory, and power consumption.

Learning Outcomes

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

- distinguish C and Embedded C.
- select the processor, memory and operating system for an application.
- design and develop an application using Embedded C.

Course Content

UNIT - I: Embedded Hardware and Software

Introduction to embedded system, selection: processor, programming language and operating system; steps in developing embedded software.

Programming 8051 in C: data types and time delay, I/O programming, logical operations, data conversion, data serialization

UNIT - II: Programming 8051 in C

8051 Timer programming: simple programs on timers 0 and 1 with some delay in mode1 and mode 2, 8051 serial port programming: Transmitting and receiving data in 8051.

UNIT - III: I/O Port Programming

Basic techniques for reading from port pins, reading and writing bytes, reading and writing bits, need for pull-up resistors, dealing with switch bounce, reading switch inputs.

UNIT - IV: Object Oriented Concepts

Object-oriented programming with C, the project header (MAIN.H), the port header (PORT.H), restructuring the goat-counting example.

UNIT - V: Real-time Constraints

Introduction, creating 'hardware delays' using timer 0 and timer 1, generating a precise 50 ms delay, creating a portable hardware delay, use of timer 2, need for 'timeout' mechanism, creating loop timeouts, testing loop timeouts, reliable switch interface, creating hardware timeouts, testing a hardware timeout.

UNIT - VI: Creating an Embedded Operating System

Introduction, the basis of simple embedded OS, Introducing sEOS, using Timer 0 or Timer 1, important design considerations when using sEOS

Text Books

1. Michael J. Pont, "Embedded C", Pearson Education, 2nd Edition, 2008.(Units I,III,IV,V,VI)
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, 2nd Edition, 2008. (Units I,II)

Reference Books

1. Zdravko Karakehayov, Knud Smed Christensen, Ole Winther, "Embedded Systems Design with 8051 Microcontrollers", Marcel Dekker, Special Indian Edition, 2010.
2. Michael Barr, "Programming Embedded Systems in C and C++", Oreilly, 2003.

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RADAR ENGINEERING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the fundamentals concepts in radar.
- To familiarize with working of different radar systems.
- To impart the knowledge of detection of radar signals in noise.

Learning Outcomes

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

- compute different parameters from radar data.
- conceptualize the radar operation.
- distinguish moving target and pulse Doppler radars.
- understand the operation of different radar receivers.
- track different objects by using radar in different noise conditions.
- realize radar systems for electronic warfare.

Course Content

UNIT - I: Introduction

The Radar equation- introduction, detection of signals in noise, receiver noise and S/N ratio, probability function, probability of detection and false alarm, radar cross section of targets, transmitter power, pulse repetition frequency.

UNIT - II: CW Radar

Principle, doppler effect, block diagram, operation, measurement of velocity and elevation of target, applications. FMCW radar: block diagram, principle of operation, applications, salient features.

UNIT - III: MTI and Pulse Doppler Radar

Introduction, principle, MTI Radar with- power amplifier transmitter and power oscillator transmitter, delay line cancellers, frequency response, blind speeds, staggered PRFs.

UNIT - IV: Tracking Radar

Tracking with Radar, mono-pulse tracking, conical scan, sequential lobing. Radar receivers – noise figure and noise temperature, duplexers and receiver protectors, radar displays.

UNIT - V: Detection of Radar Signals in Noise

Introduction, matched filter receiver – response characteristics and derivation, correlation detection, detection criteria, detector characteristics, automatic detection, constant false alarm rate receiver

UNIT - VI: Electronic Warfare

Electronic counter measures and electronic counter-counter measures, introduction, electronic counter measures, radar jamming, electronic counter-counter measures, electronic support, stealth applications.

Text Books

1. Merrill I Skolnik “Introduction to Radar Systems”, 3rd Edition, TMH, 2006
2. G.S.N.Raju “Radar Engineering and fundamentals of Navigational Aids”, I.K International, 2008.

Reference Books

1. KK Sharma “Fundamentals of RADAR”, sonar and Navigation Engineering, SK Kataria&Sons, 4th Edition, 2014.
2. Byron Edde “Radar: Principles, Technologies, Applications”, Pearson Education.

* * *

MULTI RATE SIGNAL PROCESSING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objective

- To familiarize with the concepts of interpolation and Decimation
- To familiarize with the concepts of different types of filter banks and structures.

Learning Outcomes

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

- acquire the knowledge of multirate signal processing .
- design perfect reconstruction and near perfect reconstruction filter bank system and to learn to assess the computational efficiency of multirate systems.
- analyze the quantization effects in filter banks.
- recognize the use of filter banks in applications such as speech processing and communication

Course Content

UNIT - I: Basic Multirate Operations

Decimation and Interpolation, time-domain characterization, frequency-domain characterization, cascade equivalences, filters in sampling rate alteration systems.

UNIT - II: Uniform DFT Filter Banks

Polyphase decomposition, digital filter banks- uniform DFT filter banks, polyphase implementation of uniform filter banks, Nyquist filters.

UNIT - III: Two Channel Quadrature-Mirror Filter (QMF) Bank

Filter bank structure, analyses of two channel QMF bank, alias free filter bank, alias free realization, alias free FIR QMF bank, alias free IIR QMF bank, perfect reconstruction two channel QMF bank.

UNIT - IV: M-Channel Perfect Reconstruction Filter Banks

Uniform band and non uniform filter bank - tree structured filter bank- errors created by filter bank system- polyphase representation- perfect reconstruction systems.

UNIT - V: Paraunitary Perfect Reconstruction (PR) Filter Banks

Paraunitary PR Filter Banks- filter bank properties induced by paraunitarity- two channel FIR paraunitary QMF Bank, linear phase PR filter banks: necessary conditions for linear phase property, quantization effects: types of quantization effects in filter banks, coefficient sensitivity effects, dynamic range and scaling.

UNIT - VI: Cosine Modulated Filter Banks

Cosine modulated pseudo QMF Bank- alias cancellation, eliminating phase distortion, closed form expression for the filters, polyphase structure, PR systems

Text Books

1. P. P. Vaidyanathan. "Multirate systems and filter banks." Prentice Hall. PTR. 1993.
2. Sanjit K. Mitra. " Digital Signal Processing: A computer based approach." McGraw Hill. 1998.

Reference Books

1. J.G. Proakis. D.G. Manolakis. "Digital Signal Processing: Principles. Algorithms and Applications", 3rd Edn. Prentice Hall India, 1999.
2. N.J. Fliege. "Multirate digital signal processing ." John Wiley 1994.
3. R.E. Crochiere. L. R. "Multirate Digital Signal Processing", Prentice Hall. Inc.1983.

* * *

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:

- 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.
- A candidate shall be declared to have passed in individual laboratory/ project / mini project / field work / industrial internship / 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.
- 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:

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

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:

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

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 reevaluate 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 & 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) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

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	CT2526 EC2511 EE2512	Optional Elective - III i) Human Computer Interaction ii) Digital Signal Processing iii) Control Systems	-	-	-	3
10	CS2510	Optional Elective - IV (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

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 Mining	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	CS2516 EC2512 EE2554	Optional Elective - V i) Graph Theory ii) Embedded System Design iii) Digital Control Systems	-	-	-	3
10	CS2517	Optional Elective - VI (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

* 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			No. of Credits
			L	T	P	
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) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

IV Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
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			No. of Credits
			L	T	P	
		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 conversation **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 inconsistency, 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.Kuriscose 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. Ltd.(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 $\text{area} = (s(s-a)(s-b)(s-c))^{1/2}$ 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 from 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(), strev()

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

- Samson, T. (2010). *Innovate with English*. Hyderabad: Foundation
 - Unit SEVEN and EIGHT only
- Vijayalakshmi, M. et al (2014). *Vocabulary Builder for Students of Engineering and Technology*. Hyderabad: Maruthi Publications.
- 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
- 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-written e-mail message and doing the following task:(Compulsory)

- a. Analyzing the reasons for the 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 them.

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-Mossotti relation- -Dielectric loss -Break down-Ferroelectrics.

Text Books

1. Charles Kittel, Introduction to Solid-state physics, (8th Edition) , John Wiley & Sons, Inc
2. Dr. M.N. Avadhanulu , Dr. P.G.Kshirsagar, A Text Book of Engineering Physics (9th 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, π -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 Guillermo Rico, Electronic 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 Andhra Pradesh.

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 (1 page / 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 thermistor
- 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, Multiplexers and De-Multiplexers.
- 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
Credits : 2

Internal Marks : 40
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 in turn 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 remainder. 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 remainder (-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 ϵ -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 Chandrashekar, "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

- familiarize with 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 Das and 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, Arunkumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books

1. Surveying Theory and Practice, James M Anderson and Edward, 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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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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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: Dielectric 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, bimetallic 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 Materials, Radioactive Materials, Galvanization 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, Wiley 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, battery ignition system - components, Magneto ignition system, Electronic ignition system.

Electrical System: charging circuit- generator, current-voltage regulator, starting 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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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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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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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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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 XMLAJAX.

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

$\phi(x)$, $d(x)$, $\mu(x)$, $\sigma(x)$, Mobius inversion formula, Linear Diophantine 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 Montgomery L.H., **An Introduction to Theory of Numbers**, John Wiley and Sons (1991).

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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-concentration and 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
Credits : 2

Internal Marks : 40
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
Credits : 2

Internal Marks : 40
External 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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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, lambda 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
Credits : 3

Internal Marks : 40
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 Loudon, "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", 4th edition, Pearson.
2. Behrouz A Forouzan, "Data Communications and Networking", 5th edition, TMH.

Reference Books

1. S. Keshav, "An Engineering Approach to Computer Networks", 2nd dition, Pearson Education.
2. W.A. Shay, Thomson, "Understanding Communications and Networks", 3rd 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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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# Precisely", Prentice Hall of India.

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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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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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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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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, 4th Edition, B.S.Publications.
2. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman , 7th Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5th 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, Filariasis, 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 assess 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 University, available online, accessed, 7, 2008.
2. David F.Griffiths, October (2012) “An introduction to MATLAB” the University of Dundee, available online, Accessed, 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 rods, 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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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, fluorescence 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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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”, Wiley Publications, 2003.
2. Steve Suchring, “MySQL Bible”, John Wiley, 2002

Reference Books

1. Rasmus Lerdorf 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. Vikram Vaswani, “MYSQL: The Complete Reference”, 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.

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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 No Punishment.

UNIT - II: Cyber Crime and Criminal Justice

Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber fraud and Cyber Cheating, Virus on Internet Deformation, Harassment and E- mail Abuse

UNIT - III: Cyber Criminality Strategies and Trends

Network Service Providers, Jurisdiction and Cyber Crimes, 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 Event of Digital Signature compromise, E - Governance in the India. A Warning to Babudom, Are Cyber Consumers Covered under the Consumer Protection, Goods and Services, Consumer Complaint Defect in Goods and Deficiency in Services Restrictive and Unfair Trade Practices

UNIT - V: Traditional Computer Crime

Early Hacker and Theft of Components Traditional problems, Recognizing and Defining Computer Crime, Phreakers: Yesterday's Hackers, Hacking, Computers as Commodities, Theft of intellectual Property.

UNIT - VI: Web Based Criminal Activity

Interference with Lawful Use of Computers, Malware, DoS (Denial of Service) and DDoS (Distributed Denial of Service) Attacks, Spam, Ransomware and Kidnapping of Information, Theft of Information, Data Manipulation, and Web Encroachment Online Gambling Online Fraud, Securities Fraud and stock Manipulation, Ancillary crimes

Text Books

1. Vivek Sood, "Cyber Law Simplified", 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. Degeneracy in TP and resolving it.

UNIT - VI: Assignment and Sequencing Problems

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 and 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: Reliability and Life Testing
3. S. M. Ross: Probability Models, Harcourt India Pvt. Ltd.
4. D. C. Montgomery: Introduction to Statistical Quality Control, Wiley.
5. Hadly: Linear Programming, Addison – Wiley.
6. Taha: Operation Research: An Introduction, Mac Millan.
7. Wayne L. Winston: Operations Research, Thomson, India edition, 4th 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 at each node using distance vector routing algorithm.
5. Implement hierarchical 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 Loudon, "Compiler construction, Principles and Practice", Cengage.

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WEB TECHNOLOGIES LAB
(Common to CSE & IT)
III Year – I Semester

Practical : 4
Credits : 2

Internal Marks : 40
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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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, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution in propositional 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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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", 2nd Edition, Dreamtech Press.
2. Dave Thomas, "Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide", 4th Edition, Pragmatic Bookshelf.
3. Randal L. Schwartz, y Brian D. Foy,y Tom Phoenix, "Learning Perl", 6th edition, O'REILLY Publications.

Reference Books

1. Uttam K Roy, "Web Technologies", Oxford
2. Chris Bates, WILEY, "Web Programming: building internet applications", Dreamtech, 2nd edition.
3. Robert W Sebesta, "Programming the World Wide Web", Pearson publications, 4th edition

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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-Variation 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-488, prototyping and trouble shooting.

Text Books

1. D. V. Hall, "Microprocessors and Interfacing", TMGH, 2nd edition.
2. Barry 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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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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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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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 Resistors

Resistivity, Range of Resistivity- free electron theory - classical theory & quantum theory. Semiconducting materials: Energy gap in solids - intrinsic semi conductors - extrinsic semi conductors - element & compound 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 susceptibility - complex dielectric 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, Reflection, 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 tilted 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 novel 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 diagnosis 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), evoked 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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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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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 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 - 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, 2nd Edition, Dreamtech Press
- Dave Thomas, Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide, 4th Edition, Pragmatic Bookshelf
- Randal L. Schwartz,ý Brian D. Foy ,ý Tom Phoenix, Learning Perl, 6th edition, O'REILLY Publications.

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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 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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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.
- use 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 n th 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 differential 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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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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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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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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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”, 5thedition, 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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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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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.
- Illustrate 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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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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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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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 $2 \times n$ and $m \times 2$ 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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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 agencies and 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; skills and strategies; rescue, relief reconstruction. Case Studies: Lessons and Experiences from Various Important Disasters in India

UNIT - III: Flood and Drought Disaster

Raising flood damage, assessing flood risk, flood hazard assessment, flood impact assessment, flood risk reduction options. Drought and development, relief management and prevention, drought mitigation and management-integrating technology and people.

UNIT - IV: Landslide and Earthquake Disaster

Land slide hazards zonation mapping and geo environmental problems associated with the occurrence of landslides. The use of electrical resistivity method in the study 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 safety and 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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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, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic 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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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 algorithms 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-point, 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 occurred.

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, Earthing – 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. Refrigeration 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
- assess 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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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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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 (IoT).
- 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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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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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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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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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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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, lambda 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
Credits : 2

Internal Marks : 40
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 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 Books

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia.

Reference Books

1. D. M. Dhamdhare, "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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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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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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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.

* * *

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.

* * *

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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DISTRIBUTED 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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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 framework, 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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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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ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

INFORMATION TECHNOLOGY

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 innovation by adopting changes in Information Technology, imparting quality education, research to produce visionary computer professionals and entrepreneurs.

Mission

- * To provide an academic environment in which students are given the essential resources for solving real-world problems and work in multidisciplinary teams.
- * To impart value based education and research among students, particularly belonging to rural areas, for their sustained growth in technological aspects and leadership.
- * To collaborate with the industry for making the students adoptable to evolving changes in Information Technology and related areas.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- * To exhibit analytical skills in modeling and solving computing problems by applying mathematical, scientific and engineering knowledge and to pursue their higher studies.
- * To communicate effectively with multi-disciplinary teams to develop quality software systems with an orientation towards research and development for lifelong learning.
- * To use emerging technologies in project development to fulfil industry and societal needs for the growth of global economy following professional ethics.

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

- * Organize, maintain and protect IT Infrastructural resources.
- * Design and Develop web, mobile, and smart apps based software solutions to the real world problems.

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:

- 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.
- 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.
- 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:

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

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:

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

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 reevaluate 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 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)	23	14.38	15 - 20
2	Humanities and Social Sciences (HSS)	12	7.50	10 - 15
3	Engineering Sciences (ES)	29	18.12	10 - 20
4	Professional Core (PC)	52	32.50	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 & 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 & Integral Transforms	4	1	-	4
3	PH2506	Applied Physics	4	-	-	3
4	EN2501	Environmental Studies	3	-	-	2
5	CT2502	Problem Solving through Computer Programming	4	-	-	3
6	EG2502	Functional English Lab	-	-	2	1
7	PH2507	Applied Physics Lab	-	-	2	1
8	CT2503	Computer Programming Lab	-	-	4	2
Total			19	1	8	19

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	CH2506	Chemistry	4	-	-	3
4	EN2502	Engineer & 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	EC2502	Elements of Electronics Engineering Lab	-	-	4	2
Total			20	2	10	21

* 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	MA2508	Discrete Mathematical Structures	3	1	-	3
2	CT2505	Data Structures	3	1	-	3
3	CT2506	Digital Logic Design	3	1	-	3
4	CT2507	Object Oriented Programming through Java	4	-	-	3
5	IT2501	UNIX and Shell Programming *	4	-	2	4
6	CT2508	Data Structures Lab	-	-	4	2
7	CT2509	Object Oriented Programming Lab	-	-	4	2
Total			17	3	10	20
8	NS2501	NSS / Fine Arts / Yoga / Self Defense (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	EC2521	Microprocessors and Microcontrollers *	4	-	2	4
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	CT2516	Database Management Systems Lab	-	-	4	2
Total			20	4	6	21
8	SG2501	Sports and Games / Cultural (Mandatory Non-Credit Course)	-	-	2	-
9	IT2503 EC2508 EE2506	Optional Elective - I i) Information and Communication Technology ii) Signals and Systems iii) Basic Electrical Engineering	-	-	-	3
10	IT2504	Optional Elective - II (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

* Integrated Course with Theory and Laboratory

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	CT2510	Operating Systems	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	IT2507	Operating Systems and Compiler Design Lab	-	-	4	2
8	CT2525	Web Technologies Lab	-	-	4	2
Total			21	3	8	22
9		Optional Elective - III	-	-	-	3
	IT2508	i) Object Oriented Programming through C++				
	EC2522	ii) Data Communication				
	CE2549	iii) Building Information Modelling				
10	IT2509	Optional Elective - IV (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

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	IT2510	Object Oriented Analysis and Design *	4	-	2	4
4	CT2519	Computer Networks	3	1	-	3
5		Professional Elective - II	4	-	-	3
6		Open Elective-III (see list of Open Electives)	4	-	-	3
7	IT2513	Computer Networks and Data Mining Lab	-	-	4	2
Total			22	2	6	21
8		Optional Elective - V	-	-	-	3
	IT2514	i) Secure Web Technologies				
	IT2515	ii) Management Information Systems				
	ME2544	iii) Robotics				
9	IT2516	Optional Elective - VI (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

*** 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			No. of Credits
			L	T	P	
1	BA2502	Managerial Economics and Financial Analysis	3	-	-	2
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	IT2522	Mini Project	-	-	4	2
8	IT2523	Internship / Industrial Training / Practical Training	-	-	-	2
Total			19	-	8	20
9		Optional Elective - VII	-	-	-	3
	CT2539	i) Social Networks				
	EC2523	ii) Assistive Technologies				
	ME2542	iii) Renewable Energy Sources				
10	IT2524	Optional Elective - VIII (MOOCs) Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

IV Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Professional Elective - V	4	-	-	3
2		Professional Elective - VI	4	-	-	3
3	IT2529	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			No. of Credits
			L	T	P	
		Professional Elective - I	4	-	-	3
	CT2521	i) Artificial Intelligence				
	EC2512	ii) Embedded System Design				
	CT2514	iii) Computer Graphics				
	CT2522	iv) Advanced Data Structures				
		Professional Elective - II	4	-	-	3
	IT2511	i) Soft Computing Techniques				
	IT2512	ii) Real Time Systems				
	CT2530	iii) Image Processing				
	CT2532	iv) Agile Software Development Process				
		Professional Elective - III	4	-	-	3
	IT2517	i) Machine Learning and Pattern Recognition				
	IT2518	ii) Distributed Operating Systems				
	CT2526	iii) Human Computer Interaction				
	CT2523	iv) Software Testing Methodologies				
		Professional Elective - IV	4	-	-	3
	IT2519	i) Business Intelligence				
	CT2536	ii) Mobile Computing				
	IT2520	iii) Multimedia Tools				
	CT2533	iv) Cryptography and Network Security				
		Professional Elective - V	4	-	-	3
	IT2525	i) Steganography and Biometrics				
	IT2526	ii) Parallel Computing				
	CT2524	iii) Virtual and Augmented Reality				
	IT2527	iv) E-Commerce				
		Professional Elective - VI	4	-	-	3
	CT2535	i) Internet of Things				
	CT2540	ii) Cloud Computing				
	CT2541	iii) Blockchain Technologies				
	IT2528	iv) Design Patterns				

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 conversation **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 1.1 and 1.2)
- 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 inconsistency, 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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Applied Physics

I Year – I 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, (8th Edition) , John Wiley & Sons, Inc
2. Dr. M.N. Avadhanulu , Dr. P.G.Kshirsagar, A Text Book of Engineering Physics (9th 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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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. Ltd.(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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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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Applied Physics Lab

I Year – I 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 thermistor
- 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.

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 $\text{area} = (s(s-a)(s-b)(s-c))^{1/2}$ 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 from 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(), strev()

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	: <i>if</i> -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

- Samson, T. (2010). *Innovate with English*. Hyderabad: Foundation
 - Unit SEVEN and EIGHT only
- Vijayalakshmi, M. et al (2014). *Vocabulary Builder for Students of Engineering and Technology*. Hyderabad: Maruthi Publications.
- 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
- 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-written e-mail message and doing the following task:(Compulsory)

- a. Analyzing the reasons for the 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 them.

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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Chemistry

I Year – II 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.Kurisascoe and J.Rajaram. volumes 1&2,Tata Mc Graw-Hill Publishing.

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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, π -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 Guillermo Rico, Electronic 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 Andhra Pradesh.

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 (1 page / 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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Elements of Electronics Engineering Lab

I Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To familiarize students with basic laboratory equipments.
- To construct various electronic circuits using BJTs and diodes.

Learning Outcomes

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

- Study and test different electronic components and understand the working of various electronic lab equipment.
- Obtain the I-V characteristics of PN junction diode, Zener diode, BJT, FET.
- Obtain the performance characteristics of Half wave and Full wave rectifiers without and with filters, Zener voltage regulator.
- Obtain the frequency response characteristics of CE, CC and FET CS amplifiers.

List of Experiments

1. Identification & Testing of R, L, C and other components.
2. Soldering Practice – Simple circuits using passive and active components.
3. PN Junction diode Characteristics a) Forward bias b) Reverse bias.
4. Zener diode Characteristics a) Forward bias b) Reverse bias.
5. Half – Wave Rectifier with & without Filter.
6. Full – Wave Rectifier with & without Filter.
7. CB Transistor Characteristics.
8. CE Transistor Characteristics.
9. JFET Characteristics.
10. SCR Characteristics.
11. UJT Characteristics.
12. CE amplifier.

Additional Experiments

1. FET amplifier
2. CC amplifier

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DISCRETE MATHEMATICAL STRUCTURES

(Common to CSE & IT)

II Year – I 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, Multiplexers and De-Multiplexers.
- 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, and 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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UNIX AND SHELL PROGRAMMING

II Year – I Semester

Lecture : 4 Practical : 2

Internal Marks : 40

Credits : 4

External Marks : 60

Course Objectives

- To introduce the Architecture of Unix, fundamentals of shell programming.
- To familiarize with file management, directory handling system calls, Unix process and signals.

Learning Outcomes

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

- demonstrate the Architecture of Unix, features and its functions.
- classify the UNIX file system and work with file handling, process, disk, networking utilities.
- illustrate file management and directory handling system calls.
- discriminate types of processes and able to create new process using system calls.
- choose appropriate signals to interrupt the system using system calls.
- develop shell scripts for given applications.

Course Content

UNIT - I: Introduction to UNIX

UNIX Architecture, Features of UNIX, Functions of kernel and shell, types of shells.

Unix commands – man, echo, passwd, uname, who, who am i, date, cal, bc, banner, tty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, touch, clear, more, wc, cmp, diff, comm, head, tail, cut, paste, sort, tr, uniq, nl

Program: Practice session on UNIX commands.

UNIT - II: UNIX Utilities

Introduction to Unix file system, Security by file permissions, file handling utilities, process utilities, disk utilities, networking utilities.

Programs – Practice session on Vi editor and UNIX commands

UNIT - III: Working with the Bourne shell

Introduction to shell, shell responsibilities, Meta characters, pipes and I/O redirections, shell variables, shell environment variables, Arithmetic, conditional

expressions, control structures, positional parameters, shell commands, example - shell script.

Programs :

1. Write a shell script to print the factorial of first n natural numbers.
2. Write a shell script to generate a multiplication table of the given number.
3. Write a shell script that counts the number of lines and words present in a given file.
4. Write a shell script that displays the list of all files in the given directory.
5. 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 remainder. 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 remainder (-r).

UNIT - IV: System calls

File management system calls: open, creat, read, write, close, lseek, dup, dup2.

Directory handling system calls: opendir, readdir, closedir, rewinddir, seekdir, telldir.

Programs:

1. Write a C program that illustrates uses of the opendir, readdir, and closedir APIs.
2. 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.
3. Write a C program that counts the number of blanks in a text file using standard I/O
4. Implement in C, Unix command 'cat' using system calls.

UNIT - V: UNIX Process

Introduction to process, process structure, creating a new process-fork(), vfork(), orphan process, terminating a process, -exit(), zombie process, waiting for child – wait(), waitpid() differentiating a process-exec(), system.

Programs:

1. Write a C program that illustrates the creation of child process using fork system call.
2. Write a program to sort keys of a dictionary.

3. Write a program that prints maximum and minimum value in a dictionary.
4. Write a C program that illustrates how to execute two commands concurrently with a command pipe.

UNIT - VI: Signals

Introduction to Signal, A list of signals – alarm(), handling Signals- signal(), unreliable signals, interrupted system calls, sending signals – kill() ,raise, pause, abort, sleep functions.

Programs:

1. Write a C program to implement the Kill and raise functions
2. Write a C program that displays the real time of a day every 60 seconds.

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 2nd Edition.

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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 in turn 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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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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MICROPROCESSORS AND MICROCONTROLLERS

II Year – I Semester

Lecture : 4 Practical : 2

Internal Marks : 40

Credits : 4

External Marks : 60

Course Objective

- To Introduce the concepts of 16-bit (8086) processor, an 8-bit (8051) controllers and their architecture, internal organization, functions and I/O devices interfacing with the processors.

Learning Outcomes

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

- Apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
- identify a detailed S/W & H/W structure of the Microprocessor & Microcontroller.
- Interface I/O devices to 8086 using Intel 8255.
- distinguish between Microprocessors and Microcontrollers.

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.

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: Basic Peripherals And Their Interfacing

8255 PPI various modes of operation and interfacing to 8086. Interfacing keyboard, Seven segment display, stepper motor interfacing, D/A and A/D converter.

UNIT - IV: Memory Interfacing & Interrupt Structure

Memory interfacing to 8086, Interrupt structure of 8086, Vector interrupt table, Interrupt service routine, Interrupt Mechanism

UNIT - V: Introduction to 8051 Microcontroller

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

UNIT - VI: Instructions of 8051

Addressing Modes, Instruction classification of 8051 Microcontroller, Data Transfer , Arithmetic, Logical, Bit Manipulation , Branch Instructions, machine control Instructions etc

List of Experiments

Part A: Assembly Language Programming Exercises/Experiments using 8086 Trainer kit

1. Implementation of simple decimal arithmetic and bit manipulation operations.
2. Implementation of code conversion between BCD, Binary, Hexadecimal and ASCII.

Part B: Interfacing Exercises/Experiments with 8086 trainer kit through Assembly Language Programming

1. Develop a stepper motor interface for rotating through any given sequence.
2. Develop a Digital-to-Analog Converter interface for waveform generation.

Part C: Assembly Language Programming Exercises/Experiments in 8051 using Keil

1. Develop a Embedded C Program to interface seven segment display to port1 and port2 and display the count from 00 to FFH
2. Implement the functionality of traffic signal controller using 8051 microcontroller.

Text Books

1. D. V. Hall. *Microprocessors and Interfacing*, TMGH.2nd edition 2006.
2. Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, *The 8051 Microcontrollers and Embedded Systems*- Pearson, 2nd Ed.

Reference Books

1. Advanced Microprocessors and Peripherals - A. K. Ray and K.M. Bhurchandani, TMH, 2nd edition 2006.
2. Kenneth. J. Ayala. The 8051 microcontroller, 3rd edition, Cengage learning, 2010.
3. Micro Computer System 8086/8088 Family Architecture. Programming and Design - By Liu and GA Gibson, PHI, 2nd Ed.

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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 ϵ - 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 Chandrashekar, "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

- familiarize with 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 Das and 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, Arunkumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books

1. Surveying Theory and Practice, James M Anderson and Edward, 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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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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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: Dielectric 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, bimetallic 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 Materials, Radioactive Materials, Galvanization 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, Wiley 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, battery ignition system - components, Magneto ignition system, Electronic ignition system.

Electrical System: charging circuit- generator, current-voltage regulator, starting 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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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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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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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 Books

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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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 XMLAJAX.

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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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

$\phi(x)$, $d(x)$, $\mu(x)$, $\sigma(x)$, Mobius inversion formula, Linear Diophantine 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 Montgomery L.H., **An Introduction to Theory of Numbers**, John Wiley and Sons (1991).

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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-concentration and 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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DATABASE MANAGEMENT SYSTEMS LAB

(Common to CSE & IT)

II Year – II Semester

Practical : 4

Internal Marks : 40

Credits : 2

External 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

INFORMATION AND COMMUNICATION TECHNOLOGY

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To explore the use of internet to access remote information, communicate and collaborate with others.
- To familiarize with social, economic, security and ethical issues associated with the use of ICT.

Learning Outcomes

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

- summarize the basic concepts of networking.
- demonstrate internet for learning.
- analyze social, economic and security issues associated with the use of ICT.
- design the concepts of ICT for their professional growth.

Course Content

UNIT - I:

Introduction- Input, Output Processing and Storage, Storage Devices and Media, Memory, Data Representation (extension material).

Software- Application Software, Operating System software and Graphical User Interfaces (GUIs).

UNIT - II:

Word Processing and desktop publishing- word Processing, Editing text, Formatting, Page setup, Tables, Columns, Templates, Mail merge, Macros, Graphics, Inserting special symbols and special characters, Drawing tools, Desktop Publishing.

Spreadsheets and Modeling- Basic Concepts, Adding formulate to a spread sheet, Formatting, Sorting, Creating graphs and charts, Look-up tables.

UNIT - III:

Data bases- Create a database, Design a database, Tables, Queries, Reports, Representing data graphically, Loading data from an existing file.

UNIT - IV:

Communications, networks, the Internet and e-mail- Networks, LANs, Types of LAN, LAN Topologies the Internet.

UNIT - V:

Building ICT systems for others to use- The ICT System life cycle, Identification of a Problem, Development and Testing, Implementation, Documentation and Evaluation.

UNIT - VI:

Applications and effects of ICT- Payroll System, Airline Booking System, Health care and Medicine.

Text Book

1. Roger Crawford, Heinemann IGCSE ICT, Pearson Education Limited

Reference Books

1. Agarwal J.P. (2013): Modern Educational Technology. Black Prints, Delhi.
2. Barton, R. (2004). Teaching Secondary Science with ICT. McGraw Hill International
3. Bhaskar Rao (2013): Samachara Prasara Sankethika vidya Shastramu, Masterminds, Guntur.
4. Cambridge, D. (2010). E-Portfolios for Lifelong Learning and Assessment. John Wiley and Sons.

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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

BASIC ELECTRICAL ENGINEERING

II Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

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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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
Credits : 3

Internal Marks : 40
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 Loudon, "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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OPERATING SYSTEMS

III Year – I 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, files 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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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. Robert 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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ARTIFICIAL INTELLIGENCE

III Year – I 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, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution in propositional 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 system 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", 2nd Edition Tata McGraw Hill Education.
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 publications.

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EMBEDDED SYSTEM DESIGN

III Year – I Semester

Lecture : 4

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 (RTL-level), custom single purpose processor design (RTL-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) – MicroControllers 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, 2002. (Unit II to VI).
2. Shibu.K.V , "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited (Unit I).

Reference Books

1. Raj kamal, "Embedded Systems", 2nd Edition, 2008, TMH.
2. Tammy Noergaard, "Embedded Systems Architecture", 1st Edition, 2005, Elsevier Publications.

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COMPUTER GRAPHICS

III Year – I 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, keyframe 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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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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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, 4th Edition, B.S.Publications.
2. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman , 7th Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5th 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, Filariasis, 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 assess 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 University, available online, accessed, 7, 2008.
2. David F.Griffiths, October (2012) "An introduction to MATLAB" the University of Dundee, available online, Accessed, 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 overhead 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 gases-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 rods, 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.

Course Content

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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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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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, fluorescence 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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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.

Web link

www.statlearning.com

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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 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”, Wiley Publications, 2003.
2. Steve Suchring, “MySQL Bible”, John Wiley, 2002

Reference Books

1. Rasmus Lerdorf 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. Vikram Vaswani, “MYSQL: The Complete Reference”, 2nd Edition, Tata McGraw-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 No Punishment.

UNIT - II: Cyber Crime and Criminal Justice

Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber fraud and Cyber Cheating, Virus on Internet Deformation, Harassment and E- mail Abuse

UNIT - III: Cyber Criminality Strategies and Trends

Network Service Providers, Jurisdiction and Cyber Crimes, 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 Event of Digital Signature compromise, E - Governance in the India. A Warning to Babudom, Are Cyber Consumers Covered under the Consumer Protection, Goods and Services, Consumer Complaint Defect in Goods and Deficiency in Services Restrictive and Unfair Trade Practices

UNIT - V: Traditional Computer Crime

Early Hacker and Theft of Components Traditional problems, Recognizing and Defining Computer Crime, Phreakers: Yesterday's Hackers, Hacking, Computers as Commodities, Theft of intellectual Property.

UNIT - VI: Web Based Criminal Activity

Interference with Lawful Use of Computers, Malware, DoS (Denial of Service) and DDoS (Distributed Denial of Service) Attacks, Spam, Ransomware and Kidnapping of Information, Theft of Information, Data Manipulation, and Web Encroachment Online Gambling Online Fraud, Securities Fraud and stock Manipulation, Ancillary crimes

Text Books

1. Vivek Sood, "Cyber Law Simplified", 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. Degeneracy in TP and resolving it.

UNIT - VI: Assignment and Sequencing Problems

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 and 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: Reliability and Life Testing
3. S. M. Ross: Probability Models, Harcourt India Pvt. Ltd.
4. D. C. Montgomery: 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, 4th Edition.

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OPERATING SYSTEMS AND COMPILER DESIGN LAB

III Year – I Semester

Practical : 4
Credits : 2

Internal Marks : 40
External Marks : 60

Course Objectives

- To practice memory management techniques, CPU and disk scheduling algorithms.
- To implement Bankers algorithm to avoid deadlock.
- To implement lexical analyzer and syntax analyzer.

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.
- design code to implement Bankers algorithm to avoid dead locks.
- implement lexical analyzer and syntax analyzer.

List of Experiments

1. Implement the following CPU scheduling algorithms:
a) FCFS b) SJF c) Priority d) Round Robin
2. Develop code for MVT and MFT
3. Write a program to implement the following page replacement algorithms
a) FIFO b) LRU
4. Implement the Bankers Algorithm for Dead Lock Avoidance
5. Write programs to implement the following disk scheduling algorithms
a) FCFS b) SSTF
6. Design lexical analyzer to recognize the tokens and removes the comment lines and blank spaces.
7. Implement the lexical analyzer using JLEX/ FLEX/ other lexical analyzer generating tools.
8. a) Write a program to compute FIRST sets for the given grammar.
b) Write a program to compute FOLLOW sets for the given grammar.

Note: inputs are FIRST sets and grammar.

9. a) Implement predictive parsing table for the given grammar.

Note: inputs are FIRST and FOLLOW sets of grammar

- b) Implement predictive parsing program given predictive parsing table as input.

Note: input is string and parse table.

10. Implement the syntax analyzer using YACC tool.

Text Books

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System Principles, John Wiley, 7th edition.
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition—2005.
3. Kenneth C. Loudon, Compiler Construction: Principles and Practice, 2nd edition, Cengage Learning

Reference Books

1. D. M. Dhamdhare, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 3rd edition.
3. Alfred V Aho, Monical S Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers, 2nd edition 2007, Principles Techniques and Tools, Pearson.

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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. Robert 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

OBJECT ORIENTED PROGRAMMING THROUGH C++

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of Object oriented programming using C++

Learning Outcomes

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

- apply the basic object oriented features.
- develop object oriented programs using C++.
- develop code to handle polymorphism, inheritance and exceptions.
- Implement templates in C++.

Course Content

UNIT - I: Introduction to Object-Oriented Programming and C++

Need of Object-Oriented Programming - Comparison of procedural, programming and Object-Oriented Programming.

C++ Programming Basics: Basic Program Construction, Data Types, Variables, Constants, Type Conversion, Operators, Loops and Decisions, Arrays – Strings. Structures,

UNIT - II: Features of Object-Oriented Programming

Introduction to Classes and Objects, Constructors: Parameterized constructors, Multiple constructors in a class Constructors With Default Arguments, Copy Constructors, Destructors.

UNIT - III: Polymorphism

Functions – Simple Functions, Inline Functions, Passing arguments, Recursion, Passing Objects as Function arguments and Returning Objects from Functions, Operator Overloading, Overloading Member Functions, Pointers, Virtual Functions – Friend Functions.

UNIT - IV: Inheritance

Introduction, Reusability, Access Specifiers and Simple Inheritance, Types of Inheritances (Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance).

UNIT - V: Exception Handling

Introduction, Principles of Exception Handling, The Keywords Try, Throw and Catch , Exception Handling Mechanism, Multiple Catch Statements, Catching Multiple Exceptions.

UNIT - VI: Generic Programming with Templates

Introduction, Need of Template, Definition of Class Template, Normal Function Template, Working of Function Templates, Class Template With More Parameters, Functions Templates With More Arguments.

Text Books

1. Herbert Schildt ,”The Complete Reference C++” 4th ed, TMH.
2. E Balagurusamy “Object Oriented Programming with C++”, 3rd edition, TMH, 2007.

Reference Books

1. Robert Lafore, “Object-Oriented Programming in C++”, 4th edition, SAMS Publishing, 2008
2. Deitel, “C++ How to Program”, 6th edition, PHI publication, 2008.

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Optional Elective - III

DATA COMMUNICATION

III Year – I Semester

Lecture : -

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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Optional Elective - III

BUILDING INFORMATION MODELING

III Year – I Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the importance of BIM in Architecture, Engineering and Construction (AEC) industry
- To introduce BIM tools and need of parametric modeling
- To identify the use of BIM with Owners, Facility Managers, Architects, Engineers and contractors.

Learning Outcomes

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

- apply the knowledge of inefficiencies with 2D and advantages of 3D modelling
- make use of BIM tools for model designing.
- adopt BIM towards risk identification.
- apprise the advantages and applications of BIM for designers and engineers
- provide the scope and guidance of BIM for contractors and suppliers.
- acknowledge wide use of BIM enabled processes for fabrications.

Course Content

UNIT - I :Introduction

The current (Architecture, Engineering and Construction) AEC business model, Documented inefficiencies of traditional approaches, BIM: New Tools and New Processes,

UNIT - II : Bim Tools & Parametric Modelling

The Evolution of object –based parametric modelling, BIM Environments, platforms and tools, Major BIM Design platforms,

Interoperability- different kinds of exchange formats, the evolution from file-Based exchange to building

UNIT - III: BIM for Owners and Facility Managers

BIM application areas for owners, tool guide for owners, Owner and Facility Manager's

Building model, Barriers to Implementing BIM: Risks and Common Myths, Guidelines and Issues for Owners to Consider when Adopting BIM.

UNIT - IV: BIM FOR ARCHITECTS AND ENGINEERS

Scope of design services, use in design processes, building object models and libraries, considerations in adoption for design practices.

UNIT - V: BIM FOR CONTRACTORS

Types of Construction Firms, Information Contractors Want from BIM, Processes to Develop a Contractor Building Information Model, Reduction of Design Errors Using Clash Detection, Quantity Takeoff and Cost Estimating, Construction Analysis and Planning, Integration with Cost and Schedule Control and Other Management Functions, Use of BIM Onsite: Verification, Guidance and Tracking of Construction Activities

UNIT - VI: BIM FOR SUBCONTRACTORS AND FABRICATORS

Types of Subcontractors and Fabricators, BIM-Enabled Process Change, Generic BIM System Requirements for Fabricators, Major Classes of Fabricators and Their Specific Needs, Adopting BIM in a Fabrication Operation

Text Books

1. BIM Handbook- A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors by Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, 4th edition, John Wiley & Sons Publications, Edition-2
2. BIM and Construction Management: Proven Tools, Methods, and Workflows, by Brad Hardin & Dave McCool, John Wiley & sons publications.

Reference Books

1. BIM for Construction Clients by Richard Saxon, RIBA Publishings, Edition-1
2. BIM Design: Realising the Creative Potential of Building Information Modelling by Richard Garber, John Wiley & sons publications.

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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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OBJECT ORIENTED ANALYSIS AND DESIGN

III Year – II Semester

Lecture : 4 Practical : 2

Internal Marks : 40

Credits : 4

External Marks : 60

Course Objectives

- To discriminate knowledge on Object Oriented analysis.
- To familiarize with Object Oriented system development.

Learning Outcomes

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

- recognize the need for object oriented modeling for system development.
- apply structural and behavioral modeling techniques in designing library management system.
- implement Advanced structural and Behavioral Modeling for different real world issues like Passport automation systems.
- construct software and hardware architecture models for designing library management system and Passport automation systems.
- design an object oriented software system, using structural and behavioral models based on the requirements of the user.

Course Content

UNIT - I: Object Oriented Analysis and Design

Introduction to UML - Importance of modeling, principles of modeling, object oriented modeling, Conceptual model of the UML, Architecture and Software Development Life Cycle.

Programs:

1. Draw Class Diagrams for Library Management System.
2. Identify the conceptual classes and develop a UML Class diagram for Passport automation system

UNIT - II: Structural Modeling

Classes, Relationships, Class diagrams, Object Diagrams, interfaces and packages, Common Modeling Techniques: Class Diagrams.

Programs:

1. Find the interaction between objects and represent those using UML Interaction diagrams in Library Management System and Passport automation system.
2. Identify the conceptual classes and develop a UML Class diagram for Library Management System and Passport automation system.

UNIT - III: Advanced Structural Modeling

Advanced classes, advanced relationships.

Programs:

1. Sketch advanced Class Diagrams for the classes identified in Library Management System and Passport automation system.
2. Depict the classes in Passport automation system as Advanced Class Diagrams.

UNIT - IV: Behavioral Modeling

Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.

Programs:

1. Identify the use cases and develop the use case model for Library Management System
2. Recognize the use cases and sketch the use case model for passport automation system.

UNIT - V: Advanced Behavioral Modeling

Events and signals, state machines, state chart diagrams.

Programs:

1. Draw State chart diagram for Library management system.
2. For Passport automation system sketch the state chart diagrams

UNIT - VI: Architectural Modeling

Components, Deployment, Component diagrams and Deployment diagrams.

Programs:

1. Draw Component and Deployment Diagrams for Library management system.
2. Sketch Component and Deployment Diagrams for Passport automation system.

Text Books

1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson: Pearson Education, 2nd Edition.

Reference Books

1. Object Oriented Analysis and Design with Applications: Grady Booch, Pearson Education Asia, 3rd Edition.
2. Fundamentals of Object Oriented Design in UML: Meilir Page-Jones, Pearson Education.
3. Modeling Software Systems Using UML2: Pascal Roques, WILEY- Dreamtech India Pvt. Ltd.

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COMPUTER NETWORKS

III Year – II 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", 4th edition, Pearson.
2. Behrouz A Forouzan, "Data Communications and Networking", 5th edition, TMH.

Reference Books

1. S. Keshav, "An Engineering Approach to Computer Networks", 2nd dition, Pearson Education.
2. W.A. Shay, Thomson, "Understanding Communications and Networks", 3rd edition, Cengage Learning.

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SOFT COMPUTING TECHNIQUES

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To have a detailed study of neural networks, Fuzzy Logic and uses of Heuristics based on human experience.
- To familiarize with Soft computing concepts.
- To introduce the concepts of genetic algorithm and its applications to soft computing using some applications.

Learning Outcomes

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

- outline soft computing techniques and its applications.
- classify the architecture of Artificial neural networks and learning techniques.
- interpret the working of Back propagation networks, back propagation algorithm and associative memory.
- differentiate fuzzy sets and crisp sets operations.
- apply if-then rules on fuzzy sets and perform Fuzzyfications & Defuzzifications.
- generalize the working principle, representations of genetic algorithm and its applications.

Course Content

UNIT - I: Introduction

Introduction to neural network human brain, models of a neuron, neural networks viewed as directed graphs, network architectures, knowledge representation, artificial intelligence and neural networks.

UNIT - II: Learning Process

Error correction learning, memory based learning, Hebbian learning, competitive, Boltzmann learning, credit assignment problem, memory, adaption, statistical nature of the learning process.

UNIT - III: Classical & Fuzzy Sets

Introduction to classical sets – properties, operations and relations; fuzzy sets – memberships, uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT - IV: Fuzzy Logic System Components

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT - V: Genetic Modeling

Cross over, Inversion and Deletion, Mutation operator, Bitwise operators, Generational cycle, Convergence of genetic algorithm.

UNIT - VI: Genetic Algorithms

Biological Background, Creation of offspring, Working principle, Encoding, Fitness function, Reproduction, Genetic Algorithms.

text Books

1. Simon Hhaykin, Neural networks A comprehensive foundations, 2nd edition, Pearson Education.
2. Rajasekharan and Pai, Neural Networks, Fuzzy Logic, Genetic Algorithms: Synthesis andApplications, PHI Publications

Reference Books

1. Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.
2. George J. Klir, Ute St. Clair, Bo Yuan, "Fuzzy Set Theory: Foundations and Applications" Prentice Hall, 1997.

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REAL TIME SYSTEMS

III Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the concepts of Real – Time systems.

Learning Outcomes

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

- make use of hard and soft real time systems.
- evaluate Clock driven scheduling, weighted round-robin, priority driven approaches in real time systems.
- compare rate monotonic and deadline monotonic algorithms.
- analyze multi task scheduling algorithms for periodic, aperiodic and sporadic tasks.
- demonstrate temporal distance and DCM.
- outline real time communications architecture.

Course Content

UNIT - I:

Introduction- Real time systems - Hard versus soft real time systems: hard real time systems and soft real-time systems.

UNIT - II:

Commonly used approaches to hard real-time scheduling- Clock driven scheduling, weighted round-robin, priority driven approach.

Clock - driven scheduling, scheduling sporadic jobs: Acceptance Test, EDF scheduling of accepted jobs, Algorithm for constructing static schedules.

UNIT - III:

Priority-driven scheduling of periodic tasks: Fixed Priority and Dynamic priority algorithms-Rate monotonic and Deadline monotonic algorithms.

UNIT - IV:

Resources and resource access control: Basic priority inheritance protocol-Definition, rules, and properties. Multiprocessor scheduling and resource access control and synchronization.

UNIT - V:

Scheduling flexible computations and tasks with temporal distance constraints- Algorithms for scheduling flexible application, Tasks with temporal distance constraints- temporal distance model.

UNIT - VI:

Real-Time Communications-architecture, real time connections and service disciplines-packet switched networks.

Text Books

1. Jane Liu, Real-Time Systems, Prentice Hall, 2000.
2. Philip.A.Laplante, Real Time System Design and Analysis, 3rd Edition, PHI, 2001.

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IMAGE PROCESSING

III Year – II 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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AGILE SOFTWARE DEVELOPMENT PROCESS

III 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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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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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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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 Resistors

Resistivity, Range of Resistivity- free electron theory - classical theory & quantum theory. Semiconducting materials: Energy gap in solids - intrinsic semi conductors - extrinsic semi conductors - element & compound 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 susceptibility - complex dielectric 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, Reflection, 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 tilted 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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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 novel 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 diagnosis 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), evoked 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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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’Reilly 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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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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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 - 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, 2nd Edition, Dreamtech Press
- Dave Thomas, Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide, 4th Edition, Pragmatic Bookshelf
- Randal L. Schwartz,ý Brian D. Foy ,ý Tom Phoenix, Learning Perl, 6th edition, O'REILLY Publications.

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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 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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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.
- use 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 n th 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 differential 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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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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COMPUTER NETWORKS AND DATA MINING LAB

III Year – II Semester

Practical : 4
Credits : 2

Internal Marks : 40
External Marks : 60

Course Objectives

- To develop data link layer framing methods.
- To implement distance vector routing algorithm to compute optimal path.
- To implement client/server communications using socket API.
- To implement Data preprocessing techniques and Data Mining functionalities on Data sets.

Learning Outcomes

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

- demonstrate data link layer framing methods.
- calculate best route by using distance vector routing algorithm.
- develop client/server communications using socket API.
- illustrate error detection method by using CRC.
- evaluate the performance of classification, association and clustering algorithms on different Data sets.

List of Experiments

Exercise 1: Implement the data link layer framing method of bit stuffing.

Exercise 2: Implement the data link layer framing method of character stuffing

Exercise 3: Implement CRC on a data stream with set of characters

Exercise 4: Implement Distance vector routing algorithm.

Exercise 5: Implementation of Iterative and concurrent Echo server using connection oriented protocol (TCP).

Exercise 6: Implementation of Iterative and concurrent Echo server using connection less protocol (UDP).

Exercise 7: 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

Exercise 8: Perform data preprocessing tasks on

- i. Add Attribute
- ii. Add Expression
- iii. Copy Attribute
- iv. Remove Attribute

Exercise 9: Perform Classification Techniques on data sets

Load Weather dataset into Weka and run Id3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.

Exercise 10: Perform Association rule mining on data sets

Load Transaction dataset into Weka and run Apriori algorithm with different support and confidence values and derive frequent items sets.

Exercise 11: Perform Clustering on data sets

Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters).

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SECURE WEB TECHNOLOGIES

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of securing web applications.
- To familiarize with different risks to web applications.
- To implement the steps required to mitigate those risks

Learning Outcomes

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

- outline the basics and functionality of web application.
- contrast common web application security vulnerabilities.
- determine various injection attacks on web.
- describe cross site scripting formats.
- examine types of attacks on web.
- discuss various scripting languages to develop web applications.

Course Content

UNIT - I: Web Application Basics

Introduction, HTTP Protocol, Web Functionality, Encoding Schemes, Enumerating Content and Functionality, Analyzing the Application.

UNIT - II: Authentication Security

Authentication Techniques, Design Flaws in Authentication, Implementation Flaws in Authentication, Securing Authentication, Path Traversal Attacks.

UNIT - III: Injection Attacks

Injecting into Interpreted Contexts, SQL Injection, NoSQL Injection, XPath Injection, LDAP Injection, XML Injection, HTTP Injection.

UNIT - IV: Cross Site Scripting (XSS)

Types of XSS, XSS in Real World, Finding and Exploiting XSS Vulnerabilities, Preventing XSS Attacks.

UNIT - V: User Attacks

Inducing User Action, Capturing Cross-Domain Data, Client-Side Injection Attacks, Local Privacy Attacks, ActiveX Control attacks, Browser Attacks.

UNIT - VI: Source Code Analysis

Approaches to Code Review, Signatures of Common Vulnerabilities, Analysis of Java platform, Analysis of PHP, Analysis of Perl, Analysis of JavaScript, Analysis of SQL.

Text Book

1. Dafydd Stuttard, "The Web Application Hacker's Handbook", Wiley India Pvt. Ltd.

Reference Books

1. Web Security Testing Cookbook by Paco Hope, Ben Walther
Publisher: O'Reilly Media
2. Web Security Sourcebook by Aviel D. Rubin, Daniel Geer, Marcus J. Ranum.

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MANAGEMENT INFORMATION SYSTEMS

III Year – II Semester

Lecture : -

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the information systems in Global Business today.
- To introduce the types of information systems and their functionalities in an enterprise.
- To familiarize with the applications of information systems in business areas
- To disseminate knowledge on Telecommunications and Networks in today's Business World

Learning Outcomes

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

- outline the basic concepts, strategies and challenges of MIS.
- describe the nature of the information system in the business process.
- distinguish ethical and social issues in information systems considering the real world problems.
- choose the principal tools and technologies for accessing information from databases to improve business performance and decision making
- synthesize how do the Internet and Internet technology work and how do they support communication and e-business
- synthesize the working of Internet and Internet technology and how they support communications & e-business.

Course Content

UNIT - I: Managing the Digital Firm

Why Information Systems?, Dimensions of Information Systems, Contemporary Approaches to Information Systems-Technical Approach, Behavioral Approach, Socio technical Systems

UNIT - II: Information Systems, Organizations, Management and Strategy

Organizations and Information Systems -What Is an Organization, Features of Organizations, How Information Systems Impact Organizations and Business

Firms-Economic Impacts, Organizational and Behavioral Impacts, The Internet and Organizations.

UNIT - III: Ethical and Social Issues in the Digital Firm

Understanding Ethical and Social Issues Related to Systems, Five Moral Dimensions of the Information Age, Key Technology Trends That Raise Ethical Issues, Information Rights, Property Rights.

UNIT - IV: IT Infrastructure and Platforms

IT Infrastructure -Defining IT Infrastructure, Evolution of IT Infrastructure,Infrastructure Components- Computer Hardware Platforms, Operating System Platforms, Data Management and Storage .

UNIT - V: Managing DataResources

Organizing Data in a Traditional File Environment -File Organization Terms and Concepts, Problems with the Traditional File Environment, The Database Approach to Data Management: Database Management Systems.

UNIT - VI: Telecommunications, Networks and the Internet

Telecommunications and Networking in today's Business World,The Internet.

Text Books

1. Kenneth C Laudon& Jane P Laudon, Management Information Systems, 9th Edition, Pearson-2014.

Reference Books

1. V.M.Prasad, Management Information Systems, 9th Edition, Pearson Education–2005.
2. Robert G Murdick, Joel E Ross & James R Claggett, Information Systems for Modern Management, 3rd Edition, PHI - 2007.

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ROBOTICS

III Year – II 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 – Velocity sensors.

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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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

IV 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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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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MACHINE LEARNING AND PATTERN RECOGNITION

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.

Learning Outcomes

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

- describe basic concepts of machine learning.
- apply Find-S and Candidate-elimination algorithms to solve problems of moderate complexity.
- calculate posterior probabilities using Bayes theorem.
- differentiate lazy and eager learning algorithms along with their strengths and weaknesses.
- recognize patterns using HMM and SVM.

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: Instance-Based Learning

Introduction, k-Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

UNIT - V: Pattern recognition using discrete hidden Markov models

Discrete-time Markov process, Extensions to hidden Markov models, three basic problems of HMMs, types of HMMs.

UNIT - VI: Support Vector Machines

Separating Data with the Maximum Margin, Finding the Maximum Margin, Efficient Optimization with SMO Algorithm, Speeding up Optimization with Full Platt SMO, Using Kernels for More Complex Data.

Text Books

1. Tom M. Mitchell, Machine Learning, MGH.
2. Pattern classifications, Richard O. Duda, Peter E. Hart, David G. Stroke. Wiley student edition, Second Edition.

Reference Books

1. Pattern Recognition, An Introduction, V Susheela Devi, M Narsimha Murthy, Universiy Press
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

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DISTRIBUTED OPERATING SYSTEMS

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with distributed systems and architecture models.
- To impart the concepts of distributed processes, transactions and synchronization of processes.

Learning Outcomes

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

- describe important characteristics, architectural features of distributed systems.
- identify various ways of Inter process Communications and synchronization using different algorithms.
- estimate the performance of various deadlock algorithms to achieve synchronization between the participating nodes of distributed system.
- analyze processes and processors and their scheduling policies to avoid deadlock and synchronization problems.
- classify different file system of distributed environment in storing and retrieving data efficiently using various file usage methods.
- distinguish multiprocessor, page based, shared-variable distributed shared memory.

Course Content

UNIT - I: Introduction to Distributed Systems

Goals, hardware concepts, software concepts, design issues, layered protocols, ,ATM Networks, client server model, remote procedure call, group communication.

UNIT - II: Synchronization in Distributed Systems

Clock Synchronization: Cristian's algorithm, the Berkeley algorithm, mutual exclusion: Centralized, distributed , token ring algorithms, election algorithms: the Bully and ring algorithms , atomic transactions.

UNIT - III: Deadlocks

Deadlocks in distributed systems, Distributed deadlock detection , centralized deadlock detection distributed dead lock prevention.

UNIT - IV: Processes

Processes and Processors in distributed systems- threads, system models, processor allocation, scheduling distributed system, Fault tolerance, real time distributed systems.

UNIT - V: Distributed File Systems

Distributed File system design: File service interface, Directory server interface, Semantics of file sharing, Distributed file systems implementation: File usage, System structure, Caching, replication, Trends in distributed file system.

UNIT - VI: Distributed shared memory

Introduction, on-chip memory, Bus based, ring based, switched multiprocessors, Consistency models: Strict, sequential and casual models. Page based shared memory, shared-variable distributed shared memory.

Text Books

1. Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson, 17th Impression, 2013.

Reference Books

1. Ajay D Kshemkalyani, Mukesh Sigal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge University Press.
2. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Principles" - 7th Edition, John Wiley.

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HUMAN COMPUTER INTERACTION

IV Year – I Semester

Lecture : 4

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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SOFTWARE TESTING METHODOLOGIES

IV 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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BUSINESS INTELLIGENCE

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the basic concepts of Business Intelligence, Technologies and management systems
- To familiarize with Data warehouses and model components. Business Intelligence Tools and methodology for developing business intelligence solutions.

Learning Outcomes

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

- understand the concepts of Business Intelligence, technologies and organizations for developing solutions to organizations.
- acquire knowledge about different types of capabilities for the presentation of information.
- demonstrate the design of Data warehouses and enterprise architecture for data mining applications.
- apply data mining models to business analytics problems to identify the impact of BI on corporate business performance.
- employ data mining tools and techniques for customization and standardization in decision support systems.
- describe the characteristics and steps of good business intelligence solutions for decision making system

Course Content

UNIT - I: Business Intelligence and Its Impacts

Introduction, data, information, and knowledge, what is business intelligence?, driving factors, business intelligence and related technologies, contemporary organizations, obstacles to business intelligence.

UNIT - II: BI Capabilities

Introduction, four synergistic capabilities, organizational memory, information integration, insight creation: Factors for Insight Creation Capability and Technologies, presentation.

UNIT - III: Technologies Enabling Organizational Memory and Information Integration

Introduction enterprise resource planning systems, data warehouse, designing the enterprise architecture, knowledge repositories.

Introduction, integration of data sources in a business intelligence application, text mining, environmental scanning, web mining, application of web mining in customer relationship management.

UNIT - IV: Technologies Enabling Insights and Presentation

Technologies to create insights: using data mining to create new explicit knowledge, the business analytics process, the data mining models(what happened, what will happen, what happened), effective implementation of business analytics.

Presentation: online analytical processing, visual analytics, performance dashboards, balanced scorecards, it governance, impact of business intelligence on corporate performance.

UNIT - V: BI Tools

What are business intelligence tools? Tools Supporting Organizational Memory Capability, Tools Integration Capability, Insight Creation Capability, and Presentation Capability, customization versus standardization of BI tools, leading business intelligence vendors.

UNIT - VI: Development of Business Intelligence

Introduction, BI solutions , characteristics of good business intelligence solution, sourcing of solutions, methodology and steps in the for developing business intelligence solutions.

Text Book

1. Rajiv Sabherwal, Irma Becerra-Fernandez, “Business Intelligence Practices, Technologies, and Management”, John Wiley & Sons, Inc.

Reference Books

1. Vicki L. Sauter, “Decision Support Systems for Business Intelligence”, second edition, a John Wiley & Sons, Inc. Publication.
2. Efraim Turban, Ramesh Sharda, Dursun Delen “Decision Support Systems and Intelligent Systems”, , 9th Edition, Pearson 2011.
3. Galit Shmueli, Nitin R. Patel and Peter C. Bruce “Data Mining for Business: Intelligence Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner”, , Wiley, 2007.

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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.
- Illustrate 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

MULTIMEDIA TOOLS

IV Year – I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of multimedia, animation and digital video.
- To familiarize with multimedia authoring tools.

Learning Outcomes

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

- outline Multimedia and list its applications.
- categorize the usage of color palettes in multimedia.
- generalize the principles of Animation and expand various video formats.
- demonstrate the four primary stages in a multimedia projects.
- collect various Multimedia Authoring tools.
- discuss various multimedia tools for Internet and WWW.

Course Content

UNIT - I: Introduction

Definitions- Multimedia, Interactive multimedia, Hypermedia, Multimedia developers, Where to use Multimedia, Delivering Multimedia.

UNIT - II: Images

Color, Computerized Color- Additive & Subtractive Colors, Color Palettes, Dithering, Bitmap Images – Data Matrix for 1-bit, 4-bit, 8-bit, 24-bit.

UNIT - III: Animation and Video

Animation: Power of motion, Principles of Animation, Animation by Computer – 2-D, 3-D Video: Digital Video – HDTV, Codecs – MPEG, Video Format Converters.

UNIT - IV: Making Multimedia

Stages of Multimedia Project, Hardware - Memory and storage Devices, Input and Output Devices, Software – Text Editing, OCR Software, Painting and Drawing Tools, 3-D Modeling and Animation Tools, Authoring Systems.

UNIT - V: The Internet and Multimedia

World Wide Web and HTML, Multimedia on Web – Web Servers, Web Browsers, Web Page Makers and Site Builders, Plugins – Text, Images, Sound, Animation, Video, Presentation, 3-D Worlds.

UNIT - VI: Designing for the World Wide Web

Text for Web, Images for Web – GIF, PNG, JPEG, GIF or JPEG? Animation for Web – GIF98a, Plugins and Players.

Text Book

1. Tay Vaughan, “Multimedia- Making It Work”, 8th Edition, 2011, TMH.

Reference Book

1. Joseph W Lowery, “Adobe CS5 Bible Dream weaver Bible”, 2010, Wiley publication.

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Professional Elective - IV

CRYPTOGRAPHY 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”, 5thedition, 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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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 agencies and 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; skills and strategies; rescue, relief reconstruction. Case Studies: Lessons and Experiences from Various Important Disasters in India

UNIT - III: Flood and Drought Disaster

Raising flood damage, assessing flood risk, flood hazard assessment, flood impact assessment, flood risk reduction options. Drought and development, relief management and prevention, drought mitigation and management-integrating technology and people.

UNIT - IV: Landslide and Earthquake Disaster

Land slide hazards zonation mapping and geo environmental problems associated with the occurrence of landslides. The use of electrical resistivity method in the study 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 safety and 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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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, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic 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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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 algorithms 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-point, 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 occurred.

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, Earthing – 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. Refrigeration 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
- assess 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.,

Course Content

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 (IoT).
- 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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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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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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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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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. Adhoc 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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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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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
Credits : 2

Internal Marks : 40
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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Optional Elective - VII

SOCIAL NETWORKS

IV Year – I Semester

Lecture : -

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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Optional Elective - VII

ASSISTIVE TECHNOLOGIES

IV Year – I Semester

Lecture : -

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.

Course 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.

Reference Books

1. Marion A.Hersh, Michael A.Johnson , “ Assistive Technology for the Hearing impaired, Deaf and Deafblind”, Springer Publications.
2. Meeko Mitsuko K.Oishi, Ian M.Mitchell, H.F. Machiel vanderloss, “Design and use of Assistive Technology, Springer Publications.
3. Eckehard Fuzzy Moritz, “Assistive Technologies for the Interaction of the Elderly”, Springer Publications.

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Optional Elective - VII

RENEWABLE ENERGY SOURCES

IV Year – I Semester

Lecture : -

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 tilted 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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STEGANOGRAPHY AND BIOMETRICS

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with the concepts of stenographical communication
- To introduce various verification , identification technologies and matching measures of Biometrics
- To impart various scan technologies.

Learning Outcomes

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

- outline the basic terminology of steganography.
- interpret different scenarios related to steganalysis.
- distinguish between Biometric verification and identification.
- apply Finger Scan and Facial Scan Technologies to provide person identification in logical access environment.
- compare and contrast physiological biometrics with behavioral biometrics in terms of their accuracy.

Course Content

UNIT - I: Steganography

Steganographic communication, notation and terminology, Information-Theoretic foundations of Steganography, practical steganographic methods

UNIT - II: Steganalysis

Steganalysis scenarios, some significant steganalysis Algorithms, LSB embedding and the histogram attack, sample pairs analysis.

UNIT - III: Biometrics

Benefits of biometric security–Verification and identification–Basic working of biometric matching – Accuracy – False match rate – False non-match rate – Failure to enroll rate–Derived metrics–Layered biometric solutions.

UNIT - IV: Finger scan

Features – Components – Operation (Steps) – Competing finger Scan technologies, Strength and weakness

UNIT - V: Facial Scan

Features – Components – Operation (Steps) – Competing facial Scan technologies, Strength and weakness

UNIT - VI: Other physiological biometrics

Hand scan – Retina scan – AFIS (Automatic Finger Print Identification Systems) Behavioral Biometrics–Signature scan-keystroke scan.

Text Books

- 1 Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, and Ton Kalker, “Digital Watermarking and Steganography”, 2/e, Morgan Kaufmann Publishers, 2008.
- 2 Samir Nanavati, Michael Thieme, Raj Nanavati, “Biometrics – Identity Verification in a Networked World”, WILEY-DreamTech

Reference Books

1. John Chirillo and Scott Blaul, “Implementing Biometric Security”, Wiley Eastern Publications, 2005.
- 2 JohnD.Woodward, “Biometrics-The Ultimate Reference” Jr.Wiley Dreamtech.

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PARALLEL COMPUTING

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the concepts of Parallel Computing.
- To disseminate knowledge on CUDA.

Learning Outcomes

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

- outline the fundamentals of Parallel computing.
- demonstrate Flynn's taxonomy.
- classify Different Structures of Parallel Computers.
- identify the methodologies for the development of parallel processing applications using CUDA.
- determine the important features of Graphical Processing Unit in application development.
- design and develop programs using CUDA Development Tool kit.

Course Content

UNIT - I:

Introduction: Why do we Need High Speed Computing, How do we Increase the Speed of Computers, History of Parallel Computers.

Solving problems in parallel: Utilizing Temporal Parallelism, Utilizing Data Parallelism, Comparison of Temporal and Data Parallel Processing

UNIT - II:

Parallel Architectures: Interconnection networks, processor arrays, multiprocessors, multicomputer, Flynn's taxonomy.

UNIT - III:

Structure of parallel computers: A Generalized Structure of a Parallel Computer, Classification of Parallel Computers, Vector Computers, A Typical Vector Super

Computer, Shared Memory Parallel Computers, Message Passing Parallel Computers.

UNIT - IV:

Operating systems for parallel computers: Resource Management, Process Management, Process Synchronization, Inter-process Communication, Memory Management, Input/output (Disk Arrays).

UNIT - V:

Computer Unified Device Architecture (CUDA): The age of parallel processing, The rise of GPU computing, CUDA, Applications of CUDA.

UNIT - VI:

Development Environment: CUDA Enabled Graphics Processors, NVIDIA Device driver, CUDA Development Tool kit, Standard C compiler.

Text Books

1. Parallel Computers Architecture and Programming, V. Rajaraman, C. Siva RamMurthy, PHI.
2. CUDA by Example, Jason Sanders, Edward Kandrot, Addison_Wesley.

Reference Books

1. Introduction to Parallel Computing, AnanthGrama, Anshul Gupta, George Karypis, Vipin Kumar, Pearson Education.
2. M.J. Quinn, Parallel Computing Theory and Practice, McGraw Hill, 2002.
3. M.J. Quinn, Parallel Programming in C with MPI and OpenMP, McGrawHill, 2008.

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VIRTUAL AND AUGMENTED REALITY

IV Year – II 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 disseminate knowledge on 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
- determine 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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E-COMMERCE
IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the basic concepts of E-Commerce, Mercantile Process model, e-payment systems.
- To disseminate knowledge on electronic data interchange (EDI), workflow automation, SCM and advertising on internet.

Learning Outcomes

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

- outline the fundamentals in E-Commerce with respect to consumer and organization oriented applications
- compare Mercantile process models in context to consumer and merchant perspectives
- illustrate smart cards, credit/debit cards, Digital token based systems
- analyze the EDI problems and performance of VAN in inter-organizational commerce
- classify the procedures of work flow automation and SCM to improve intra-organizational commerce
- distinguish digital documents from document library for development of E-commerce through online marketing process

Course Content

UNIT - I: Welcome to Electronic Commerce

Electronic commerce framework, Electronic commerce and media convergence, the anatomy of e-commerce applications, Electronic Commerce Consumer applications, Electronic Commerce organization applications

UNIT - II: Consumer Oriented Electronic Commerce

Introduction to Consumer Oriented Electronic commerce, Mercantile Process Models from the Consumer's Perspective, Mercantile Process Models from the Merchant's Perspective

UNIT - III: Electronic Payment Systems

Digital Token-Based Electronic payment systems, Smart Cards and Electronic Payment Systems, Credit Cards based electronic payment systems, Risks in Electronic Payment systems

UNIT - IV: Inter-organizational Commerce and EDI

Electronic Data Interchange (EDI), EDI Software Implementation, Value added networks (VANs)

UNIT - V: Intra-organizational Commerce

Work Flow Automation and Coordination, Customization and internal Commerce, Supply Chain Management (SCM)

UNIT - VI: Corporate Digital Library and Advertising, Marketing on Internet

Making a business case for a document library, Types of Digital documents, Corporate Data warehouse, the new age of Information-Based marketing, advertising on the Internet, Charting the on-line Marketing Process, Market research

Text Book

1. Kalakota, Whinston, "**Frontiers of electronic commerce**", Pearson.

Reference Books

1. Hendry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, "E-Commerce fundamentals and applications", Wiley.
2. S. Jaiswal, "E-Commerce", Galgotia.
3. Kenneth C. Taudon, Carol Guyerico, Traver, "E-Commerce – Business, Technology, Society", Addison-Wesley Pub.

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INTERNET OF THINGS

IV Year – II 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 ArduinoIoT 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, IoTvs M2M.

UNIT - II: IoT Design Methodology

IoT Design Methodology: Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specification, Functional View Specification, Operational View specification, Device & Component Integration and 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 & 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. ArshdeepBahga, Vijay Madiseti, “Internet of Things – A hands-on approach”, UniversitiesPress, 2015.
2. Adrian McEwen & Hakim Cassimally, “Designing the Internet of Things”, Wiley Publications – 2014.

Reference Books

1. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.
2. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.
3. WaltenegusDargie,ChristianPoellabauer, “Fundamentals of Wireless Sensor Networks: Theory and Practice”.

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Professional Elective - VI

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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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 Block chain

Technical challenges, Business model challenges, scandals and public perception, government regulation, privacy challenges for personal records, decentralization trends likely to persist.

Text Book

1. Blockchain For Dummies®, IBM Limited Edition, Manav Gupta, 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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DESIGN PATTERNS

IV Year – II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize with Structural and behavioral Design Patterns.

Learning Outcomes

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

- demonstrate how Design Patterns Solve Design Problems.
- design a Document Editor using Design Patterns.
- use Creational Patterns for object creation mechanism.
- demonstrate how Structural Design Patterns use to ease the design by identifying a simple way to realize relationships between entities.
- implement behavioral design patterns in carrying out communication between objects

Course Content

UNIT - I:

Introduction: Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT - II:

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

UNIT - III:

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT - IV:

Structural Pattern Part-I: Adapter, Bridge, Composite, decorator, façade, Flyweight, Proxy.

UNIT - V:

Behavioral Patterns Part-I:Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method ,Visitor, Discussion of Behavioral Patterns.

UNIT - VI:

What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

Text Book

1. Erich Gamma, “Design Patterns”, Pearson Education

Reference Books

1. Pattern's in JAVA Vol-I By Mark Grand ,Wiley DreamTech.
2. JAVA Enterprise Design Patterns Vol-III By Mark Grand ,Wiley DreamTech.

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ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

STRUCTURAL ENGINEERING Department of Civil Engineering

M.Tech Two Year Degree Course

(Applicable for the batch 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
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 provide quality education embedded with knowledge, ethics and advanced skills and preparing students globally competitive to enrich the civil engineering research and practice.

Mission:

- * Aims at imparting integrated knowledge in basic and applied areas of civil engineering to cater the needs of industry, profession and the society at large.
- * To develop faculty and infrastructure making the department a centre of excellence providing knowledge base with ethical values and transforming innovative and extension services to the community and nation.
- * To make the department a collaborative hub with leading industries and organizations, promote research and development and combat the challenging problems in civil engineering which leads for sustenance of its excellence.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO-I : To prepare the students with comprehensive and in depth understanding of knowledge and research directions in structural engineering discipline

PEO-II : To Prepare the students applying the established engineering method to solve complex and challenging engineering problem

PEO-III: To inculcate ethical practices in students making them creative innovative and pro-active demeanour and understand the significance of lifelong learning in global perspective.

IV. PROGRAM OUTCOMES (POs)

PO-1 : An ability to independently carry out research /investigation and development work to solve practical problems.

PO-2 : An ability to write and present a substantial technical report/document.

PO-3 : Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

V. ACADEMIC REGULATIONS

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

1. Duration of the Program

The duration of the program is two academic years consisting of four semesters. However, a student is permitted to complete the course work of M.Tech program in the stipulated time frame of four academic years from the date of joining.

2. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

3. Program Credits

Each specialization of the M.Tech programs is designed to have a total of 70 credits and the student shall have to complete the two year course work and earn all the 70 credits for the award of M.Tech Degree.

4. Attendance Regulations

- 4.1 A student shall be eligible to appear for Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- 4.2 Condoning of shortage of attendance in aggregate up to 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 the College Academic Committee. 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.
- 4.3 A student shall be eligible to claim for condonation of attendance shortage only once during the two years (four semesters) course work.
- 4.4 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.
- 4.5 Shortage of Attendance below 65% in aggregate shall in *NO* case be condoned.

- 4.6 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that semester and their registration shall stand cancelled.
- 4.7 A fee stipulated by the college shall be payable towards condoning attendance shortage.

5. Examinations and Scheme of Evaluation

5.1 Theory Courses :

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 assignments and 30 marks are based on two mid-term examinations.
- ii) Each assignment carries 10 marks and the average of two assignments shall be taken as the marks for continuous assessment.
- iii) Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of four questions, each for 10 marks. All the questions need to be answered.
- 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 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 two questions, each for 20 marks, with internal choice. All the questions need to be answered. 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 8 questions, each for 12 marks, out of which 5 questions are to be answered.
- ii) 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.

5.2 Laboratory Courses :

- i) For practical subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 40 internal marks. Of the 40 marks for internal, 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 an internal examiner and an external examiner for 60 marks.

5.3 (a) Seminar:

- i) For seminar, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the literature and submit it to the department in a report form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of report and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh report towards the end of that semester and appear for evaluation by the committee.

(b) Term Paper:

- i) For term paper, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the research papers and submit it to the department in publication form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of paper and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh paper towards the end of that semester and appear for evaluation by the committee.

5.4 Project Work:

Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee.

- i) A Project Review Committee (PRC) shall be constituted for each specialization with Head of the Department / a Senior Faculty as Chairman and two other senior faculty members.
- ii) Registration of Project Work: A candidate who has been promoted to 3rd semester shall be eligible to register for the project work.
- iii) The eligible candidate can choose his project supervisor and submit the title, objective, abstract and plan of action of the proposed project work to the department for approval by the PRC. The candidate whose proposal is approved by the PRC shall register for the project work. The minimum duration of project work will be 36 weeks from the date of registration.
- iv) If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. In case of such changes, the candidate has to register afresh.
- v) There shall be three reviews on the progress of the project work by the PRC with an interval of 12 weeks. The candidate needs to submit a report on the progress of his work and present it before the PRC for assessment. The PRC may suggest for an extension of date of submission of dissertation if the progress of work is not satisfactory or absent himself for the review.
- vi) A candidate who has passed all the theory, laboratory, seminar and term paper examinations and shown satisfactory progress of project work is permitted to submit the dissertation after 36 weeks from the date of registration.
- vii) If a candidate fails to submit the dissertation by the end of the 4th semester, he has to take the permission for an extension by paying the semester(s) tuition fee.
- viii) Three copies of the Project Thesis certified by the supervisor shall be submitted to the Department.
- ix) Project evaluation and Viva-Voce examination is conducted at the end of 4th semester by a committee consisting of Project Supervisor, senior faculty of the department, HoD and an External Examiner nominated by the Chief Controller of Examinations out of a panel of three examiners suggested by the department.

The following grades are awarded for the project work:

- i. Excellent
- ii. Very Good
- iii. Good
- iv. Satisfactory
- v. Unsatisfactory

The Grade “unsatisfactory” is treated as Fail. Failed Students should take supplementary examination after making required modifications, if any, in the dissertation with a minimum gap of 8 weeks by paying the required examination fee.

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

6.1 Criteria for Passing a Course:

- i) A candidate shall be declared to have passed in individual theory / laboratory 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.
- ii) The candidate shall be declared to have passed in seminar / term paper viva-voce if he secures 50% marks.
- iii) The candidate shall be declared to have successfully completed the project work if he secures a minimum of ‘satisfactory’ grade in the project evaluation and viva-voce examination.
- iv) On passing a course of a program, the student shall earn assigned credits in that course.

6.2 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 /Elective /Laboratory /Seminar / Term Paper /Project Dissertation (%)	Grade Points	Letter Grade
≥ 90	10	O (Outstanding)
≥ 80 & < 90	9	A+ (Excellent)
≥ 70 & < 80	8	A (Very Good)
≥ 60 & < 70	7	B+ (Good)
≥ 50 & < 60	6	B (Above Average)
< 50	0	F (Fail)

6.3 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:

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

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.

6.4 Eligibility for Award of B.Tech Degree:

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

- Pursued a course of study for not less than two academic years and not more than four academic years.
- Registered for prescribed **70** credits and secured **70** credits.
- Students, who fail to complete their Two years Course of study within Four years or fail to acquire the prescribed **70** Credits for the award of the degree within four academic years from the year of their admission shall forfeit their seat in M. Tech course and their admission shall stand cancelled.

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

The CGPA is calculated as given below:

$$\text{CGPA} = \frac{\sum (CR \times GP)}{\sum CR} \quad \text{for entire program.}$$

where CR = Credits of a course

GP = Grade points awarded for a course

* CGPA is calculated for a candidate who passed all the prescribed courses excluding project work.

6.6 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
$\geq 6.5 \text{ \& } < 7.5$	First Class
$\geq 6.0 \text{ \& } < 6.5$	Second Class

7. Supplementary Examinations

- Supplementary examinations will be conducted once in a year along with regular examinations.

- 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.

8. Re-admission Criteria

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/-

9. Break in Study

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of M.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 shall be paid by the candidate to condone his break in study.

10. 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 he will be offered substitute subjects in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

11. 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 be withheld in such cases.

12. 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 / year. 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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.	Expulsion from the examination hall 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 / year. 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 / year.
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 / year 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.

13. Other Matters

- i) Deserving physically challenged candidates will be given additional examination time and a scribe based on the certificate issued by the concerned authority. 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.
- v) Wherever the word he, him or his occurs, it will also include she, her and hers.

VI. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits
1	Baisc Sciences (BS)	3	4.28
2	Humanities and Social Sciences (HSS)	3	4.28
3	Professional Core (PC)	25	35.72
4	Professional Electives (PE)	9	12.86
7	Others (Seminar, Term Paper, Dissertation, etc.)	30	42.86

COURSE STRUCTURE & SYLLABUS

COURSE STRUCTURE

I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	MA2901	Computational Methods in Engineering	4	-	-	3
2	CE2901	Theory of Elasticity	4	-	-	3
3	CE2902	Structural Dynamics	4	-	-	3
4	CE2903	Advanced Design of Concrete Structures	4	-	-	3
5	CE2904	Stability of Structures	4	-	-	3
6		Professional Elective - I	4	-	-	3
7	CE2908	Advanced Concrete Technology and Structural Engineering Lab	-	-	4	2
Total			24	-	4	20

II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	CE2909	Earthquake Resistant Design	4	-	-	3
2	CE2910	Finite Element Analysis	4	-	-	3
3	CE2911	Theory of Plates and Shells	4	-	-	3
4		Research Methodologies	4	-	-	3
5		Professional Elective - II	4	-	-	3
6		Professional Elective - III	4	-	-	3
7	CE2918	Computer Applications in Structural Engineering Lab	-	-	4	2
8		Seminar	-	-	-	2
Total			24	-	4	22

L : Lecture T : Tutorial P : Practical

III Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Term Paper	-	-	4	2
2		Dissertation (Initiated in third semester)	-	-	-	-
Total			-	-	4	2

IV Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Dissertation (Carried out in third & Fourth Semester)	-	-	52	34
Total			-	-	52	34

Professional Electives:

Professional Elective - I

- CE2905 Advanced Concrete Technology
- CE2906 Ground Improvement Techniques
- CE2907 Structural Optimization

Professional Elective - II

- CE2912 Advanced Design of Steel Structures
- CE2913 Pre-Stressed Concrete
- CE2914 Fracture Mechanics of Concrete

Professional Elective - III

- CE2915 Design of Sub-Structures
- CE2916 Design of Bridge Structures
- CE2917 High Rise Buildings

SYLLABUS

COMPUTATIONAL METHODS IN ENGINEERING

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- know how to solve system of equations, ordinary differential equations and partial differential equations numerically.
- understand correlation and regression.
- know optimization techniques in solving linear and fractional programming problems.

Learning Outcomes

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

- find the solutions of system of linear and non linear equations.
- solve ordinary and partial differential equations numerically.
- determine the correlation coefficient and regression.
- optimize linear and fractional programming problems.

Course Content

UNIT–I: Introduction to Numerical Methods Applied to Engineering Problems

Solving system of linear equations by Gauss Seidel and Relaxation methods. Solving system of non-linear equations by Newton-Raphson method. Fitting of non-linear curves by the method of least squares.

UNIT–II: Numerical Solutions of Ordinary Differential Equations

Conversion of initial value problem to boundary value problem using shooting method, solution through a set of equations - derivative boundary conditions - Rayleigh Ritz method.

UNIT–III: Numerical Solutions of Partial Differential Equations

Finite-difference approximations to derivatives; Laplace equation : Jacobi Method - ADI method, Parabolic Equation – Crank Nicolson method.

UNIT–IV: Applied Statistics

Bivariate Data-simple correlation- Correlation analysis - correlation coefficient – coefficient of correlation for ungrouped and grouped bi-variate data – coefficient of determination – test of significance for correlation coefficient. Regression Analysis - simple linear regression - multiple linear regression.

UNIT–V: Optimization Techniques

Linear Programming : Mathematical formulation-graphical solution of two variable – simplex method-artificial variable technique- Big M method- linear fractional programming problem.

Text Books:

1. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall India,3rd Edition.(UNITS – I,II,III)
2. Agarrval, B.L., Basic Statistics ,Wiley , 2nd edition.(UNIT - IV)
3. S.D.Sharma,Operations Research,Kedarnath Ram Nadh,1972 (Unit- V)

References:

1. Ward Cheney and David Kincaid M, Numerical Mathematics and Computing, Brooks/Cole Publishing Company1999, Fourth edition.
2. Riley K.F,. M.P.Hobson and Bence S.J, Mathematical Methods for Physics and Engineering, Cambridge University press,1999.
3. Steven C.Chapra, Raymond P.Canale Numerical Methods for Engineers Tata Mc-Graw Hill
4. Curtis F.Gerald, Partick.O.Wheatly,Applied Numerical analysis, Addison-Wesley,1989
5. Kanti swarup,Gupta P.K. and Manmohan , Operations Research , S.chand and sons, 2004.

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THEORY OF ELASTICITY

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- impart knowledge of principal stresses and strains and analytical skills of solving problems using plane stress, plane strain and torsion.

Learning Outcomes

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

- apply the knowledge of plane stress and plane strain in a given problem.
- analyze the structure using principle of elasticity.
- explain the principles of stress-strain relations for linearly elastic solids and Torsion.

Course Content

UNIT-I: Plane Stress and Plane Strain

Definition of stress and strain, component of stress and strain, Hooke's law, plane stress, plane strain, stress and strain at a point, differential Equations of equilibrium and compatibility equations, stress function.

UNIT-II: Two Dimensional Problems in Rectangular Co-ordinates

Solution by polynomials – Saint-Venant's principle – Determination of displacements – Bending of cantilever loaded at the end – Bending of a beam by uniform load.

UNIT-III: Two Dimensional Problems in Polar Co-ordinates

General equations in polar co-ordinates – Stress distribution symmetrical about an axis – Pure bending of curved bars - Strain components in polar co-ordinates – Displacements for symmetrical stress distributions – Stress in a circular disc – The effect of circular holes on stress distribution in plates.

UNIT-IV: Analysis of Stress and Strain in Three Dimensions

Principal stresses – Stress ellipsoid – Stress-director surface – Determination of principal stresses – Stress invariants - Max shear stress – Homogeneous deformation – Principal axes of strain rotation. General Theorems: Differential equation of equilibrium – Boundary conditions for compatibility – Displacements – Equations of equilibrium in terms of displacements – Principle of superposition.

UNIT-V: Torsion

Torsion of Straight bars – Bars with elliptical cross section – Other elementary solution – Membrane analogy – Torsion of narrow rectangular bars – Solution of torsional problems by energy method – Use of soap films in solving torsional problems.

Text books:

1. S P Timoshenko & J N Goodier, "Theory of Elasticity", Mc Graw Hill Publications.(Units I,II,III,IV,V)
2. Sadhu Singh ,"Theory of Elasticity", Khanna Publications.

References:

1. C.T. Wang ,"Applied Elasticity" , McGraw-Hill Publications.
2. Martin H. Sadd, "Elasticity Theory, Applications and Numeric", Oxford Publications.

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STRUCTURAL DYNAMICS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- create an understanding on degrees of freedom & dynamic loading and ability to formulate the equations of motion and apply them to simple dynamic problems.
- familiarize on obtaining the natural frequencies & mode shapes and impart the knowledge on mode super position method to undamped forced motion of multi degree freedom system.

Learning Outcomes

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

- develop differential equation of motion for an undamped single degree freedom system.
- understand different types of damping and concept of logarithmic decrement.
- formulate the equations for response against harmonic, Periodic and Impulsive loadings & Duhamel integral.
- understand how to formulate stiffness and mass matrices and carry out free vibration analysis.
- obtain response against forced motion applying mode super position method.

Course Content

UNIT-I: Theory of vibrations

Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Vectorial representation of S.H.M. - Free vibrations of single degree of freedom system - Undamped and Damped vibrations - Critical damping - Logarithmic decrement.

UNIT-II: Single Degree of Freedom Systems

Fundamental objectives of dynamic analysis - Types of prescribed loading - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Formulation and solution of the equation of motion - Free vibration response - Response to Harmonic, Impulsive and general dynamic loadings - Duhamel integral.

UNIT–III :Multi Degree of Freedom Systems –Free vibrations

Selection of the degrees of Freedom- concept of shear building - Evaluation of structural property matrices - Formulation of the MDOF equations of motion - Undamped free vibrations -Solutions of Eigen value problem for natural frequencies and mode shapes. Examples on two degree freedom systems.

UNIT–IV: Multi Degree of Freedom Systems-Forced vibrations

Selection of the degrees of Freedom - - Formulation of the MDOF equations of motion - Analysis of Dynamic response – Normal co-ordinates - Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition method procedure.Examples on forced vibration of undamped two degree freedom systems.

UNIT–V: Continuous Systems

Introduction - Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure -Natural frequencies and mode-shapes of simple beams with different end conditions - Principles of application to continuous beams.

Textbooks:

1. Mario Paz and Leigh ,”Structural dynamics”, CBS Publishers, 1st edition 1985.(Units- II,III,IV&V)
2. S.R.Damodarasamy & S.Kavitha,”Structural Dynamics and Aseismic Design”, PHI Learning private Ltd., New Delhi. (Units-I,II,III&IV)

References:

1. Anil K. Chopra ,”Dynamics of Structures”, Pearson Education (Singapore), Delhi.
2. Raymond W.Clough, Joseph Penzien, “Dynamics of Structures”, M.C.GrawHill Book Company.
3. Roy R.C. Craig “ Structural Dynamics – An introduction to computer methods”, John Wiley & sons.

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ADVANCED DESIGN OF CONCRETE STRUCTURES

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- impart the knowledge on designing various types of structures like bunkers & silos, grid floors and RC frames, and design a project problem

Learning Outcomes

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

- design the bunkers and silos
- to analyse grid floors using approximate methods
- gain the knowledge of estimation of crack width and deflection of beams.
- design the structures for fire resistance.
- gain the knowledge on concept of designing Multi-storeyed building frames.

Course Content

UNIT–I: Bunkers and Silos

Introduction, design of rectangular and circular bunkers and Silos.

UNIT–II: Approximate analysis of Grid Floors

Introduction, analysis of rectangular grid floors by Timoshenko's plate theory and stiffness matrix method, comparison of methods of analysis, reinforcement detailing in grid floor

UNIT–III: Crack width and Redistribution of Moments

Estimation of crack width in Reinforced Concrete Members:

Introduction, factors affecting crack width in beams, mechanisms of flexural cracking, estimation of crack width in beams by empirical method and IS 456 method, shrinkage and thermal cracking.

Redistribution of Moments in Reinforced Concrete Beams:

Introduction, redistribution of moments in fixed beam, positions of points of contra flexures, final shape of redistributed bending moment diagram, moment redistribution for a two-span continuous beam, advantages and disadvantages of moment redistribution, moment-curvature ($M - \phi$), relation of reinforced concrete sections.

UNIT–IV: Design of Reinforced Concrete Members for Fire Resistance:

Introduction, ISO 834 standard heating conditions, grading or Classifications, effect of high temperature on steel and concrete, effect of high temperatures on different types of structural members, fire resistance by structural detailing from tabulated

data, analytical determination of the ultimate bending moment, moment carrying capacity of reinforced concrete beams under fire- Other considerations.

UNIT–V: Multistorey Building Frames

Introduction-analysis of Multi-storey Frames-Method of substitute Frames-Design Example-Bending Moments in Columns-Analysis of Multi-storey frames subjected to horizontal forces-Design Example.

NOTE:Student should submit a report on a project problem

Text books:

1. P.C. Varghese, “Advanced Reinforced Concrete Design”, Prentice Hallpublication(Unit II,III&IV)
2. N.Krishnam Raju ,”Advanced Reinforced concrete Design”, CBSpublication.(Unit I&V)

References:

1. Park & Paulay, “Reinforced Concrete”, John Wiley & sons Publications.
2. Pillai and Menon, “Reinforced concrete Design “.

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STABILITY OF STRUCTURES

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- impart the knowledge on linear and nonlinear behaviour of structures.
- familiarize the student with stability of plates under combined loads.

Learning Outcomes

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

- analyze these structures with linear and nonlinear behaviour.
- gain the knowledge on Stability of Continuous systems.
- distinguish between elastic buckling and in- elastic buckling.

Course Content

UNIT–I: Criteria for Design Of Structures

Concept of stability, strength, and stiffness - Stability of discrete systems - Linear and nonlinear behavior.

Beam columns: Differential equation for beam columns – Beam column with concentrated loads – Continuous with lateral load – Couples – Beam column with built in ends – Continuous beams with axial load – Determination of allowable stresses.

UNIT–II: Elastic Buckling

Elastic buckling of bars: Elastic buckling of straight columns – Effect of shear stress on buckling – Eccentrically and laterally loaded columns –Sway & Non Sway mode - Energy methods – Buckling of a bar on elastic foundation –Buckling of bars with change in cross section – Effect of shear force on critical load – Built up columns – Effect of Initial curvature on bars – Buckling of frames – Sway & Non Sway mode.

UNIT–III: In-Elastic Buckling

In-elastic buckling: Buckling of straight bars – Double modulus theory, Tangent modulus theory. Empirical formulae of design – various end conditions– Design of columns based on buckling–Rayleigh Ritz method –Stiffness method and formulation of Geometric stiffness matrix- Applications to simpleframes.

UNIT–IV: Torsional Buckling

Torsional Buckling: Pure torsion of thin walled bars of open cross section – Non uniform torsion of thin walled bars of open cross section - Torsional buckling – Buckling on Torsion and Flexure.

UNIT–V: Lateral Buckling

Lateral Buckling of simply supported Beams: Beams of rectangular cross section subjected for pure bending, buckling of I Section subjected to pure bending.

Text books:

1. Alexander Chajes, "Principles of Structural Stability Theory", PHI Publications.
(Unit I,II,III&IV,V)
2. Timshenko & Gere, "Theory of Elastic stability", Mc Graw Hill Publications.

References:

1. Simitses, G.J., "An introduction to the elastic stability of structures", 2nd Edition, Prentice Hall.
2. Bazant, Z.P. and Cedolin, L., "Stability of structures", 1st Edition, Oxford University Press, Oxford.
3. Brush, B.O., and Almoroth, B.O., "Buckling of Bars, Plates and Shells", 3rd Edition, McGraw Hill, NY.
4. Galambos, T.V., "Guide to stability design criteria for metal Structures", 2nd Edition, Wiley, NY.

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ADVANCED CONCRETE TECHNOLOGY

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- impart awareness on ingredients of concrete, mix design, various admixtures for specific concreting purposes and testing of fresh, hardened & special concretes.

Learning Outcomes

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

- select proper ingredients of concrete and acquire knowledge about the testing of materials for quality assurance.
- select special concretes for specific purposes.
- design a required concrete mix.

Course Content

UNIT-I: Constituents of Concrete and Properties

Properties of cement, hydration of cement, hydration product, heat of hydration, review of tests on properties of cement, fine aggregate and coarse aggregate and their influence on strength of concrete. Porosity, absorption and moisture content and their influence. Soundness of aggregate. Alkali aggregate reaction. Review of tests on properties of aggregate. Water, its influence on concrete. Additives and Admixtures in concrete.

UNIT-II: Manufacturing Methods of Concrete

Manufacturing methods of concreting, properties of fresh and hardened concrete, strength of concrete – water cement ratio. Gel space ratio. Gain of strength with age. Maturity concept of concrete. Mechanical properties of concrete. Workability- tests and procedure. Influence of various parameters on strength of concrete. Use of ready mix concrete – advantages and disadvantages. Relationship between various mechanical strengths of concrete. Shrinkage and Creep of concrete - types, mechanism and factors affects.

UNIT-III: Concrete Mix Design

Design and manufacture of normal concrete, quality Control- mix design by I.S. method, Road note method and Accelerated curing method.

UNIT–IV: Special Concretes

Introduction, properties and applications of fibre reinforced concrete, light weight concrete – cellular concrete, no fine concrete and aerated & formed concrete– polymer concrete – fly ash concrete and green Concrete.

UNIT–V: Design of High Strength and High Performance Concretes

Introduction, properties and applications of Self compacting concrete – High performance concrete – High density concrete.

Text books:

1. Shetty, M.S., "Concrete Technology" Theory and Practice, S.Chand Publications- 3rd Edition (Units I,II,III,IV,V)
2. Neville,A.M. and Brookes,J.J., "Concrete Technology" , Pearson Education,2nd Edition.

References:

1. Neville,A.M., "Properties of Concrete", Pearson Education Limited , 5th Edition.
2. Shanta Kumar,A.R., "Concrete Technology", Oxford University Press, New Delhi, 2nd Edition.
3. Krishna Raju.N., " Design of Concrete Mixes", CBS Publishers and Distributors, 2nd Edition.
4. M L Gambhir," Concrete Technology", Tata McGraw Hill Publishers, New Delhi, 2nd Edition.

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GROUND IMPROVEMENT TECHNIQUES

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- understand the need of ground improvement techniques in improving the soil conditions.
- familiarize the applications of Reinforced Earth and Geosynthetics

Learning Outcomes

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

- select suitable ground improvement technique according to soil condition.
- explain the types and functions of geosynthetics.

Course Content

UNIT–I: Introduction and Compaction Techniques

Introduction: Need and objectives of ground improvement techniques, classification of ground improvement techniques

Compaction Techniques: Methods of compaction - Shallow compaction and Deep compaction techniques – Vibro-floatation, blasting, dynamic consolidation and compaction piles

UNIT–II: Dewatering Techniques and Drains

Dewatering Techniques: Open sumps and ditches, well-point system, electro-osmosis, vacuum dewatering wells

Drains: Types, preloading and design features of vertical drains.

UNIT–III: Stabilization with Admixtures

Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen

UNIT–IV: Reinforced Earth Techniques and Grouting

Reinforced Earth Techniques: Concept of soil reinforcement, reinforcing materials, backfill criteria, design of reinforcement for internal stability, applications of reinforced earth structures. soil nailing and its applications.

Grouting: Objectives of grouting, grouts and their applications, methods of grouting

UNIT–V: Geo-synthetics

Geotextiles – Types, functions, properties and applications; Geogrids & Geomembranes - Properties and applications

Text books:

1. Purushotham Raj, "Ground Improvement Techniques", Laxmi Publications, New Delhi (Unit-I, II, III)
2. Hausmann M.R. "Engineering Principles of Ground Modification", (1990), McGraw-Hill International Edition. (Unit-IV, V)

References:

1. Swami Saran, "Reinforced Soil and its Engineering Applications", I.K. International Publishing House pvt. Ltd.
2. G.L.Siva Kumar Babu, "An introduction to Soil Reinforcement and Geosynthetics", Universities Press.
3. Moseley M.P. "Ground Improvement", (1993), Blackie Academic and Professional, Boca Taton, Florida, USA.

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STRUCTURAL OPTIMIZATION

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize on various methods of optimisation and design of structural members.

Learning Outcomes

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

- derive optimized structure using classical and modern methods of optimisation.
- impart with the knowledge of formulation of structural optimisation problems.
- understand the concept of Classical methods of optimisation for multivariable with equality or inequality constraints.

Course Content

UNIT-I: Introduction

Introduction: General Introduction: Basic theory and elements of optimisation Terminology and definitions Basic principles and 'procedure of optimisation. Classical Methods of optimisation: Trial and error method, Monte Carlo method and Lagrangian Multiplier method illustrative examples. Linear Programming: Introduction, terminology, standard form of linear programming problem, geometrical interpretation, canonical form of equation graphical and algebraic methods of solving L.P. problems, illustrative examples.

UNIT-II: Linear Programming

Linear Programming: Simplex methods, dual formulations illustrative examples. Network analysis: Introduction to network theory, transportation and assignment models Formulation of mathematical models and solutions Applications to Civil Engineering problems.

UNIT-III: Non Linear programming

Non Linear programming: Unconstrained and constrained methods of optimisation on .Univariate search, Steepest Descent Methods, Kuhn Tucker conditions –

Penalty functions, slack variables and Lagrangian multiplier methods illustrative examples.

Geometric and Dynamic Programming : illustrative Examples.

UNIT–IV: Structural Optimisation-I

Structural optimisation: Structural design of rectangular reinforced concrete beams
Optimisation applied to concrete mix proportioning Procedure of optimisation for reinforced concrete deep beams.

UNIT–V: Structural Optimisation-II

Structural optimisation: Optimum structural design of reinforced concrete T and L beams
Optimisation of planner trusses Procedure of optimisation for structural grid and slab Floor Systems.

Text books :

1. S.S. Rao ,”Engineering optimisation”, ,New Age Internationals (1999) (Units I, II, III).
2. Paul, J.O., “Systems Analysis for Civil Engineers”, John Wiley & Sons (1988)
1. Arora, J.S.(Units IV&V).

References:

1. J.S. Arora, “Introduction to Optimum Design”, 2nd Edition, McGraw-Hill Book Company, 2000.
2. Morris A.J., “Foundations of Structural optimisation - A Unified Approach”, 3rd Edition, John Wiley and Sons, 2003.

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ADVANCED CONCRETE TECHNOLOGY AND STRUCTURAL ENGINEERING LAB

I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

To make the students

- familiarize the students to the advanced equipment for testing of materials.

Learning Outcomes

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

- gain the knowledge on concept of NDT.
- compare the strengths of concrete by different mix design methods.
- analyze different characteristics of a structure for dynamic loadings.

List of Experiments:

1. Strain measurement - Electrical resistance strain gauges.
2. Non destructive testing- Rebound Hammer test, UPV test.
3. Qualifications tests on Self compaction concrete- L Box test, J Box test, U box test, Slump test.
4. Mix design methods using a) I.S. Code method b) ACI Code method.
5. Measurement of cover and bar diameter by poroscope /re-bar locator.
6. Buckling of columns.
7. Determination of horizontal thrust in two hinged arche.
8. Determination of horizontal thrust in three hinged arche.
9. Identification of dynamic Mode shapes and frequencies for rigid type structure.
10. Identification of dynamic Mode shapes and frequencies for flexible structure.
11. Repair and rehabilitation of concrete beam.
12. Open ended experiment.

References:

1. process manual by Millennium Technologies.
2. N. Krishna Raju, "Design of Concrete Mixes".
3. M. S. Shetty," Concrete Technology (Theory And Practice)", S. Chand Publication.

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EARTHQUAKE RESISTANT DESIGN

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- impart the knowledge of designing earthquake resistant structures and familiarize the codal provisions and carry out an analytical problem.

Learning Outcomes

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

- describe various terms of engineering seismology.
- gain the knowledge on seismic codal provisions and detailing.
- design earthquake-resistant structures by using different methods.
- acquire the knowledge in structural irregularities in seismic planning and shear wall concept.
- Understand the retrofiting techniques and base isolation of structure.

Course Content

UNIT–I: Engineering Seismology

Introduction, structure of earth, plate tectonics, elastic rebound theory, earthquake terminology- source, focus, epicenter, hypocenter, earthquake size, magnitude & intensity, seismic waves, seismic zones, seismic zoning map of India, seismograms and accelerograms – Causes and effects of earthquakes.

UNIT–II: Codal Provisions

Review of Indian Seismic code IS: 1893 – 2002 (Part- I) provisions- Earthquake design philosophy.

Introduction - Design forces for buildings by Equivalent static method and Response spectrum method.

UNIT–III: Structural Irregularities and Shear Walls

Structural Irregularities: Vertical discontinuity in load path, irregularities in strength and stiffness, mass irregularities, vertical geometric irregularity, proximity of adjacent buildings, plan configurations, torsion irregularities, re-entrant corners, non-parallel systems, diaphragm discontinuity.

Shear Walls: Introduction, types of shear walls, description of building, determination of lateral forces in buildings, design of shear walls as per Indian Standard Code: 13920, detailing of reinforcement of shear walls.

UNIT–IV: Retrofitting Techniques

Introduction, seismic evaluation methods, consideration in retrofitting of structures, classification of retrofitting techniques, retrofitting strategies of R.C.buildings - structural level and member level retrofit methods.

UNIT–V: Masonry Buildings

Introduction, determination of design lateral load, distribution of lateral forces on shear wall, determination of wall rigidities, determination of torsional forces, determination of pier loads, moments and shear, design of shear walls for shear, structural details.

NOTE: Student should submit a report on a project problem

Text books:

1. pankaj Agarwal & shrikhande Manish, “Earthquake Resistant Design of Structures”, Eswar Press. (Units II, III, IV & V)
2. Duggal S.K., “Earthquake Resistant Design of Structures”, Oxford University Press, 2nd Edition. (Units I & V)

References:

1. Anil K. Chopra, “Dynamics of Structures, Theory and Applications to Earthquake Engineering”, 4th Edition, Prentice Hall of India.
2. JaiKrishna AR Chandrasekharan, and Brijesh Chandra, “Elements of Earthquake Engineering”, 3rd Edition, Saritha Prakasham, Meerut.
3. Relevant Indian Standard Codes: IS-875, IS-1893, IS -4326, IS- 13920

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FINITE ELEMENT ANALYSIS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- apply the concepts of Finite Element Method (FEM) for solving structural Engineering problems and familiarize the usage of the software.

Learning Outcomes

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

- understand the fundamentals of Finite element method.
- derive the solution of the problems of 1D and 2D by FEM.
- apply the concept of iso-parametric formulation for solving problems.
- derive the shape functions for higher order elements.
- solve the finite element problems using software.

Course Content

UNIT-I: Fundamental Concepts of FEM

Introduction, need of FEM, applications of FEM, advantages & disadvantages - Energy principles, discretization – Rayleigh-Ritz method, method of functional approximation- Weight Residual Techniques, basic steps of FEM, finite element modelling- Application to structural problems

UNIT-II: One Dimensional Problems- Bars and Beams.

Co-ordinates & shape functions, one dimensional scalar variable problems, element stiffness of bar element due to axial loading, formulation of stiffness matrix of bar element by direct stiffness method, minimum potential energy principle, beams derivation of stiffness matrix for beams by strain energy concept & direct stiffness method and problems on these concepts.

UNIT-III: One Dimensional Problems -Frames & Trusses

Derivation of stiffness matrix for trusses, stress calculations, temperature effects and problems on these concepts. Derivation of stiffness matrix for a plane frame element, formulation of finite element equation and analyzing procedure for frame structure-Problems.

UNIT-IV: Two Dimensional Problems

Finite element modeling of 2-D elements, derivation of shape functions for two dimensional linear element (Triangular) by area coordinates , Problems on these concepts.

Derivation of shape functions for CST element, stress strain relationship matrix formulation for 3D & 2D systems, stiffness matrix for CST element.

UNIT–V: Axisymmetric & Isoparametric Problems

Introduction, axisymmetric formulation, derivation of shape function for axisymmetric triangular element, stress -strain relationship matrix, strain & stress displacement matrices & Problems on these concepts. Isoperimetric formulation, higher order elements, derivation of shape functions for a four noded quadrilateral element using natural coordinates, strain displacement matrix for four noded quadrilateral element, stress-strain relationship matrix, stiffness matrix for isoperimetric element, numerical integration , gauss quadrature method for rectangular elements, simple problems

Text books:

1. Sk.Md ,Jalaludin ,”Finite Element Analysis”, Anuradha Publishers (Units I,II,III,IV&V)
2. TirupatiR.Chandrapatla and Ashok D.Belgaundu,”Finite Elements Methods in Engineering” by (Units II, III & IV)

References:

1. C.S.Krishna Murthy ,”FEA–Theory & Programming”,Tata Mcgraw Hill, New Delhi.
2. S.S. Bhavakatti ,”FEA”,New age international publishers
3. FEA by David V Hutton,TataMcgraw Hill, New Delhi.

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THEORY OF PLATES AND SHELLS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- familiarize the behaviour of the plates and shells with different geometry under various types of loads.

Learning Outcomes

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

- evaluate the deflection of plates for different loadings.
- understand the concept of folded plates.
- determine various forces in shells.
- explain the concept of curvature in shells.
- gain knowledge on beams, theory of cylindrical shells.

Course Content

UNIT – I: Rectangular Plates

Pure bending of Plates – Relations between bending moments and curvature – Derivation of governing differential equation for plate – Slope and curvature of slightly bent plates. Rectangular Plates: Plates under uniformly distributed load with different boundary conditions. Navier and Levy's type of solutions for various boundary condition.

UNIT – II: Circular Plates

Circular plates: Symmetrically loaded, Circular plates under various loading conditions, Circular plate with a circular hole at center.

UNIT – III: Folded Plates

Structural behaviour of folded plates; Equation of three shears; Application of Simpson's and Whitney's methods.

UNIT – IV: Introduction to Shells

Introduction to shells -Classification of shells- Equations of Equilibrium of shells: Derivation of stress resultants, principles of membrane theory and bending theory.

UNIT – V: Cylindrical Shells

Cylindrical Shells: Derivation of the governing DKJ equation for bending theory, details of Schorer's theory. Beam method of analysis.

Text books:

1. Timoshenko and Krieger, "Theory of plates and shells", McGraw-Hill bookcompany, INC, New York.[Unit – I,II]
2. P.C. Varghese, "Design of Reinforced Concrete Shells and Folded plates", PHI Learning Private Limited, New Delhi (2010).[Unit - III]
3. S.S.Bhavikatti, "Theory of plates and shells", New Age International, New Delhi.[Unit –III, IV,V]

References:

1. J. Ramchandran, "Thin Shells Theory and Problems", Universities Press. "Stresses in shells", Flugge, 2nd Edition, Springer.
2. Bairagi. K, "Plate Analysis", Khanna Publisher, New Delhi.
3. Ramaswamy. G.S, "Design and Construction of Concrete Shell Roofs", McGraw K.Chandra sekhar.

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RESEARCH METHODOLOGIES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- familiarize with the objectives, motivation and significance of research.
- know research methodologies.
- define research problem and perform data analysis.
- write a research paper and report.

Learning Outcomes

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

- understand research approaches
- understand various research methodologies
- define a research problem
- perform data analysis
- write research papers and reports

Course Content

UNIT – I: Introduction

Introduction, objectives and motivation of research, types of research, research approaches, significance of research methods.

UNIT – II: Research Methodology

Research methods versus methodology, research and scientific method, importance of knowing how research is done, research process. criteria for good research.

UNIT – III: Defining Research Problem

The research problems, necessity of defining the problem, technique involved in defining a problem, review of related literature, purpose of literature survey, identifying the current status, presentation of literature survey findings. critique, survey and peer review process.

UNIT – IV: Research Design and Data Analysis

Meaning of research design, features of good design, important concepts relating to research design, different research designs, basic principles of experimental designs.

Methods of data collection - collection of primary data, observation method, interview method, collection of data through questionnaires, collection of data through schedules, difference between questionnaires and schedules, some other methods of data collection, collection of secondary data, selection of appropriate method for data collection, case study method.

Processing and analysis of data - processing operations, some problems in processing, elements, types of analysis, statistics in research.

UNIT – V: Research Paper and Report Writing

Final paper presentation. significance of report writing, different steps in writing report, layout of the research report, types of report, precautions for writing research reports.

Textbook :

1. C.R.Kothari, "Research Methodology Methods and Techniques", Wishwa Prakashan Publishers, Second Edition (Units – I,II,III,IV,V).

References:

1. Panner Selvam R, "Research Methodology" PHI Learning Private Limited. Newdelhi.
2. Ramalh C and Murali Krishna P "Research Methodology"-Text and cases Student help line publishing , Hyderabad.

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ADVANCED DESIGN OF STEEL STRUCTURES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- impart the concepts of designing water tanks, bridges, transmission line towers and chimneys.
- familiarize on plastic behavior, plastic moment and plastic mechanism of steel structures like simple beams and portal frames.

Learning Outcomes

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

- apply the design principles to elevated steel water tanks.
- identify the configuration of truss bridges and understand the design principles of truss elements.
- develop the methodology of designing transmission line tower structures.
- understand the design concepts of self supporting chimneys & foundations.
- adopt principles of plastic analysis, plastic mechanism and apply to simple beams & frames.

Course Content

UNIT - I: Water Tanks

Design of elevated water storage steel tanks – Rectangular & cylindrical – Design of staging – Lacing – Battering.

UNIT - II: Truss Bridges

Through type truss bridge (Pratt & Warren type) - Dead load and equivalent live loads – Design of compression and tension members, Top & bottom lateral bracings and top portal bracing.

UNIT - III: Towers

Towers Loading, Analysis & Design of Transmission line towers – Simple problems

UNIT - IV: chimneys

Design of self supporting steel chimneys including foundation connections.

UNIT - V: Plastic Analysis

Plastic analysis of steel structures – Plastic bending in beams, collapse mechanism – Fully plastic Moment – Shape factor and Plastic moment – Ultimate load carrying capacity of simple beams and portal frames.

Note: Designs are by limit state method as per IS 800-2007.

Text Books:

1. Ramchandra, "Design of Steel Structures Vol. II, Standard book house. (Units I, II, III, IV, V)
2. A.S.Arya & J.L.Ajmani Nem, "Design of Steel Structures" by chand & Brothers, Roorkee.

Reference Books:

1. B.C.Punmia, Ashok kumar jain & Arun kumar jain, "Comprehensive Design of steel structures" Laxmi publications, New Delhi.
2. P.Dayaratnam, "Design of Steel Structures", Wheeler publishing, New Delhi.
3. V.N.Vazirani & M.M.Ratwani, "Steel Structures", Khanna publications, New Delhi.
4. Relevant steel codes of Bureau of Indian standard.

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PRE-STRESSED CONCRETE

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- impart the knowledge on pre-stressing techniques and materials required for pre-stressing.
- familiarize with the losses of pre-stress, design of beams & slabs and deflections.

Learning Outcomes

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

- gain the knowledge on materials, pre-stressing Systems, end anchorages.
- gain the knowledge on losses of pre-stress.
- analyze and design of sections for flexure and shear.
- compute deflections in pre-stressed concrete.
- apply the concept to pre-stress for designing of compression members and slabs.

Course Content

UNIT - I: Introduction

Historic development – Need for High strength steel and concrete- Advantages and limitations of pre-stressed concrete –Materials: High strength steel and concrete . I.S.Code provisions, methods and systems of pre-stressing; Pre-tensioning and post-tensioning methods and its applications – systems of pre-stressing - Hoyer system, Magnel-Blaton system, Freyssinet system and Gifford – Udall system.

UNIT - II: Losses of Prestress

Loss of pre-stress in pre-tensioned and post-tensioned members-elastic Deformation of concrete, shrinkage of concrete, creep of concrete, Relaxation of stress in steel, Anchorage slip and frictional losses.-Total losses allowed for design.

Analysis of sections for flexure; Elastic analysis of concrete beams pre-stressed with straight, concentric, eccentric, bent and parabolic tendons-Pressure line-load balancing concept.

UNIT - III: Design of Section for Flexure and Shear

Types of flexural failures-determination of flexural strength using IS code method—Shear and Principle stresses-ultimate shear resistance of pre-stressed concrete-design of shear reinforcement –Design of section for flexure.

UNIT- IV: Deflections

Importance of control of deflections, factors influencing deflection, codal provisions, short term and long term deflections of un cracked members

Continuous Beams: advantages of continuous members- code provisions – Analysis of two span span continuous beams- concordant cable profiles.

UNIT - V: Compression Members and Slabs

Compression Members :Introduction – design of PSC short columns

Slabs: Introduction –types of pre-stressed concrete floor slabs- code provisions- design of PSC floor slabs-one way and two way slabs.

Text books:

1. N. Krishnam Raju, “Prestressed Concrete “, TMH, 5th Edition. (Units I,II,III,IV,V).

References:

1. Lin., T.Y., “Design of Prestressed Concrete Structures”, John Wiley & Sons, 3rd Edition.
2. Edward G. Nawy, “Prestressed Concrete A Fundamental Approach”, Prentice Hall, 5th Edition.
3. Rajagopalan. N, “Prestressed Concrete”, Narosa publications, 2nd Edition.

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FRACTURE MECHANICS OF CONCRETE

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- impart knowledge on the mechanisms of failure and non linear fracture mechanics.

Learning Outcomes

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

- understand the behaviour of concrete with tension and compression failure surfaces
- gain the concepts of CTOD and CMD.

Course Content

UNIT – I: Introduction to Fracture Mechanics

Fundamentals of fracture mechanics, mechanisms of fracture and crack growth

UNIT – II: Fracture and Cracking

Cleavage fracture, ductile fracture, fatigue cracking, environment assisted cracking, quasi brittle materials.

UNIT – III: Failure Analysis

Service failure analysis, linear elastic fracture mechanics, griffith's criteria, stress intensity factors, crack tip plastic zone, erwin's plastic zone correction, R curves, compliance, J integral, nonlinear analysis ,review of concrete behaviour in tension and compression, basic frameworks for modelling of quasi brittle materials.

UNIT – IV: Nonlinear Fracture Mechanics

Nonlinear fracture mechanics – Discrete crack concept/smeared crack concept, size effect, plasticity models for concrete – Associated and non-associated flow, failure surfaces for quasi brittle materials.

UNIT – V: Concept of CTOD and CMD

Concept of CTOD and CMD, material models, crack models, band models and models based on continuum damage mechanics.

Text books:

1. David Broek – Sijthoff & Noordhoff – Alphen aan den Rijn, "Elementary engineering fracture mechanics", Netherlands (Units I, II, III, IV, V)
2. Rilem Report, "Fracture mechanics of concrete structures – Theory and applications", Edited by L. Elfgreen, Chapman and Hall – 1989.

References:

1. Victor, C. Li, & Z.P. Bazant, "Fracture mechanics", ACI SP 118.
2. Valliappan S, "Continuum Mechanics Fundamentals" (1982), Oxford IBH, N D. New Delhi.
3. Venkataraman and Patel, "Structural Mechanics with introduction to Elasticity and Plasticity", McGraw Hill, 1990.

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DESIGN OF SUB-STRUCTURES

II Semester

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

Course Objectives

To make the students

- impart the knowledge on soil exploration and design principles of shallow and pile foundations.
- introduce vibration concept in soils.

Learning Outcomes

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

- gain the knowledge on method of soil exploration.
- evaluate the bearing capacity of soil.
- gain the knowledge on mode of vibration and analysis of machine foundation.
- gain the knowledge on concept of load carrying capacity of pile group.

Course Content

UNIT – I: Soil Exploration

Soil Exploration – Importance, terminology, methods of boring. Soil sampling – Types of samples, design considerations of open drive samplers.

UNIT – II: Shallow Foundations

Shallow Foundations – Bearing capacity – Terzaghi's, Meyerhof's, Hansen's, Vesic's and IS code methods- Bearing capacity based on standard penetration.

UNIT – III: Footings

Principle of design of footing, proportioning footings for equal settlement, mat foundation - Rectangular and trapezoidal combined footings, common type of Raft foundations, bearing capacity and differential settlement of mat foundation.

UNIT – IV: Pile Foundations

Pile foundations-Classification of piles-factors influencing choice-Load carrying capacity of single pile in clayey and sandy soils using static & dynamic pile formulae- Group of piles – Pile cap - Efficiency of pile groups- load carrying capacity and settlement of pile groups in cohesive and non cohesive soils.

UNIT – V: Vibrations in Soils

Fundamentals of Vibration; Free and Forced Vibration with and without damping; Natural frequency of foundation; Types of machine foundation; I.S. Code of practice for design and construction of block foundation for reciprocating and impact type machines for high speed rotary machines.

Text books:

1. Braja M. Das , "Principles of Foundation Engineering", Cengage Learning. (Unit-I, II, III, IV)
2. J.E. Bowles, " Foundation Analysis and Design", McGraw Hill Publishing Co., (Unit –V)

References:

1. K.R.Arora, "Soil Mechanics and Foundation Engineering", standard publishers and Distributors, Delhi.
2. Terzaghi and Peck , "Soil Mechanics in Engineering Practice", John Wiley & sons.
3. Wayne C. Teng, "Foundation Design" , Prentice – Hall.
4. Swami Saran , "Analysis and Design of sub structures", Oxford & IBH.

* * *

DESIGN OF BRIDGE STRUCTURES

II Semester

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

Course Objectives

To make the students

- impart overall knowledge on analysis and design of RC bridges.
- familiarize students with the knowledge of bridge sub structure and bearings.

Learning Outcomes

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

- gain the knowledge on different IRC loading standards
- design slab bridge decks.
- acquire knowledge on general considerations for prestressed concrete bridges.
- design the open well foundations.

Course Content

UNIT - I: Introduction

Definition, history, classification, planning and stages, preliminary / conceptual design, detailed design.

UNIT - II: Bridge loading standards

Evaluation, IRC standards, highway bridge standards, impact factors, comparative analysis, railway bridge standards.

UNIT - III: Reinforced concrete slab bridge decks

General features, design coefficients, analysis of slab decks, design aids, minimum reinforcements, design of reinforced concrete culverts for IRC class AA & A loads.

UNIT - IV: Prestressed Concrete Bridges

General aspects, advantages of prestressed concrete bridges, pretensioned and post-tensioned concrete bridge decks, design of post tensioned concrete beam and slab bridge deck.

UNIT - V: Bridge Foundations

Types of foundations- Well foundation, open well foundation, components of well foundation – Pile foundations (designs not included) - Reinforcement detailing and bar bending schedule need to be prepared

Text Books:

1. Krishnam Raju N., “Design of Bridges”, 4th edition, Oxford and IBH Publishing Co., Ltd. (Units II, III, IV & V)
2. Ponnu Swamy, “Bridge Engineering”, 4th edition, Mc Graw-Hill Publication (Units I).

Reference Books:

1. Johnson Victor D, “Essentials of Bridge Engineering”, 7th edition, Oxford, IBH Publishing Co., Ltd.
2. Vazirani, Ratvani & Aswani, “Design of Concrete Bridges”, 5th edition, Khanna Publishers.
3. Swami Saran, “Analysis and Design of sub-structures”, 2nd edition, Oxford IBH Publishing Co Ltd.

* * *

Professional Elective - III

HIGH RISE BUILDINGS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- impart the overall knowledge about the material, elements and systems with planning, analysis and design involved in Tall Buildings.

Learning Outcomes

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

- introduce various systems of tall buildings
- know about different types of loads, materials and design philosophy
- impart knowledge about static, dynamic and stability analysis of various systems
- know about recent topics of research of tall buildings

Course Content

UNIT I: Introduction

Design Philosophy - History - Advantages and disadvantages - Vertical city concepts - Essential amenities - Fire safety - Water supply - Drainage and garbage disposal - Service systems - Structural and foundation systems. Factors affecting height, Growth and form - Human comfort criteria.

UNIT II: Loads and Materials

Gravity loading - Dead and Live load - calculation - Impact and construction loads. Wind loading - static and dynamic approach - Analytical and wind tunnel experimental method. Earthquake loading - Equivalent lateral force, Modal analysis - Combination of loading in various design philosophies. Materials for tall buildings - High strength concrete - Light weight concrete - Fibre reinforced concrete Composite Materials.

UNIT III: Structural Systems

Behavior of High Rise structures - Different system for load distribution in steel and concrete - Vertical and horizontal load resistant systems – Rigid frames - Braced

frames - Infilled frames - Shear walls - wall frames – Tubular systems - Outrigger braced systems - Mega systems.

UNIT IV: Analysis and Design

Analysis and Design principles of various horizontal load transfer systems - Approximate methods - Modeling for accurate analysis - 3D analysis -Member forces - Displacements. Analysis for various secondary effects -Creep, shrinkage and temperature. Stability Analysis - Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity loading, P - effect and various methods of analysis - Influence of foundation instability, Out of plumb effects - Elastic Deformations. Dynamic Analysis - Principles of design of tall braced frames for earthquake and blast resistant design.

UNIT V: Advanced Topics

Structural systems for future generation buildings - Expert systems for consultations - Economics - Research needs in tall building materials, systems and designs.

Text books:

1. Schuller.W.G., “High Rise Building Structures”, John Wiley & sons, 1977(Units I,II,III,IV)
2. Lynn.S. Beedle, “Advances in Tall Buildings”, CBS Publishers and Distributors, New Delhi, 1996(Units V)

References:

1. Gupta.Y.P.,(Editor), “Proceedings of National Seminar on High Rise Structures - Design and Construction Practices for Middle Level Cities”, New Age International Limited, New Delhi, 1995.
2. Smith .B.S. and Coull .A., “Tall Building Structure”, ‘Analysis and Design’, John Wiley & Sons, Inc., 1991
3. Taranath .B.S., “Structural Analysis and Design of Tall Buildings”, McGraw Hill Co. 1988

* * *

COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING LAB

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- apply the civil engineering software to some of the structural engineering problems.

Learning Outcomes

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

- analysis the structural elements using software designs.
- design the structures for the dynamic loads using software's.
- solve the finite elements application problems of structural engineering by software's.

Any 10 of the following problems are to be solved using Computer Programs / Application software like STAAD/SAP/ETABS/ NISA (Civil) etc.

List of Experiments:

1. Introduction to software's
2. Analysis of determinate beam to different types of loading.
3. Analysis of continuous beam subjected to different types of loading.
4. Analysis of 2-D building frame for gravity loads.
5. Analysis of 3-D frame for gravity loads
6. Lateral forces on a building due to an earthquake using equivalent static method
7. Wind analysis of 3-D frames.
8. Analysis and Design of steel girder
9. Analysis of pin jointed plane trusses
10. Analysis and design of simple bridge deck.
11. Design of reinforced concrete retaining wall (cantilever type)
12. Open ended experiment.

References:

1. Prof. Sham Tickoo, "Learning Bentley Staad.Pro V8i for Structural Analysis" dreamtech press.
2. S.Ramamrutham,R. Narayan, "Theory of structures" Dhanpat rai publishing company.
3. Punmia.B.C , Design of steel structures, Laxmi publicationsList of Experiments:

* * *

ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

POWER ELECTRONICS AND ELECTRIC DRIVES

**Department of
Electrical and Electronics Engineering**

M.Tech Two Year Degree Course

(Applicable for the batch 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
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 pioneer in electrical and electronics engineering education and research, preparing students for higher levels of intellectual attainment, and making significant contributions to profession and society.

Mission:

- * To impart quality education in electrical and electronics engineering in dynamic learning environment and strive continuously for the interest of stake holders, industry and society.
- * To create an environment conducive to student-centered learning and collaborative research.
- * To provide students with knowledge, technical skills, and values to excel as engineers and leaders in their profession.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO-I : Apply fundamental principles of Electrical & Electronics Engineering, Mathematical Sciences relevant to Electric Power & Energy related industries and institutions.

PEO-II : Undertake research in the emerging areas of Power Semi-conductor Devices, Static Power Electronic Converters, Pc based Real time implementations with control system applications to Electrical Drives and Power Supplies.

PEO-III: Apply leadership skills through effective communication and work in a collaborative interdisciplinary environment.

PEO-IV: Acquire ethical values, social responsibilities and life-long learning ability through professional bodies encouraged during their study in the college campus.

IV. PROGRAM OUTCOMES (POs)

PO-1 : An ability to independently carry out research /investigation and development work to solve practical problems.

PO-2 : An ability to write and present a substantial technical report/document.

PO-3 : Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

V. ACADEMIC REGULATIONS

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

1. Duration of the Program

The duration of the program is two academic years consisting of four semesters. However, a student is permitted to complete the course work of M.Tech program in the stipulated time frame of four academic years from the date of joining.

2. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

3. Program Credits

Each specialization of the M.Tech programs is designed to have a total of 70 credits and the student shall have to complete the two year course work and earn all the 70 credits for the award of M.Tech Degree.

4. Attendance Regulations

- 4.1 A student shall be eligible to appear for Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- 4.2 Condoning of shortage of attendance in aggregate up to 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 the College Academic Committee. 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.
- 4.3 A student shall be eligible to claim for condonation of attendance shortage only once during the two years (four semesters) course work.
- 4.4 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.
- 4.5 Shortage of Attendance below 65% in aggregate shall in *NO* case be condoned.

- 4.6 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that semester and their registration shall stand cancelled.
- 4.7 A fee stipulated by the college shall be payable towards condoning attendance shortage.

5. Examinations and Scheme of Evaluation

5.1 Theory Courses :

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 assignments and 30 marks are based on two mid-term examinations.
- ii) Each assignment carries 10 marks and the average of two assignments shall be taken as the marks for continuous assessment.
- iii) Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of four questions, each for 10 marks. All the questions need to be answered.
- 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 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 two questions, each for 20 marks, with internal choice. All the questions need to be answered. 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 8 questions, each for 12 marks, out of which 5 questions are to be answered.
- ii) 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.

5.2 Laboratory Courses :

- i) For practical subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 40 internal marks. Of the 40 marks for internal, 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 an internal examiner and an external examiner for 60 marks.

5.3 (a) Seminar:

- i) For seminar, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the literature and submit it to the department in a report form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of report and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh report towards the end of that semester and appear for evaluation by the committee.

(b) Term Paper:

- i) For term paper, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the research papers and submit it to the department in publication form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of paper and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh paper towards the end of that semester and appear for evaluation by the committee.

5.4 Project Work:

Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee.

- i) A Project Review Committee (PRC) shall be constituted for each specialization with Head of the Department / a Senior Faculty as Chairman and two other senior faculty members.
- ii) Registration of Project Work: A candidate who has been promoted to 3rd semester shall be eligible to register for the project work.
- iii) The eligible candidate can choose his project supervisor and submit the title, objective, abstract and plan of action of the proposed project work to the department for approval by the PRC. The candidate whose proposal is approved by the PRC shall register for the project work. The minimum duration of project work will be 36 weeks from the date of registration.
- iv) If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. In case of such changes, the candidate has to register afresh.
- v) There shall be three reviews on the progress of the project work by the PRC with an interval of 12 weeks. The candidate needs to submit a report on the progress of his work and present it before the PRC for assessment. The PRC may suggest for an extension of date of submission of dissertation if the progress of work is not satisfactory or absent himself for the review.
- vi) A candidate who has passed all the theory, laboratory, seminar and term paper examinations and shown satisfactory progress of project work is permitted to submit the dissertation after 36 weeks from the date of registration.
- vii) If a candidate fails to submit the dissertation by the end of the 4th semester, he has to take the permission for an extension by paying the semester(s) tuition fee.
- viii) Three copies of the Project Thesis certified by the supervisor shall be submitted to the Department.
- ix) Project evaluation and Viva-Voce examination is conducted at the end of 4th semester by a committee consisting of Project Supervisor, senior faculty of the department, HoD and an External Examiner nominated by the Chief Controller of Examinations out of a panel of three examiners suggested by the department.

The following grades are awarded for the project work:

- i. Excellent
- ii. Very Good
- iii. Good
- iv. Satisfactory
- v. Unsatisfactory

The Grade “unsatisfactory” is treated as Fail. Failed Students should take supplementary examination after making required modifications, if any, in the dissertation with a minimum gap of 8 weeks by paying the required examination fee.

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

6.1 Criteria for Passing a Course:

- i) A candidate shall be declared to have passed in individual theory / laboratory 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.
- ii) The candidate shall be declared to have passed in seminar / term paper viva-voce if he secures 50% marks.
- iii) The candidate shall be declared to have successfully completed the project work if he secures a minimum of ‘satisfactory’ grade in the project evaluation and viva-voce examination.
- iv) On passing a course of a program, the student shall earn assigned credits in that course.

6.2 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 /Elective /Laboratory /Seminar / Term Paper /Project Dissertation (%)	Grade Points	Letter Grade
≥ 90	10	O (Outstanding)
≥ 80 & < 90	9	A+ (Excellent)
≥ 70 & < 80	8	A (Very Good)
≥ 60 & < 70	7	B+ (Good)
≥ 50 & < 60	6	B (Above Average)
< 50	0	F (Fail)

6.3 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:

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

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.

6.4 Eligibility for Award of B.Tech Degree:

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

- Pursued a course of study for not less than two academic years and not more than four academic years.
- Registered for prescribed **70** credits and secured **70** credits.
- Students, who fail to complete their Two years Course of study within Four years or fail to acquire the prescribed **70** Credits for the award of the degree within four academic years from the year of their admission shall forfeit their seat in M. Tech course and their admission shall stand cancelled.

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

The CGPA is calculated as given below:

$$\text{CGPA} = \frac{\sum (CR \times GP)}{\sum CR} \quad \text{for entire program.}$$

where CR = Credits of a course

GP = Grade points awarded for a course

* CGPA is calculated for a candidate who passed all the prescribed courses excluding project work.

6.6 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
$\geq 6.5 \text{ \& } < 7.5$	First Class
$\geq 5.5 \text{ \& } < 6.5$	Second Class

7. Supplementary Examinations

- Supplementary examinations will be conducted once in a year along with regular examinations.

- 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.

8. Re-admission Criteria

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/-

9. Break in Study

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of M.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 shall be paid by the candidate to condone his break in study.

10. 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 he will be offered substitute subjects in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

11. 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 be withheld in such cases.

12. 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 / year. 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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.	Expulsion from the examination hall 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 / year. 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 / year.
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 / year 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.

13. Other Matters

- i) Deserving physically challenged candidates will be given additional examination time and a scribe based on the certificate issued by the concerned authority. 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.
- v) Wherever the word he, him or his occurs, it will also include she, her and hers.

VI. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits
1	Baisc Sciences (BS)	3	4.28
2	Humanities and Social Sciences (HSS)	3	4.28
3	Professional Core (PC)	25	35.72
4	Professional Electives (PE)	9	12.86
7	Others (Seminar, Term Paper, Dissertation, etc.)	30	42.86

COURSE STRUCTURE & SYLLABUS

COURSE STRUCTURE

I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	MA2902	Linear and Non-Linear Optimization	4	-	-	3
2	EC2901	ARM Architecture and Programming**	3	-	2	3
3	EE2902	Analysis of Power Electronic Converters	4	-	-	3
4	EE2903	Electrical Machine Modeling and Analysis	4	-	-	3
5	EE2904	Modern Control Theory	4	-	-	3
6		Professional Elective - I	4	-	-	3
7	EE2908	Power Electronic System Simulation Lab	-	-	4	2
Total			23	-	6	20

II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	EE2910	Research Methodology	4	-	-	3
2	EE2911	Advanced Digital Control Systems	4	-	-	3
3	EE2912	Switched Mode Power Converters **	3	-	2	3
4	EE2913	Advanced Electric Drives	4	-	-	3
5		Professional Elective - II	4	-	-	3
6		Professional Elective - III	4	-	-	3
7	EE2919	Power Electronics and Electric Drives Lab	-	-	4	2
8		Seminar	-	-	-	2
Total			23	-	6	22

** Project Based Theory Course

L : Lecture T : Tutorial P : Practical

III Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Term Paper	-	-	4	2
2		Dissertation (Initiated in third semester)	-	-	-	-
Total			-	-	4	2

IV Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Dissertation (Carried out in third & Fourth Semester)	-	-	52	34
Total			-	-	52	34

Professional Electives:

Professional Elective - I

- EE2905 Power Semiconductor Devices & Protection
- EE2906 Special Machines and Control
- EE2907 HVDC Transmission Systems

Professional Elective - II

- EE2914 Renewable Energy Storage Systems
- EE2915 Application of power Electronics to Power Systems
- EE2916 Custom Power Devices

Professional Elective - III

- EC2902 Digital Signal Processing and Applications
- EE2917 AI Techniques
- EE2918 Smart Grids

SYLLABUS

LINEAR AND NON-LINEAR OPTIMIZATION

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

Students should be able to

- Familiarize different optimization techniques and approaches.
- Provide the concepts of various classical and modern methods of constrained and constrained problems in both single and multivariable
- Understand Non – Linear optimization problems.
- know evolutionary optimization methods

Course Outcomes

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

- apply the knowledge of Mathematics in analyzing on engineering problems.
- formulate optimization problem.
- develop an optimization problem in standard form and assess the optimality of a solution.
- solve various constrained and unconstrained problems in single variable as well as multi variable.
- apply the concepts of optimality criteria for various types of optimization problems.

Course Content

Unit-I: Linear Optimization

Formulation of LPP, Graphical solution, Standard form of linear programming problem, Simplex method, Big-M method

Unit-II: Classical Optimization Techniques

Introduction -Single-Variable Optimization-Multivariable Optimization, Nonlinear Programming One-Dimensional Minimization Methods Introduction – Unimodal Function – Elimination Methods Unrestricted Search - Exhaustive Search- Dichotomous Search - Interval Halving Method- Fibonacci Method - Golden Section Method.

Unit-III: Nonlinear Programming I Unconstrained Optimization Techniques

Introduction –Direct search methods Random Search Methods -Univariate Method- Pattern Directions- Powell's Method- Indirect search (Descent) methods Gradient of a Function -Steepest Descent (Cauchy) Method - Conjugate Gradient (Fletcher–Reeves) Method

Unit-IV: Nonlinear Programming II constrained Optimization Techniques

Optimization with equality and inequality constraints, Direct methods, Indirect methods using penalty functions, Lagrange multipliers, Geometric programming Introduction - unconstrained minimization problems.

Unit- V: Modern Methods of Optimization

Genetic Algorithms Introduction – Representation of Design Variables, Representation of Objective function and constraints, Genetic operators - Ant Colony Optimization Introduction , Basic concepts, Ant searching behavior, Path retracing and pheromone updating, pheromone trail evaporation algorithm.

Text Books:

1. Singiresu S.Rao, Engineering Optimization, Theory and Practice 4th edition. New Age International (P) Limited, Publishers. (Unit-I 3.1 to 3.9; Unit-II 2.1 to 2.5 and 5.1 to 5.8; Unit-III 6.1,6.2,6.4,6.7,6.10,6.11 and 6.12; Unit-IV 7.5 to 7.8, 7.12,7.13 and 7.15; Unit-V 12.7).
2. Kalyan moy Deb, Optimization for Engineering Design, PHI, Delhi, 2014.

Reference Books:

1. S.D. Sharma, Operations Research, 8th edition, Kedarnath Publishers, 2007.
2. E.J. Haug and J. S. Arora, Applied Optimal Design, Wiley, New York.
3. Marco Dorigo and Thomas stutzle, Ant colony optimization MIT press, 2004. (Unit-V 4.1 to 4.4)
4. S.N.Sivanandan, S.N. DeepaSpringer Introduction to genetic Algorithms, Springer.

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ARM ARCHITECTURE AND PROGRAMMING

I Semester

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

Pre - requisite

Basic knowledge on Microcontroller 8051, Programming (preferably C), Computer Architecture and Computer logic design.

Course Objectives

To make the students

- To introduce the basic concepts of ARM architecture and processor families.
- To familiarize the various concepts of Registers, Instruction sets, Interrupts and vector tables.
- To impart the ARM programming skills.

Learning Outcomes

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

- Understand the architecture of the ARM microcontrollers and ARM Processor Families.
- Apply the concepts of Registers, Thumb Instruction sets, Memory organization and Interrupts.
- Develop a real time application using ARM.

Course Content

UNIT - I: ARM Architecture

ARM Design Philosophy, Registers, Program Status Register, Instruction Pipelines, Interrupts and Vector Table, Cache Architecture, Policies, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Context Switch.[Textbook1,2]

UNIT- II: ARM Programming Model – I

Instruction Set Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions. [Textbook1]

UNIT - III: ARM Programming Model – II

Thumb Instruction Set Register Usage, Other Branch Instructions, Data Processing Instructions, Single and Multi-Register Load-Store Instructions, Stack, Software Interrupt Instructions [Textbook1]

UNIT - IV: ARM Programming

C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops. [Textbook1]

UNIT- V: Embedded ARM Applications

ARM Processor Families, VLSI Ruby II Advanced Communication Processor, ISDN Subscriber Processor, One CTM VWS22100 GSM chip, Ericsson -VLSI Bluetooth Baseband Controller, ARM 7500 and ARM 7500FE. [Textbook 1]

Text Books:

1. ARM Systems Developers Guide- Design & Optimizing System Software - Andrew N. Sloss, Dominic Symes, Chris Wright, 2004, Elsevier. (Unit I to V)
2. ARM System-on-Chip Architecture, Addison Wesley – 2 Edition. (Unit I to V)

References:

1. Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes / Cole, 1999, Thomas Learning.
2. Embedded Systems - Architecture Programming and Design – Raj Kamal, 2nd ed., 2008, TMH.
3. Designing with PIC Microcontrollers- John B. Peatman, 1998, PH Inc.

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ANALYSIS OF POWER ELECTRONIC CONVERTERS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize the concepts of power factor improvement methods in both single phase and three phase converters.
- familiarize with Voltage control methods in single phase and Three phase AC voltage controllers and inverters.

Learning Outcomes

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

- Analyze various types of power electronic converters with different loads.
- Identify appropriate AC voltage controller for a particular application.
- apply different power factor improvement methods for converters.
- Select an appropriate voltage control technique for an inverter.
- Analyze different types of multilevel inverter topologies.
- Design a suitable power electronic converter for a given application

Course Content

UNIT - I: AC Voltage Controllers

Single Phase AC Voltage Controllers with PWM control only –synchronous tap changers - Three Phase AC Voltage controllers-Analysis of Controllers with star and delta connected resistive, Resistive –inductive loads-Effects of source andload inductances –Application- numerical Problems.

UNIT- II: Single Phase and Three Phase AC-DC Converters

Single phase full and half Converters with inductive load – Power factor improvements Extinction angle control-symmetrical angle control - single phase sinusoidal PWM-Single phase series converters. Three Phases full and half Converter with inductive load –Harmonic analysis -Power factor improvements-three phase PWM-twelve pulse converters-Numerical problems

UNIT - III: Power Factor Correction Converters

Single-phase single stage boost power factor corrected rectifier, power circuit principle of Operation, and steady state- analysis, three phases boost PFC converter.

UNIT - IV: PWM Inverters

Single phase full bridge inverters - sinusoidal PWM – modified PWM – phase displacement Control – Trapezoidal, staircase, stepped, harmonic injection and delta modulation – numerical Problems - Three-Phase Inverters- Sinusoidal PWM- 600 PWM- Third Harmonic PWM- Space Vector Modulation- Comparison of PWM Techniques-current source inverters-Variable dc link Inverter - numerical problems..

UNIT - V: Multi Level Inverters

Multilevel Concept, Types of Multilevel Inverters- Diode-Clamped Multilevel Inverter, Features of Diode-Clamped Inverter, Improved Diode-Clamped Inverter- Flying-Capacitors Multilevel Inverter- Features of Flying-Capacitors Inverter- Cascaded Multilevel Inverter- Principle of Operation- Features of Cascaded Inverter- Switching Device Currents-DC-Link Capacitor Voltage Balancing- Features of Multilevel Inverters- Comparisons of Multilevel Converters

Text Books:

1. Power Electronics-Md.H.Rashid –Pearson Education Third Edition- First Indian Reprint- 2008 (Units – I to VI).

Reference Books:

1. Power Electronics – Lander –Mc.Graw Hill ,2009.
2. Modern power Electronics and AC Drives – B.K.Bose- Prentice Hall; First edition , October 2001.
3. Power Converter Circuits – William Shepherd & Li Zhang ,CRC Press, 12-Mar-2004.
4. Power Electronics- Ned Mohan, Tore Mundelein and William P.Robbins – JohnWiley& Sons -2ndEdition,2002.

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ELECTRICAL MACHINE MODELING AND ANALYSIS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- know the concepts of Kron's primitive machine
- familiarize with modeling of Electrical Machines.

Learning Outcomes

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

- Represent basic two pole electrical machine
- Analyze the steady state and transient behavior of D.C. machine.
- Apply transformation techniques for modeling of an electrical machine.
- Develop a mathematical model to an electrical machine for specific application.
- Selection of reference frame for a particular application

Course Content

UNIT - I: Basic concepts of Modeling

Introduction to generalized theory of electrical machines – Conventions used in generalized theory of electrical machines–Basic two-pole machine representation of commutator machines, 3-phase synchronous machine with and without damper bars and 3-phase induction machine–Kron's primitive Machine voltage, current and torque equations – Steps to apply the generalized theory to rotating electrical machines.

UNIT - II: Modeling of DC Machine

Mathematical model of separately excited D.C motor – Steady State analysis- Transient State analysis-Sudden application of Inertia Load-Transfer function of Separately excited D.C Motor- Mathematical model of D.C Series motor, Shunt motor.

UNIT - III: Reference Frame Theory

Linear transformation –Invariance of power –Phase transformations three phase to two phase transformation (a, b, c to $\hat{a}, \hat{a}, 0$), two phase to three phase transformation ($\hat{a}, \hat{a}, 0$ to a, b, c) – Transformation from rotating axes ($\hat{a}, \hat{a}, 0$) to stationary axes ($d, q, 0$) –Park's transformations three phase to two phase transformation (a, b, c to $\hat{a}, \hat{a}, 0$), two phase to three phase transformation ($\hat{a}, \hat{a}, 0$ to a, b, c).

UNIT - IV: Modeling of Three Phase Induction Machine

Generalized model in arbitrary reference frame-Electromagnetic torque-Derivation of commonly used Induction machine models-Stator reference frame model-Rotor reference frame model-Synchronously rotating reference frame model – State space model with flux linkages as variables.

UNIT - V: Modeling of Synchronous Machine

Synchronous machine inductances –voltage equations in the rotor's dq0 reference frame-electromagnetic torque-current in terms of flux linkages- three phase synchronous machine model - modeling of MBLDC motor.

Textbooks

1. P.S.Bimbra, “Generalized Theory of Electrical Machines”, Khanna Publications, 5th edition, 1995 (Units - I, II, III).
2. P.C.Krause, Oleg Wasynczuk, and Scott D.Sudhoff, “ Analysis of Electrical Machinery and Drive Systems”, IEEE Press, Third Edition, 2013 (Units - III, IV, V).

Reference Books

1. R.Krishnan, “Electric Motor Drives - Modeling, Analysis & control”, Pearson Publications, First Edition, 2002 (Units - II, IV, V).
2. Chee Mun Ong, “Dynamic simulation of Electric machinery using Matlab / Simulink”, Prentice Hall Publications, 1998 (Units-II, IV, V).

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MODERN CONTROL THEORY

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- To understand the concept of stability, controllability and observability of LTI systems.
- To understand the use of classical nonlinear techniques such as phase plane, describing functions.
- To familiarize with the design of state feedback controllers and observers for a given system.

Learning Outcomes

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

- Construct state diagram for a given continuous time state model.
- Compute the solution for a given state model of linear continuous systems.
- Select an appropriate stability criterion for the design of non linear systems.
- Analyze controllability and observability from state model.
- Design a state feedback controller and observer to meet the desired specifications.

Course Content

UNIT - I: State Variable Analysis

State space representation of Linear Continuous time models for physical systems – Existence and Uniqueness of Solutions to Continuous Time State Equations, Solution of Linear Time invariant continuous-Time State Equations, State transition matrix and its properties. Conversion of state space model to transfer function model. Canonical Forms – Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form.

UNIT- II: Controllability and Observability

General concept of Controllability, and Observability, Controllability tests for Continuous – Time Invariant systems, - Observability tests for Continuous - Time Invariant systems. Controllability and observability form Jordan canonical form and other canonical forms.

UNIT - III: Describing Function Analysis

Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems- stability analysis of non – linear systems. Singular points – Introduction to linearization of nonlinear systems.

UNIT - IV: Stability Analysis

Stability in the sense of Lyapunov, Lyapunov's stability and Lyapunov's instability theorems – Stability Analysis of the Linear Continuous time invariant systems by Lyapunov second method – Generation of Lyapunov functions – Variable gradient method – Krasovskii's method.

UNIT - V: State Feedback Controllers and Observers

Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement. Full order observer and reduced order observer.

Text Books

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996. (Unit I,II,V)
2. Modern control engineering – K.Ogata, prentice Hall Of India, 3rd edition, 1998. (Unit III,IV,V)

Reference books

1. Control system Engineering – I.J. Nagarath, M.Gopal. New Age International Publications, 5th edition.
2. Systems and Control - Stainslaw H. Zak, Oxford Press, 2003.
3. Automatic feedback control system synthesis – Truxal, International student edition.
4. Modern Control Systems - Richard C. Dorf and Robert H. Bishop, 11th Edition Pearson Edu,India, 2009.

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POWER SEMICONDUCTOR DEVICES AND PROTECTION

I Semester

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

Course Objectives

To make the student

- Know the static and dynamic characteristics of current and voltage controlled power semiconductor devices
- Familiar with the selection of devices for different power electronics applications,

Learning Outcomes

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

- Understand the static-dynamic characteristics of voltage controlled power semiconductor devices
- Understand the driver circuit operation of various devices
- Understand the control and firing circuits required for different switching devices.
- Understand the protection of switching devices

Course Content

UNIT - I: Overview of Power Switching Device

Introduction to power switching device classification of device, controlled and un-controlled device, I-V characteristics of ideal and real switching device

Power Diodes Device structure and i - v characteristics, rating & specifications, switching characteristics, reverse recovery, classifications of various diode Schottky diode, line frequency diodes, fast recovery diodes

UNIT- II: Power Transistors

Device structure and i-v characteristics, rating & specifications, switching characteristics, on to off and off to on state transitions, on/off transition loss analysis, driver circuits

UNIT - III: Power MOSFETs

Device structure and i - v characteristics, rating & specifications, switching characteristics, on to off and off to on state transitions, on/off transition loss analysis, driver circuits.

UNIT - IV: IGBT

Device structure and $i - v$ Characteristics, rating & specifications, switching Characteristics, ON to OFF and OFF to ON state transitions, ON/OFF transitions, loss analysis, Comparison of all the above device with reference to power handling capability, frequency of operation, driver circuit, emerging power switching device

UNIT- V: Protection of the Switching Device

Device protection against over voltage/current, di/dt and dv/dt ; safe operating area, design of snubbers for power devices.

Text Books:

1. Williams, B. W. "Power electronics Devices, drivers, and applications" Mc.Graw hill 2nd edition, 1992. (Unit I to V)
2. Power Electronics-Md.H.Rashid –Pearson Education Third Edition- First Indian Reprint- 2008 (Unit I to V)

References:

1. MD Singh and K.B Khanchandani, "Power Electronics", Tata McGraw Hill, 2001.
2. Mohan, Undeland and Robins, "Power Electronics – Concepts, applications and Design, John Wiley and Sons, Singapore, 2000.

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SPECIAL MACHINES AND CONTROL

I Semester

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

Course Objectives

To make the students

- To familiarize the students with the constructional details, operating principles, theory of torque production and characteristics of various electrical machines.
- To expose the students to different power controllers and control practices associated with various electrical machines.

Learning Outcomes

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

- Demonstrate the knowledge and understanding of constructional details, working principles and control practices associated with various electrical machines.
- Describe the process of e.m.f. generation and torque production in various electrical machines.
- Analyze the speed-torque characteristics of various electrical machines.
- Apply the knowledge of Mathematics and Physical Science in designing the closed loop control strategy for various electrical machines to meet specified performance requirements.
- Suggest and select an appropriate electrical machine for a specified application.

Course Content

UNIT – I: Stepper Motors

Introduction – Classification of stepper motors - Constructional features and principle of operation – Torque equation of variable reluctance stepper motor – Open loop control - Closed loop control – Applications.

UNIT – II: Switched Reluctance Motors

Constructional features – Principle of operation – Torque equation – Speed and torque characteristics – Power converter switching circuits – Current control schemes – Closed loop control – Applications.

UNIT–III: Synchronous Reluctance Motors

Constructional features – Principle of operation – Phasor diagram – Torque Equation – Speed and torque characteristics – Control of synchronous reluctance motor – Applications.

UNIT–IV: Permanent Magnet Brushless D.C. Motors

Constructional features – Electronic commutation – Principle of operation – EMF and Torque equations – Torque and Speed characteristics – Power controller – Comparison between conventional dc motor and PMSM motor – Applications.

UNIT–V: Permanent Magnet Synchronous Motors

Constructional features – Principle of operation – Phasor diagram – EMF and Torque equations – Torque and Speed characteristics – Power controllers – Comparison of permanent magnet excitation and electromagnet excitation – Applications.

UNIT–VI: Linear Motors

Comparison between a linear electric motor and rotary motor – Classification of linear induction motor (LIM) – Constructional details – Principle of operation– Linear Synchronous motor (LSM) – Types – Constructional details – Principle of operation– Control of LSM – Applications of Linear Motors.

Textbooks:

- 1) 'Stepping Motors A Guide to Modern theory and practice', P.P.Acornley, Peter Peregrines, London, 2002.(UNIT-I)
- 2) 'Stepping Motors and their Microprocessor Controls', Kenjo, T., ClarendonPress, 1984(UNIT-I,II)
- 3) 'Brushless Permanent Magnet & Reluctance Motor Drives', T.J.E. Miller, Clarenden press, Oxford, 1989.(UNIT-IV)
- 4) 'Linear Electric Motors Theory Design and Practical Applications', Naser, A.and Boldea.L, Prentice Hall of India, 1987.(UNIT-VI)

References

- 1) 'Special Electrical Machines', E.G.Janardanan, PHI Learning Private Limited, First Edition, 2015(UNIT-I,II,III,IV,V,VI).
 - 2) 'Principles of Special Electrical Machines', J.Gnanavadivel, Dr.S.Muralidharan, Dr.J.Karthikeyan, Anuradha Publications, Fourth Edition, 2014.(UNIT-I,II,III,IV,V,VI)
 - 3) 'Special Electrical Machines', K.Dhayalini, Anuradha Publications, Third Edition, 2011.(UNIT-I,II,III,IV,V)
- 'Electric Motor Drives - Modeling, Analysis, and Control', R.Krishnan, PrenticeHall of India, 2003.(UNIT-V).

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HVDC TRANSMISSION SYSTEMS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- To introduce the concepts of HVDC Transmission.
- To familiarize with various converters , controllers and networks used in HVDC Transmission.

Learning Outcomes

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

- Design the voltage level and ratings of the HVDC system for a given amount of power transfer.
- Identify the suitable converter and its control scheme in HVDC Transmission.
- Estimate the amount of reactive power to be compensated for a given HVDC Transmission system.
- Develop a suitable model for a given AC- DC network.
- Choose appropriate protecting device for various faults in HVDC stations.
- Design a suitable filter to eliminate harmonics in the HVDC System.

Course Content

UNIT- I: Basic Concepts

Economics & Terminal equipment of HVDC transmission systems Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC & DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

UNIT- II: Analysis Of HVDC Converters

Choice of Converter configuration – analysis of Graetz – characteristics of 6 Pulse & 12 Pulse converters –Cases of two 3 phase converters in star –star mode – their performance. Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system; Starting and stopping of DC link; Power Control.

UNIT- III: Reactive Power Control And In HVDC

Reactive Power Requirements in steady state-Conventional control strategies- Alternate control strategies sources of reactive power-AC Filters – shunt capacitors-synchronous condensers.

UNIT- IV: Power Flow Analysis in AC/DC Systems

Modelling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC load flow –solution of AC-DC Power flow-Simultaneous method-Sequential method.

UNIT- V: Converter Faults, Harmonics & Protection

Converter faults – protection against over current and over voltage in converter station – surge arresters – DC breakers –Audible noise-space charge field-corona effects on DC lines-Radio interference. Generation of Harmonics, Characteristics and Non- Characteristics harmonics, Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics. Types of AC filters, Design of Single tuned filters –Design of High pass filters.

Text Books:

1. HVDC Power Transmission Systems Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited Publishers, First Edition, 2005.(Unit I to V)
2. EHVAC and HVDC Transmission Engineering and Practice – S.Rao. Khanna Publishers, 1990. (Unit I,II,IV,VI)

Reference Books:

1. HVDC Transmission – J.Arrillaga. published by the institution of electrical engineering, London, UK, 1998.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons, First Edition.
3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications, First Edition

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POWER ELECTRONIC SYSTEM SIMULATION LAB

I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

To make the students

- Get the requisite knowledge necessary to appreciate the dynamical equations involved in the analysis of different PED configurations.
- Design and simulate different power converters studied in the core courses on power converters, Inverters and dynamics of electrical machines.

Learning Outcomes

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

- Simulate different dynamical equations for modeling of converters and machines.
- Model and Analyze the dynamics of basic DC converters and their closed loop operation.
- Analyze various load phenomena of different converters.
- Analyze the operation of various Inverter topologies with relevant switching schemes.

List of experiments

1. Simulation of Numerical solution of ordinary and partial differential equations.
2. Simulation of dynamic performance of Buck boost, SEPIC DC Converters using State space modelling.
3. Simulation of Buck and boost converters for closed loop voltage control mode control.
4. Simulation of Buck and boost converters for closed loop current mode control mode.
5. Simulation of single phase half wave controlled converter fed RLE load.
6. Simulation of single phase fully controlled converter fed RLE load.
7. Simulation of three phase half-controlled converter fed RL load.
8. Simulation of single phase ac phase controlled fed RL load.
9. Simulation of three phase to single phase cyclo - converter fed RL load
10. Simulation of various PWM techniques for inverter topologies

11. Simulation of i) LC tank circuit resonance, ii) Basic / modified series inverter and iii) Series loaded series resonant inverter
12. Simulation of multi-level inverter topologies.

Text Books

1. Rashid, Muhammad H. *Spice for power electronics and electric power*. CRC Press, 2012.
2. Shaffer, Randall. *Fundamentals of power electronics with MATLAB*. Firewall Media, 2013.

Reference

1. Robert W. Erickson & Dragon Maksimovic, “ Fundamentals of Power Electronics” Second Edition, 2001 Springer science and Business media.
2. Ned Mohan, T. M. Udeland and W.P Robbin, “Power Electronics converters, Application and design” John Wiley and sons. Wiley India edition, 2006.
3. Rashid M.H., “Power Electronics Circuits, Devices and Applications “, Prentice Hal India, New Delhi, 1995.

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RESEARCH METHODOLOGY

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- familiarize with the objectives, motivation and significance of research.
- know research methodologies.
- define research problem and perform data analysis.
- write a research paper and report.

Learning Outcomes

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

- understand research approaches
- understand various research methodologies
- define a research problem
- perform data analysis
- write research papers and reports

Course Content

UNIT – I Introduction

Introduction, objectives and motivation of research, types of research, research approaches, significance of research methods.

UNIT – II Research Methodology

Research methods versus methodology, research and scientific method, importance of knowing how research is done, research process. criteria for good research.

UNIT – III Defining Research Problem

The research problems, necessity of defining the problem, technique involved in defining a problem, review of related literature, purpose of literature survey, identifying the current status, presentation of literature survey findings. critique, survey and peer review process.

UNIT – IV: Research Design and Data Analysis

Meaning of research design, features of good design, important concepts relating to research design, different research designs, basic principles of experimental designs.

Methods of data collection - collection of primary data, observation method, interview method, collection of data through questionnaires, collection of data through schedules, difference between questionnaires and schedules, some other methods of data collection, collection of secondary data, selection of appropriate method for data collection, case study method.

Processing and analysis of data - processing operations, some problems in processing, elements, types of analysis, statistics in research.

UNIT – V: Research Paper and Report Writing

Final paper presentation. significance of report writing, different steps in writing report, layout of the research report, types of report, precautions for writing research reports.

Textbooks

1. C.R.Kothari, “Research Methodology Methods and Techniques”, Wishwa Prakashan Publishers, Second Edition (Units – I,II....).

Reference Books:

1. Template of ASCE/ASME/IEEE for paper writing.

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ADVANCED DIGITAL CONTROL SYSTEMS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- The theory of z-transformations and application for the mathematical analysis of digital control systems.
- Examine the stability of the system using different tests.
- Represent the discrete-time systems in state-space model and evaluation of state transition matrix.
- Study the design of state feedback control by “the pole placement method.”

Learning Outcomes

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

- Understand z-transformations and their role in the mathematical analysis of different systems (like Laplace transforms in analog systems).
- Stability criterion for digital systems and methods adopted for testing.
- Apply the concept of controllability and observability to design an appropriate digital feedback controller.
- Develop digital hardware controller.

Course Content

UNIT - I Sampling and Reconstruction

Overview of modern digital control theories, z- and inverse z- transformation and properties, difference Equation – solution by recursion and z-transform, relationship between s- plane and z-plane, sampling theorem – data conversion and quantization – mathematical modeling- data reconstruction and filtering of sampled signals – zero- order – hold.

UNIT - II Stability Analysis

Digital control systems – pulse transfer function of open loop, closed loop systems, stability tests of linear digital control systems, relationship between $G(s)$ and $G(z)$.

UNIT - III State Space Analysis

State equations of discrete data systems, solution of discrete state equations, state transition matrix Z-transform method. Relation between state equation and transfer functions, Concepts of controllability and observability.

UNIT - IV State Feedback Controllers and Observers

Digital State observer Design of the full order and reduced order state observer – pole placement design by state feedback, Design of Dead Beat controller – some case studies.

UNIT - V Digitizing Analog Controllers

Digitizing analog controllers, digital hardware control, and Actuators limitation.

Text Books:

1. Discrete-Time Control systems - K. Ogata, PHI/Addison-Wesley Longman Pte. Ltd., India, Delhi, 2nd edition, 1995. (Unit II,III,IV)
2. Digital Control Systems - Kuo, Oxford University Press, 2nd edition, 1992.(Unit I,V)

References Books:

1. Digital control of dynamic systems – Gene F. Franklin, J.David powell, Michael workman, pearson education, 3rd edition 2000.
2. Digital control and state variable methods – M.Gopal, Tata McGraw Hill, India, 4th edition, 1997.
3. Continuous and Discrete Control Systems – Dorsay, McGraw – Hill, 1996.

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SWITCHED MODE POWER CONVERTERS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make students

- Familiarize the modern power electronic converters and its applications in electric power utility.
- Get acquainted to the design of closed loop operation of DC-DC Converters

Learning Outcomes

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

- Acquire and apply knowledge of mathematics and converter/machine dynamics in Electrical engineering.
- Design essential magnetic circuits in power supplies and drive systems.
- Design and conduct experiments towards developing new Converter designs.

Course Content

UNIT - I: Steady - State Converter Analysis

Buck, Boost, Buck- Boost and Cuk converters Principles of operation – Continuous conduction mode – Concepts of volt-sec balance and charge balance – Analysis and design based on steady-state relationships – Introduction to discontinuous conduction mode – Isolation topologies.

UNIT - II: Converter Dynamics

AC equivalent circuit analysis – State space averaging – Circuit averaging – Averaged switch modeling – Transfer function model for buck, boost, buck-boost, SEPIC and cuk converters – Input filters.

UNIT - III: Controller Design

Review of P, PI, and PID control concepts – gain margin and phase margin – Bode plot based analysis – Design of controller for buck, boost, buck-boost, SEPIC and cuk converters.

UNIT- IV: Design of Magnetics

Basic magnetic theory revision – Inductor design – Design of mutual inductance – Design of transformer for isolated topologies – Ferrite core table and selection of area product – wire table – selection of wire gauge.

UNIT- V: Resonant Converters

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS, Clamped voltage topologies- Series and parallel Resonant converters- Voltage control.

Text Books:

1. Robert W. Erickson & Dragon Maksimovic "Fundamentals of Power Electronics" Second Edition, 2001 Springer science and Business media (Unit I to V)
2. Wu Keng C Wu, "Switch-Mode Power Converters Design and Analysis. (Unit I to V).

References Books:

1. John G.Kassakian, Martin F. Schlecht, George C. Verghese, "Principles of Power Electronics" Pearson, India, New Delhi, 2010.
2. Simon Ang and Alejandra Oliva, "Power Switching Converter" Yesdee publishers, New Delhi, 2nd edition (first Indian Reprint), 2010.

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ADVANCED ELECTRIC DRIVES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- To familiarize with the speed control of DC motors with choppers
- To familiarize with the speed control methods of different AC drives

Learning Outcomes

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

- Identify & study the operational problems of chopper controlled DC motor drives
- Analyze steady state operation and control schemes of Induction motor.
- Describe the operational characteristics of slip power recovery schemes.
- Describe the flux weakening methodology scheme for PMSM drives
- Select an appropriate ac and dc drive for particular application.

Course Content

UNIT - I: Chopper controlled DC motor drives

Closed loop control of chopper fed DC motor Drives-Speed controlled drive system – current control loop – pulse width modulated current controller

UNIT - II: Inverter Fed Induction motor drives

Voltage Source Inverter Fed Induction motor drives

Scalar control- Voltage fed Inverter Control-Open loop volts/Hz control-Speed control with slip regulation Speed control with torque and Flux Control.

Current Source Inverter Fed Induction motor drives

Current-Fed Inverter Control-Independent current and frequency control-Speed and flux control in Current-Fed Inverter drive-

UNIT - III: Slip power recovery scheme

Slip power recovery schemes Slip-power recovery Drives-Static Kramer drive-Phasor diagram-Torque expression.

UNIT - IV: Vector control of Induction Motor Drive

Vector control of Induction Motor Principles of vector control, Direct vector control, derivation of indirect vector control, implementation – block diagram flux weakening operation.

UNIT - V Control of Permanent magnet Synchronous motor drives

PMSM and its characteristics- Control strategies-Constant torque angle control- power factor control, constant flux control, flux weakening operation

Text Books:

1. Electric Motor Drives Modeling, Analysis & control -R. Krishnan First Edition - Pearson Education 2010. (Unit – II,III,IV,V)
2. Modern Power Electronics and AC Drives –B. K. Bose- First Edition Pearson Publications,2010. (Unit – II,III,IV,V)

Reference Books:

1. Fundamentals of Electric Drives – G. K. Dubey –Second Edition, Narosa Publications –2010. (Unit – I)
2. Power Semiconductor Controlled drives – G. K. Dubey First.

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RENEWABLE ENERGY SYSTEMS ENERGY STORAGE

II Semester

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

Course objectives

To make the students

- Develop an overview of Solar Power Generation, related MPPT methodologies
- Knowledge on different renewable energy sources and storage devices to deal with grid connected PV systems

Learning Outcomes

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

- Recognize, model and simulate different renewable energy sources.
- Analyze, model and simulate basic control strategies required for grid connection.
- Implement a complete system for standalone/grid connected system.

Course Content

UNIT - I: Introduction

Electric grid introduction, Supply guarantee and power quality, Stability, Effects of renewable energy penetration into the grid, Boundaries of the actual grid configuration, Consumption models and patterns, static and dynamic energy conversion technologies, interfacing requirements

UNIT - II: Dynamic Energy Conversion Technologies

Introduction to different conventional and nonconventional dynamic generation technologies, principle of operation and analysis of reciprocating engines, gas and micro turbines, hydro and wind based generation technologies, control and integrated operation of different dynamic energy conversion devices

UNIT - III: Static Energy Conversion Technologies

Introduction to different conventional and nonconventional static generation technologies, principle of operation and analysis of fuel cell, photovoltaic based generators, and wind based generation technologies, different storage technologies such as batteries, fly wheels and ultra capacitors, plug-in-hybrid vehicles, control and integrated operation of different static energy conversion devices

UNIT - IV: Real and reactive power control

Control issues and challenges in Diesel, PV, wind and fuel cell based generators, PLL, Modulation Techniques, Dimensioning of filters, Linear and nonlinear controllers, predictive controllers and adaptive controllers, Fault-ride through Capabilities, Load frequency and Voltage Control

UNIT- V: Integration of different Energy Conversion Technologies

Resources evaluation and needs, Dimensioning integration systems, Optimized integrated systems, Interfacing requirements, integrated Control of different resources, Distributed versus Centralized Control, Synchro Converters, Grid connected and Islanding Operations, stability and protection issues, load sharing, Cases studies

Text books:

1. Ali Keyhani Mohammad Marwali and Min Dai, "Integration and Control of Renewable Energy in Electric Power System" John Wiley publishing company (Unit I to V)
2. S. Chowdhury, S. P. Chowdhury, P. Crossley, "Microgrids and Active Distribution Networks", IET Power Electronics Series, 2012 (Unit I to V)

References:

1. Quing-Chang Zhong, "Control of Power Inverters in Renewable Energy and Smart Grid Integration", Wiley, IEEE Press
2. Bin Wu, Yongqiang Lang, NavidZargari, "Power Conversion and Control of Wind Energy Systems", Wiley 2011.
3. G. Masters, "Renewable and Efficient Electric Power Systems", IEEE-Wiley Publishers, 2013.

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Professional Elective - II

APPLICATIONS OF POWER ELECTRONICS TO POWER SYSTEMS II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- To Introduce the Flexible AC Transmission System devices, basic types of FACTS controllers and different types of converters and their operation in different modes.
- To expose the practical problems associated with the operation of Power system and the necessity of FACTS devices

Learning Outcomes

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

- apply the knowledge of FACTS devices for enhancing power handling capacity in the transmission network.
- understand the fundamental principles and control practices associated with FACTS controllers.
- analyze different types of FACTS controllers.
- identify the operational related problems of transmission system and suggest suitable remedial measures.
- select an appropriate FACTS controller to meet specified performance requirements.

Course Content

UNIT - I: FACTS Concepts

FACTS concepts, Transmission interconnections, power flow in an AC System, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, benefits from FACTS controllers.

UNIT - II: Voltage Source Converters

Single phase, three phase, full wave bridge converters, transformer connections for 12 pulse, 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source converters, and comparison of current source converters with voltage source converters.

UNIT - III: Static Shunt Compensation

Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, methods of controllable var generation, variable impedance type static var generators, switching converter type var generators, hybrid var generators.

UNIT - IV: SVC and STATCOM

The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping, operating point control and summary of compensation control.

UNIT - V: Static Series Compensators

Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, functional requirements. GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC), control schemes for GSC, TSSC and TCSC.

Text Books:

1. “Understanding FACTS Devices” N.G.Hingorani and L.Guygi, IEEE Press. Indian Edition is available—Standard Publications (Units I to V)

Reference Books:

1. HVDC & FACTS Controllers applications of static converters in power systems - Vijay K.Sood- Springer publishers.
2. Sang.Y.H and John.A.T, “Flexible AC Transmission systems” IEEE Press (2006).

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CUSTOM POWER DEVICES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize the various power quality problems, their origin and mitigation methods.
- familiarize students with Operation of custom power devices and their applications.
- introduce the concept of compensation by custom power devices.

Learning Outcomes

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

- identify various power quality problems in power system.
- analyze different types of custom power devices.
- analyze different types of multilevel converters.
- analyze different power factor improvement methods in converters.
- select suitable switching and breaking devices for a given application.
- apply various control methods in inverters for reactive power compensation.
- select and design a suitable custom power device for a given application.

Course Content

UNIT – I : Introduction and Characterization of Electric Power Quality

Electric Power Quality, Power Electronic applications in Power Transmission Systems, Power Electronic applications in Power Distribution Systems. Power Quality terms and Definitions, Power Quality Problems.

Custom Power, Classification of Custom Power Devices - Network reconfiguration type, compensating Type.

UNIT – II: Overview of Custom Power Devices

Compensation Devices for Voltage Sags and Momentary Interruptions - Backup Energy Supply Devices - Battery UPS - Super Conducting Magnetic Energy Storage systems - Flywheel - Voltage Source Converter - Multi-level converters, Multilevel Inverter, SPWM in Multilevel Inverter.

UNIT – III: Reactive Power and Harmonic Compensation Devices

Reactive power and harmonic compensation devices - Static Var Compensator - Topologies - Direct Connected Static Var Compensation for Distribution Systems - Static Series Compensator - Static Shunt Compensator (DSTATCOM) - Interaction with Distribution Equipment and System - Installation Considerations.

UNIT – IV: Source Transfer Switches, Solid State Limiting and Breaking Devices

Source Transfer Switch - Static Source Transfer Switch (SSTS) - Advantages of STS - Hybrid source transfer switch - High-speed mechanical source transfer switch - Solid state current limiter - Solid state breaker.

UNIT - V: Application of Custom Power Devices In Power Systems

P-Q theory - Control of P and Q - Dynamic Voltage Restorer (DVR) - Operation and control - Interline Power Flow Controller (IPFC) - Operation and control - Unified Power Quality Conditioner (UPQC) - Operation and control.

Text Books:

1. Power Quality Enhancement Using Custom Power Devices - Power Electronics and Power Systems, Gerard Ledwich, Arindam Ghosh, Kluwer Academic Publishers, 2002, 1st edition (Unit – I,II).
2. Guidebook on Custom Power Devices, Technical Report, Published by EPRI, Nov 2000 (Units – III,IV,V).

Reference Books:

1. Custom Power Devices - An Introduction, Arindam Ghosh and Gerard Ledwich, Springer, 2002, 1st edition (Unit- II,III,IV)
2. Roger C Dugan, et.al, “Electrical Power Systems Quality”, 3rd Edition, TMH, 2012.)(Unit-I)
3. “Power Quality in Power System and Electrical Machines” by Ewald Fuchs, Mohammad A. S. Masoum Academic Press, Elsevier, 2009. 1st edition. (Unit-I)
4. Instantaneous Power Theory and Applications to Power Conditioning By Hirofumi Akagi, Edson Hirokazu Watanabe, Mauricio Aredes, Published by John Wiley and sons, 2007, 1st edition. (Unit-VI).

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DIGITAL SIGNAL PROCESSING AND APPLICATIONS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- To familiarize with the concepts of DFT, FFT, IIR and FIR filters.
- To understand the architecture of TMS320F281x processor.

Learning Outcomes

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

- Perform the DFT and FFT of a sequence.
- Design IIR and FIR Filters for given specifications.
- Analyze the decimation and interpolation on signals.
- Use TMS320F281x processor for Signal Processing applications.

Course Content

UNIT - I: Introduction to Digital Signal Processing

Digital signal processing system, sampling theorem, discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) Radix-2, Decimation and Interpolation.

UNIT - II: IIR Filter Design

Design of IIR Filters from Analog Filters, Analog Filters Approximations Butterworth and Chebyshev; Frequency Transformations, General Considerations in Digital Filter Design, Bilinear Transformation Method, and Impulse Invariance Technique.

UNIT - III: FIR Filter Design

Symmetric and Anti Symmetric FIR Filters, properties of FIR digital filters, design of Linear-Phase FIR Filters using Fourier series Method and Rectangular, Hanning, Hamming, Blackman and Keiser Windows;

UNIT - IV: Effects of Finite Word Length in Digital Filters

Introduction, Rounding and Truncation Errors, Quantization Effects in Analog-to-Digital Conversion of Signals, Coefficient Quantization effects in Direct Form Realization of IIR Filters and FIR filters, Scaling.

UNIT - V: TMS320F281x- Digital Signal Processor

Features of TMS320F281x, functional overview, memory map , brief description of C28x CPU, memory bus(Harvard Architecture), interrupt sources, System Control.

Text Books:

1. John G.Proakis, DimitrisG.Manoliks, "Digital signal processing principles, Algorithms and Applications", 3rd Edition, 2000, PHI. (Units I to III)
2. S Salivahanan, A Vallavaraj, and C Gnanapriya, "Digital Signal Processing",Tata McGraw Hill (Unit-IV)

Reference Books:

1. TMS320F2812 – Digital Signal Processors, Data Manual of Texas Instruments.(Unit-V)
2. Alan Oppenheim and Ronald W.Schafer, "DigitalSignalProcessing", PHI 2000.
3. Sanjit K.Mithra, "Digital Signal Processing A computer Based approach", Tata McGraw Hill, 2nd Edition, 2000.*M*.

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AI TECHNIQUES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Pre - Requisite:

Basic Knowledge on Structure and function of human brain and classical sets and conventional and PID controller techniques.

Course Objectives

To make the students

- To introduce the concept of Artificial Intelligence (AI).
- To familiarize with the architecture, principle of operation of Artificial Neural Networks,
- To introduce Fuzzy mathematics and fuzzy controllers design

Learning Outcomes:

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

- understand the concepts of Neural Networks.
- apply various learning methods to train Neural Network architectures.
- differentiate the crisp and fuzzy sets.
- design Fuzzy logic Controller for an Engineering application]
- select an appropriate AI technique for a specific application.

Course Content

UNIT I: Introduction to Neural Networks

Introduction to Neural Networks: Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Essentials of Neural Networks: Neural network Architectures-knowledge representation learning process-learning tasks and their rules

UNIT II: Feed Forward Neural Networks (FFN)

Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications. Multi Layer Feed Forward Neural Networks (MLFFN) Generalized delta rule, delta rule for Multi Layer Feed Forward

Neural Networks, Concept of Back Propagation, Back Propagation algorithm, Advantages and Disadvantages of Back Propagation.

UNIT III: ANN Memories and Applications

ANN Paradigms, Hebbian Learning, Bidirectional Associative Memory (BAM) architecture, BAM training and Hopfield networks.

Neural Network Applications: load forecasting, fault identification, process control and identification.

UNIT IV: Introduction to Fuzzy Logic

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT V: Fuzzy Logic System Components and Applications

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. Fuzzy Logic Applications: Speed control of Drives, Process Control -P, PI, PD, and PID Controllers.

Text Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – 6th impression, PHI Publication. (Unit I to V)
2. Introduction to Artificial Neural Systems - Jacek M. Zurada, Jaico Publishing House, 6th impression 1997. (Unit I to V)

Reference Books:

1. Neural Networks-James Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks-Simon Hakens, 2nd impression Pearson Education.
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI.
4. Neural Networks and Fuzzy logic System by Bart kosko, PHI Publications.

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SMART GRIDS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- To Study about Smart Grid technologies.
- To study different smart meters and advanced metering infrastructure.
- To familiarize the power quality management issues in Smart Grid.
- To familiarize the high performance computing for Smart Grid applications

Learning Outcomes

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

- **Develop** more understanding on the concepts of Smart Grid and its present developments.
- **Explain** about different Smart Grid technologies.
- **Build** knowledge about different smart meters.
- **Build** knowledge about and advanced metering infrastructure.
- **Build** knowledge on power quality management in Smart Grids.
- **Develop** more understanding on LAN, WAN and Cloud Computing for Smart Grid applications.

Course Content

UNIT- I Introduction To Smart Grid 10

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, Functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT- II Smart Grid Technologies (Transmission) 10

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems EMS, FACTS and HVDC, Wide area monitoring, Protection and control

UNIT- III: Smart Grid Technologies (Distribution) 10

DMS, Volt/VAr control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).20

UNIT- IV: Smart Meters And Advanced Metering Infrastructure 10

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives and AMI needs in the smart grid.

UNIT- V: Smart Meters And Advanced Metering Infrastructure 8

Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNIT-VI: High Performance Computing For Smart Grid Applications 12

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD, Computing to make Smart Grids smarter and Cyber Security for Smart Grid.

Text Books:

1. Stuart Borlase “Smart Grid Infrastructure, Technology and Solutions”,CRC Press 2012. (Unit I to V)
2. Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid Technology and Applications”, Wiley. (Unit I to V)

Reference Books:

1. Vehbi C. Güngör, DilanSahin, TaskinKocak, Salih Ergüt, Concettina Buccella, Carlo Cecati,and Gerhard P. Hancke, Smart Grid Technologies Communication Technologies and Standards IEEE Transactions on Industrial Informatics, Vol. 7, No. 4, November 2011.
2. Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang “Smart Grid – The New and Improved Power Grid A Survey”, IEEE Transaction on Smart Grids.

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POWER ELECTRONICS AND ELECTRIC DRIVES LAB

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- To provide hands-on- experience on various Power Electronic converters.
- To expose students to various motion control schemes of electric machines.

Learning Outcomes

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

- Test, measure and determine the various parameters of three phase converters and provide valid conclusions
- Observe and understand the performance of different power converters to select suitable DC drive for an application
- Diagnose the various causes of harmonics and design a PWM converter
- Design converter fed dc drives and chopper fed dc drives
- Understand the behavior of inverter topologies for operating AC drives
- Use advanced signal processing systems to understand the closed loop operation of drives

List of Experiments

Any 10 experiments from the following list are required to be conducted

1. 3- ϕ Ac Voltage Controller on Motor Load.
2. 3- ϕ Full Converter with R & RL Loads
3. 3- ϕ Full Converter with Dc Motor Drive
4. Four Quadrant Chopper Drive Using Dc Motor
5. 1- ϕ IGBT based PWM Inverter on R& RL Loads
6. 3- ϕ IGBT based PWM Inverter on R & RL Load
7. 3- ϕ SCR based Inverter Drive for AC Motor Module
8. Speed Controller Of 3- ϕ Slip-ring Induction Motor by Static Rotor Resistance Controller
9. 3- ϕ PWM Pulse Generator Module
10. DSP Based V/F Control Of Induction Motor

11. 3- ϕ PWM Pulse Generation using FPGA
12. FPGA based 3- ϕ IGBT inverter.

Reference Books:

1. Robert W. Erickson & Dragon Maksimovic "Fundamentals of Power Electronics" Second Edition, 2001 Springer science and Business media
2. Ned Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics converters, Application and design" John Wiley and sons. Wiley India edition, 2006.
3. Fundamentals of Power Electronics With MATLAB Randall S. Saffer.
4. Rashid M. H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, New Delhi, 1995.

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ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

MACHINE DESIGN

Department of Mechanical Engineering

M.Tech Two Year Degree Course

(Applicable for the batch 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
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 become a competent centre in moulding students as professional mechanical engineers having ethical standards and social consciousness.

Mission:

- * To impart value based education and to enhance competencies of students through effective design and delivery of the curriculum that fulfils the needs of the industry.
- * To instill desire and confidence in the students to cater the needs of the society through their activities of excellence.
- * To impart technical skills and nurture values, and mould the students as professionals to offer solutions to the technological challenges.
- * To guide and support the students for enhancing nation's wealth through entrepreneurship.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO-I : Machine design post graduates will have strong technical knowledge to design mechanical systems.

PEO-II : Machine design post graduates will have problem solving and decision making skills contributing to overall personality and career development.

PEO-III: Machine design post graduates will have groomed attitude of team work, team building leadership and regard for ethical practices.

PEO-IV: Machine design post graduates will engage in lifelong learning to adapt to socio-economic-technological developments.

IV. PROGRAM OUTCOMES (POs)

PO-1 : An ability to independently carry out research /investigation and development work to solve practical problems.

PO-2 : An ability to write and present a substantial technical report/document.

PO-3 : An ability to demonstrate a degree of mastery at a level higher than the bachelor program.

PO-4 : An ability design complex engineering systems in a multi-disciplinary environment.

PO-5 : An ability to apply contemporary techniques and computer aided tools to design mechanical systems.

PO-5 : An ability to design Mechanical Systems considering public health, safety, cultural, ethical, legal societal and environmental aspects.

V. ACADEMIC REGULATIONS

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

1. Duration of the Program

The duration of the program is two academic years consisting of four semesters. However, a student is permitted to complete the course work of M.Tech program in the stipulated time frame of four academic years from the date of joining.

2. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

3. Program Credits

Each specialization of the M.Tech programs is designed to have a total of 70 credits and the student shall have to complete the two year course work and earn all the 70 credits for the award of M.Tech Degree.

4. Attendance Regulations

- 4.1 A student shall be eligible to appear for Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- 4.2 Condoning of shortage of attendance in aggregate up to 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 the College Academic Committee. 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.
- 4.3 A student shall be eligible to claim for condonation of attendance shortage only once during the two years (four semesters) course work.
- 4.4 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.
- 4.5 Shortage of Attendance below 65% in aggregate shall in *NO* case be condoned.

- 4.6 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that semester and their registration shall stand cancelled.
- 4.7 A fee stipulated by the college shall be payable towards condoning attendance shortage.

5. Examinations and Scheme of Evaluation

5.1 Theory Courses :

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 assignments and 30 marks are based on two mid-term examinations.
- ii) Each assignment carries 10 marks and the average of two assignments shall be taken as the marks for continuous assessment.
- iii) Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of four questions, each for 10 marks. All the questions need to be answered.
- 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 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 two questions, each for 20 marks, with internal choice. All the questions need to be answered. 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 8 questions, each for 12 marks, out of which 5 questions are to be answered.
- ii) 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.

5.2 Laboratory Courses :

- i) For practical subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 40 internal marks. Of the 40 marks for internal, 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 an internal examiner and an external examiner for 60 marks.

5.3 (a) Seminar:

- i) For seminar, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the literature and submit it to the department in a report form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of report and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh report towards the end of that semester and appear for evaluation by the committee.

(b) Term Paper:

- i) For term paper, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the research papers and submit it to the department in publication form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of paper and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh paper towards the end of that semester and appear for evaluation by the committee.

5.4 Project Work:

Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee.

- i) A Project Review Committee (PRC) shall be constituted for each specialization with Head of the Department / a Senior Faculty as Chairman and two other senior faculty members.
- ii) Registration of Project Work: A candidate who has been promoted to 3rd semester shall be eligible to register for the project work.
- iii) The eligible candidate can choose his project supervisor and submit the title, objective, abstract and plan of action of the proposed project work to the department for approval by the PRC. The candidate whose proposal is approved by the PRC shall register for the project work. The minimum duration of project work will be 36 weeks from the date of registration.
- iv) If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. In case of such changes, the candidate has to register afresh.
- v) There shall be three reviews on the progress of the project work by the PRC with an interval of 12 weeks. The candidate needs to submit a report on the progress of his work and present it before the PRC for assessment. The PRC may suggest for an extension of date of submission of dissertation if the progress of work is not satisfactory or absent himself for the review.
- vi) A candidate who has passed all the theory, laboratory, seminar and term paper examinations and shown satisfactory progress of project work is permitted to submit the dissertation after 36 weeks from the date of registration.
- vii) If a candidate fails to submit the dissertation by the end of the 4th semester, he has to take the permission for an extension by paying the semester(s) tuition fee.
- viii) Three copies of the Project Thesis certified by the supervisor shall be submitted to the Department.
- ix) Project evaluation and Viva-Voce examination is conducted at the end of 4th semester by a committee consisting of Project Supervisor, senior faculty of the department, HoD and an External Examiner nominated by the Chief Controller of Examinations out of a panel of three examiners suggested by the department.

The following grades are awarded for the project work:

- i. Excellent
- ii. Very Good
- iii. Good
- iv. Satisfactory
- v. Unsatisfactory

The Grade “unsatisfactory” is treated as Fail. Failed Students should take supplementary examination after making required modifications, if any, in the dissertation with a minimum gap of 8 weeks by paying the required examination fee.

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

6.1 Criteria for Passing a Course:

- i) A candidate shall be declared to have passed in individual theory / laboratory 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.
- ii) The candidate shall be declared to have passed in seminar / term paper viva-voce if he secures 50% marks.
- iii) The candidate shall be declared to have successfully completed the project work if he secures a minimum of ‘satisfactory’ grade in the project evaluation and viva-voce examination.
- iv) On passing a course of a program, the student shall earn assigned credits in that course.

6.2 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 /Elective /Laboratory /Seminar / Term Paper /Project Dissertation (%)	Grade Points	Letter Grade
≥ 90	10	O (Outstanding)
≥ 80 & < 90	9	A+ (Excellent)
≥ 70 & < 80	8	A (Very Good)
≥ 60 & < 70	7	B+ (Good)
≥ 50 & < 60	6	B (Above Average)
< 50	0	F (Fail)

6.3 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:

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

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.

6.4 Eligibility for Award of B.Tech Degree:

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

- Pursued a course of study for not less than two academic years and not more than four academic years.
- Registered for prescribed **70** credits and secured **70** credits.
- Students, who fail to complete their Two years Course of study within Four years or fail to acquire the prescribed **70** Credits for the award of the degree within four academic years from the year of their admission shall forfeit their seat in M. Tech course and their admission shall stand cancelled.

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

The CGPA is calculated as given below:

$$\text{CGPA} = \frac{\sum (CR \times GP)}{\sum CR} \quad \text{for entire program.}$$

where CR = Credits of a course

GP = Grade points awarded for a course

* CGPA is calculated for a candidate who passed all the prescribed courses excluding project work.

6.6 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
$\geq 6.5 \text{ \& } < 7.5$	First Class
$\geq 6.0 \text{ \& } < 6.5$	Second Class

7. Supplementary Examinations

- Supplementary examinations will be conducted once in a year along with regular examinations.

- 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.

8. Re-admission Criteria

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/-

9. Break in Study

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of M.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 shall be paid by the candidate to condone his break in study.

10. 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 he will be offered substitute subjects in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

11. 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 be withheld in such cases.

12. 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 / year. 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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.	Expulsion from the examination hall 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 / year. 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 / year.
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 / year 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.

13. Other Matters

- i) Deserving physically challenged candidates will be given additional examination time and a scribe based on the certificate issued by the concerned authority. 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.
- v) Wherever the word he, him or his occurs, it will also include she, her and hers.

VI. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits
1	Baisc Sciences (BS)	3	4.28
2	Humanities and Social Sciences (HSS)	3	4.28
3	Professional Core (PC)	25	35.72
4	Professional Electives (PE)	9	12.86
7	Others (Seminar, Term Paper, Dissertation, etc.)	30	42.86

COURSE STRUCTURE & SYLLABUS

COURSE STRUCTURE

I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	MA2901	Computational Methods in Engineering	4	-	-	3
2	ME2901	Advanced Mechanics of Solids	4	-	-	3
3	ME2902	Analysis and Synthesis of Mechanisms	4	-	-	3
4	ME2903	Mechanical Vibrations **	3	-	2	3
5	ME2904	Gear Engineering	4	-	-	3
6		Professional Elective - I	4	-	-	3
7	ME2908	Machine Dynamics Lab	-	-	4	2
Total			23	-	6	20

II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Research Methodologies	4	-	-	3
2	ME2909	Finite Element Methods **	3	-	2	3
3	ME2910	Design with Advanced Materials	4	-	-	3
4	ME2911	Design for Manufacturing and Assembly	4	-	-	3
5		Professional Elective - II	4	-	-	3
6		Professional Elective - III	4	-	-	3
7	ME2918	Modeling and Analysis Lab	-	-	4	2
8		Seminar	-	-	-	2
Total			23	-	6	22

** Project Based Theory Course

L : Lecture T : Tutorial P : Practical

III Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Term Paper	-	-	4	2
2		Dissertation (Initiated in third semester)	-	-	-	-
Total			-	-	4	2

IV Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Dissertation (Carried out in third & Fourth Semester)	-	-	52	34
Total			-	-	52	34

Professional Electives:

Professional Elective - I

- ME2905 Rotor Dynamics
- ME2906 Experimental Stress Analysis
- ME2907 Product Design

Professional Elective - II

- ME2912 Fracture Mechanics
- ME2913 Condition Monitoring
- ME2914 Rapid Tooling and Prototyping

Professional Elective - III

- ME2915 Theory of Elasticity
- ME2916 Geometric Modeling
- ME2917 Tribology

SYLLABUS

COMPUTATIONAL METHODS IN ENGINEERING

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- know how to solve system of equations, ordinary differential equations and partial differential equations numerically.
- understand correlation and regression
- know optimization techniques in solving linear and fractional programming problems

Learning Outcomes

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

- find the solutions of system of linear and non linear equations.
- solve ordinary and partial differential equations numerically.
- determine the correlation coefficient and regression.
- optimize linear and fractional programming problems.

Course Content

UNIT – I: Introduction to Numerical Methods Applied to Engineering Problems

Solving system of linear equations by Gauss Seidel and Relaxation methods. Solving system of non-linear equations by Newton-Raphson method. Fitting of non-linear curves by the method of least squares.

UNIT – II: Numerical Solutions of Ordinary Differential Equations

Conversion of initial value problem to boundary value problem using shooting method, solution through a set of equations - derivative boundary conditions - Rayleigh Ritz method.

UNIT – III Upon successful completion of the course, the students will be able to: Numerical Solutions of Partial Differential Equations

Finite-difference approximations to derivatives; Laplace equation : Jacobi Method - ADI method, Parabolic Equation – Crank Nicolson method.

UNIT – IV: Applied Statistics

Bivariate Data-simple correlation- Correlation analysis - correlation coefficient – coefficient of correlation for ungrouped and grouped bi-variate data – coefficient of determination – test of significance for correlation coefficient. Regression Analysis - simple linear regression - multiple linear regression.

UNIT – V: Optimization Techniques

Linear Programming : Mathematical formulation-graphical solution of two variable – simplex method-artificial variable technique- Big M method- linear fractional programming problems.

Text Books:

1. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall India,3rd Edition.(UNITS – I,II,III)
2. Agarrval, B.L., Basic Statistics ,Wiley , 2nd edition.(UNIT - IV)
3. S.D.Sharma, Operations Research, Kedarnath Ram Nadh,1972 (Unit- V)

References:

1. Ward Cheney and David Kincaid M, Numerical Mathematics and Computing, Brooks/Cole Publishing Company1999, Fourth edition.
2. Riley K.F,. M.P.Hobson and Bence S.J, Mathematical Methods for Physics and Engineering, Cambridge University press,1999.
3. Steven C.Chapra, Raymond P.Canale Numerical Methods for Engineers Tata Mc-Graw Hill.
4. Curtis F.Gerald, Partick.O.Wheatly,Applied Numerical analysis, Addison-Wesley,1989.
5. Kanti swarup,Gupta P.K. and Manmohan , Operations Research , S.chand and sons, 2004.

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ADVANCED MECHANICS OF SOLIDS

I Semester

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

Course Objectives

To make the students

- familiarize with the concepts of stresses and strains in un symmetric bending and torsion using classical methods.

Learning Outcomes

Student will be able to

- apply the theory of elasticity including strain/displacement and Hooke's Law relationships.
- solve torsion problems in bars and thin walled methods.
- solve for stresses and deflection beam under unsymmetrical loading.
- assess various failure criteria in engineering problems.

Course Content

UNIT - I: *Principal Stresses and Strains*

Plane state of stress- stresses on an inclined plane in a rectangular block under axial loading – compound stresses – normal and tangential stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains- Analytical and graphical solutions

UNIT - II: *Shear Center*

Bending axis and shear center-shear center for axi-symmetric and unsymmetrical sections

Unsymmetrical bending: Bending stresses in Beams subjected to nonsymmetrical bending; deflection of straight beams due to nonsymmetrical bending

UNIT - III: *Curved Beam Theory*

Winkler Bach formula for circumferential stress –limitations – correction factors – radial stress in curved beams – closed ring subjected to concentrated and uniform loads-stresses in chain links.

UNIT - IV: *Axi-Symmetric Problems*

Rotating Discs- flat discs, discs of uniform thickness, discs of uniform strength, rotating cylinders.

Torsion: Linear elastic solution, Prandtl elastic membrane (Soap-Film) analogy, narrow rectangular cross section, hollow thin wall torsion members, multiple connected cross sections.

UNIT - V: *Introduction to Theory of Elasticity*

Equilibrium and Compatibility conditions for elastic solids, 2D elasticity equations for plane stress, plane strain, Airy's stress function, bending of cantilever loaded at the end.

Text Books:

1. Boresi & Sidebottom, "Advanced Mechanics of materials" Wiely International, 6th edition.(UNITS - I,II)
2. Dr Sadhu singh , "Strength of materials" , Khanna Publication, 1st edition (UNITS- III,IV,V)

Reference Books:

1. Timoschenko S.P. and Goodier J.N., " Theory of elasticity", McGraw- Hill Publishers, 3rd Edition.
2. L.S Srinath, "Advanced Mechanics of Solids", McGraw Hill Education(India)Pvt. Ltd. 3rd edition.

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ANALYSIS AND SYNTHESIS OF MECHANISMS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize with the concepts used for kinematic analysis and synthesis of mechanisms.
- familiarize with the concepts of force analysis of mechanisms.

Learning Outcomes

Student will be able to

- determine the displacement , velocity and accelerations of links of mechanism.
- determine the forces and torque acting by performing force analysis.
- apply path curvature characteristics in analysis of mechanisms.
- apply analytical and synthesis techniques in design of mechanisms.

Course Content

UNIT - I: *Introduction*

Elements of mechanisms ,degrees of freedom , Kutzbach equation and Grublers criterion , applications of Grublers criterion, transmission angles- extreme values of transmission angles , toggle positions.

Displacement , Velocity and Acceleration Analysis (Analytical methods only):

Analysis for four bar and single slider crank mechanisms.

Analysis of Complex mechanisms : Goodman indirect method and Hall Ault auxiliary point method

UNIT - II: *Static Force Analysis*

Static equilibrium , equilibrium of two and three force members , equilibrium of four force members , static force analysis of four bar and slider crank mechanisms.

Dynamic Force Analysis:

D'Alembert Principle , dynamic analysis of four bar mechanism and single slider crank mechanism – dynamically equivalent system – inertia of Connecting Rod – inertia force and torque in reciprocating Engine.

UNIT - III: Path Curvature Theory

Introduction , fixed and moving centrodes , inflection points and inflection circle , Euler Savary Equation , Bobilliers Construction , Collineation axis , Bobillier theorem ,Hartmann construction

UNIT - IV: Kinematic Synthesis

Introduction , type, dimensional and number Synthesis , synthesis for function generation, path and motion generation ,Chebyshev Spacing of accuracy points

Graphical Synthesis Techniques:

Motion generation for two prescribed positions and three prescribed positions – path generation for three prescribed positions without and with prescribed timing – function generation for three prescribed positions.

UNIT - V: Analytical Synthesis Techniques

Four bar and slider crank function generator with three accuracy points – use of complex numbers and dyads – three prescribed positions for motion, path and function generation using dyad.

Text Books:

1. S.S. Rattan, “ Theory of Machines”,Tata Mc Graw Hill, 3rd Edition (UNITS I,II)
2. Erdman and Sandor ,”Advanced Mechanism Design “,Prentice Hall International ,2nd Edition(UNITS – III,IV,V).

Reference Books:

1. Uicker, Pennock and Shigley,” Theory of machines and Mechanisms”, Oxford Univ Press.
2. Amitabha Ghosh and Ashok Kumar Mallik, “ Theory of Mechanism and machines”, East West Press pvt Ltd,2nd edition.
3. Robert L.Norton,” Design of Machinery”, Tata McGraw Hill ,3rd edition.

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MECHANICAL VIBRATIONS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- understand and appreciate the importance of vibrations in mechanical design of machine parts that operate in vibratory conditions,
- write the differential equation of motion of the vibratory systems
- analyze free and forced vibration of single and multi degree of freedom linear systems.
- to develop an ability analyze continuous vibrational systems

Learning Outcomes

Student will be able to

- appreciate the need and importance of vibration analysis in mechanical design of machine parts that operate in vibratory conditions.
- model undamped and damped mechanical systems and structures
- analyze the mathematical model of a linear vibratory system to determine its response
- model of SDOF and MDOF vibratory systems and determine their responses
- analyse frequency and time response of vibratory systems
- understand the fundamentals of vibrations of continuous systems such as beams and plates

Course Content

UNIT – I: Fundamentals of Vibration

Basic concepts of vibration -importance of study of vibration; -elements of vibration; classification of vibration; vibration analysis procedure; spring elements – equivalent stiffness; mass or inertia elements;; definitions and terminology; periodic and simple harmonic motion; the beats phenomenon-representation of harmonic motion in complex form .

Single Degree Of Freedom System-

Undamped Free Vibrations: Different methods for equation of motion – Newton's second law, D'alembert's principle, energy methods, Rayleigh's method, free vibrations of an undamped torsional vibrations.

UNIT – II: Damped Free Vibrations

Components of a vibrating system –different types of dampings - damping elements – equivalent damping; -general differential equation of motion of the system; critical damping coefficient and damping ratio; damped natural frequency; logarithmic decrement; energy dissipated in viscous damping- torsional vibrations-.equation of motion-torsional vibrations with viscous damping

UNIT – III: Forced Vibration Analysis - Single Degree Of Freedom System

Response of damped and undamped systems to harmonic excitation; frequency response curve; magnification factor; harmonic excitation of the base, vibration isolation and transmissibility ; response of a damped system under rotating unbalance; forced vibration with coulomb damping.

Vibration measuring instruments –seismic mass, vibrometer, accelerometer– frequency measuring instruments

UNIT - IV: Two Degree of Freedom Systems

Principle mode of vibration free and forced vibration analysis of a undamped systems – principal modes – orthogonality principle -semi definite systems; torsionally equal shafts –geared systems.

UNIT - V: Multidegree and continuous systems

Multidegree Freedom Systems :Introduction-influence coefficients –derive the equation of motion using matrix method , dunkerley's method, and rayleigh's method , eigen values and eigen vectors; torsional vibration of multi rotor systems.

Continuous Systems :vibrations of bars and beams- formulation of equation of motion, characteristic equation, eigen values, identification of node and mode shapes

Text Books:

1. S. S. Rao , Mechanical Vibrations , 4th Edition, Pearson-Prentice Hall (UNITS-I,II,III,IV,V)
2. G.S. Grover & S.P.Nigam ,Mechanical Vibrations , Nem Chand & Bros, 8th edition, (UNITS-I,II,III,IV)

Reference Books:

1. William T. Thomson and Marie Dillon Dahleh , Theory of Vibration with Application, Pearson New International Edition,5th Edition,
2. V.P.Singh ,Mechanical vibration, Dhanpat Rai & Co ,4th Edition
3. Mechanical vibration - Schaum Series, McGraw Hill ,2nd Edition

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GEAR ENGINEERING

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- know the design of gears like spur, helical, bevel and worm gears against different types of failures.
- learn the concepts of gear box design and its optimization.

Learning Outcomes

Student will be able to

- select and design appropriate gear for the given application and against the failures.
- design the gear box for given specifications.
- optimize the parameters of gear like weight, space etc.

Course Content

UNIT - I: *Introduction*

Basic Principles, Nomenclature, types of gear teeth profiles, gear manufacturing processes, gear inspection methods using non-destructive techniques - LPT, MPI and UT.

Gear Failures: Analysis of gear tooth failures - tooth wear, tooth breakage, pitting, scoring, wear, overloading, gear-casing problems, lubrication failures.

UNIT - II: *Spur & Helical Gears*

Tooth loads, Design considerations, design of spur gear teeth - Lewis beam strength, Buckingham's dynamic load and wear load, design of spur gear - plastic deformation .

UNIT - III: *Bevel & Worm gears*

Tooth loads, design considerations, design of spur gear teeth - Lewis beam strength, Buckingham's dynamic load and wear load, design of spur gear - plastic deformation .

UNIT - IV: *Gear Trains*

Simple, compound, reverted and epicyclic gear trains.

Gear Box : Introduction, types of gear box, construction of ray diagram, design of a gear box - sliding type.

UNIT - V: Optimal Gear Design

Optimization of gear design parameters, weight minimization, constraints in gear train design- space, interference, strength, dynamic considerations, rigidity etc.,

Text Books:

1. J.E.Shigley, "Mechanical Engineering Design", TATA Mc.Graw Hill Education Pvt., Ltd.(UNITS – I,II,III,IV)
2. T.V.Sundarajanmurthy, N.Shanmugam", "Machine Design", Anuradha Publication, Chennai.(UNITS – IV,V)

Reference Books:

1. V.B.Bandari, "Design of Machine Elements " TATA Mc.Graw Hill Education Pvt., Ltd..
2. Norton, "Machine Design - An Integrated Approach", , Pearson Publications, 2nd Edition.
3. S. Jalaluddin," Machine Design" Anuradha Publications, Chennai.

Note: Design data book is allowed for examination.

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ROTOR DYNAMICS
I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- develop expertise regarding rotor dynamics and vibration in rotating machinery.
- expose the concepts of rigid rotor dynamics, rotor vibration and critical speeds.

Learning Outcomes

Student will be able to

- analyze vibrations in rotating machinery.
- determine the whirling speed of rotor.
- identify the effect of bearings on rotor vibrations.
- monitor the condition of rotors

Course Content

UNIT - I: *Introduction to Vibration and the Laval-Jeffcott Rotor Model*

Co-ordinate systems, steady state rotor motion, elliptical motion, single degree of freedom systems, free and forced vibrations. The two degrees of freedom rotor system, translational motion, natural frequencies and natural modes, steady state response to unbalance, the effect of flexible support.

UNIT - II: *Torsional Vibration in Rotating Machinery*

Modeling of rotating machinery shafting - multi degree of freedom systems - determination of natural frequencies and mode shapes - branched systems - Holzer method.

UNIT - III: *Rigid Rotor Dynamics and Critical Speeds*

Rigid disk equation - rigid rotor dynamics- rigid rotor on flexible rotor - the gyroscopic effect on rotor dynamics - whirling of an unbalanced simple elastic rotor, simple shafts with several disks - effect of axial stiffness - determination of bending critical speeds - Campbell diagram.

UNIT - IV: *Influence of Bearing on Rotor Vibration:*

Support stiffness on critical speeds- stiffness and damping coefficients of journal bearings-computation and measurements of journal bearing coefficients -mechanics

of hydro dynamic instability- half frequency whirl and resonance whip- design configurations of stable journal bearings

UNIT - V: *Balancing and Condition Monitoring of Rotors*

Single plane balancing, multi-plane balancing, balancing of rigid rotors, balancing of flexible rotors noise spectrum, real time analysis, knowledge based expert systems.

Text Books:

1. J. S.Rao, “*Rotor Dynamics*”, New Age International Publishers, New Delhi, 2nd Edition.

Reference Books:

1. S.Timoshenko, D H.Young and W. Weaver , “Vibration Problems in Engineering”, John Wiley, 3rd Edition.
2. Weng Jeng Chen and J Edger Gunter, “Introduction to Dynamics of Rotor – Bearing Systems”, Trafford Publishing Ltd., London 3rd Edition.
3. T. Yamamoto and Y.Ishida , “Linear and Nonlinear Rotordynamics: A Modern Treatment with Applications”, John Wiley and Sons Inc, New York, 2nd Edition.
4. J. S.Rao, “Vibratory Condition Monitoring of Machines”, Narosa Publishing House, 2nd Edition.

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EXPERIMENTAL STRESS ANALYSIS

I Semester

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

Course Objectives

To make the students

- understand the relation between the mechanics theory and experimental stress analysis.
- familiarize with the new experimental methods to determine stresses and strains.

Learning Outcomes

Student will be able to

- measure strains using different types of strain gauges
- evaluate stresses using modern techniques of experimental methods

Course Content

UNIT - I: *Introduction*

Stress, strain, plane stress and plane strain conditions, compatibility conditions. problems using plane stress and plane strain conditions, stress functions, Mohr's circle for stress strain, three-dimensional stress strain relations.

UNIT - II: *Strain Measurement and Recordings*

Various types of strain gauges, electrical resistance strain gauges, semiconductor strain gauges, strain gauge circuits. introduction, static recording and data logging, dynamic recording at very low frequencies, dynamic recording at intermediate frequencies, dynamic recording at high frequencies, dynamic recording at very high frequencies.

UNIT - III: *Photo Elasticity*

Photo elasticity – polariscope – plane and circularly polarized light, bright and dark field setups, photo elastic materials –isochromatic fringes – isoclinics

Three Dimensional Photo Elasticity : Introduction, locking in model deformation, materials for three-dimensional photo elasticity, machining cementing and slicing three-dimensional models, slicing the model and interpretation of the resulting fringe patterns, effective stresses, the shear-difference method in three dimensions, applications of the frozen stress method

UNIT - IV: *Brittle Coatings*

Introduction, coating stresses, failure theories, brittle coating crack patterns, crack detection, ceramic based brittle coatings, resin based brittle coatings, test procedures for brittle coatings analysis, calibration procedures, analysis of brittle coating data.

Moire Methods: Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-fringe analysis, the displacement field approach to Moire-fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-fringes, experimental procedure and techniques.

UNIT - V: *Birefringent Coatings*

Introduction, coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, fringeorder determinations in coatings.

Text Books:

1. Timoshenke and Goodier Jr ,”Theory of Elasticity” McGraw Hill Education (India) Pvt Ltd, 3rd Edition

Reference Books:

1. Love .A.H, “A treatise on Mathematical theory of Elasticity , volume -1” , Nabu Press,
2. Dally and Riley,” Experimental stress analysis”, Mc Graw-Hill, 2nd Edition

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PRODUCT DESIGN

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- impart the process of product design;
- expose the various factors influencing product design.

Learning Outcomes

Student will be able to

- apply various methods of concept generation to arrive at a fruitful design.
- analyze the factors influencing the design.
- determine the risk and reliability aspects associated with product design.
- select appropriate manufacturing processes to realize the product design
- assess the eco friendly nature of the product.
- communicate design information

Course Content

UNIT - I: *Product Design Process*

Design process steps, concept generation, brain storming, synectics. morphological method, TRIZ, behavioral aspects of decision making,

Modeling and Simulation: Role of models in engineering design, mathematical modeling, similitude and scale models, geometric modeling on computer, finite-element analysis.

UNIT - II: *Material Selection*

Material selection for new product design, role of processing in design, design for manufacture and assembly.

UNIT - III: *Design for Reliability*

Causes of unreliability, methods of improving reliability, failure mode and effect analysis, FMEA procedure, fault tree analysis, product liability, intellectual property.

UNIT - IV: *Design for Environment*

Need of design for environment, techniques to reduce environment impact

UNIT - V: Robust Design and Optimization

Detail design-activities and decisions in detail design-communicating design and manufacturing information.

Text Books:

1. George E. Dieter, "Engineering Design", Mc GRAW-HILL LTD., 2nd Edition (UNITS – I, II, III)
2. Kevin Otto, "Product Design", Pearson Education, 3rd Edition (UNITS – IV, V)

Reference Books:

1. Richard S. Handscombe, "The Product Management Handbook", McGRAW-HILL
2. Ulrich Eppinger, "New Product Design and development", TMH
3. KEN HURST, "Engineering Design Principles", 1st Edition, ELSEVIER
4. John W. Evans and Jillian Y. Evans, "Product Integrity and Reliability in Design", 1st Edition, Springer .

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MACHINE DYNAMICS LAB

I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

To make the students

- study the behavior of machine elements experimentally when subjected to dynamic forces.
- observe and analyse vibration behavior of mechanical systems.

Learning Outcomes

Student will be able to

- estimate gyroscopic couple on given rotor system
- estimate the moment of inertia of given component
- estimate the natural frequency of free and forced and torsional vibration systems.
- perform dynamic balancing of rotating and reciprocating masses.
- assess the whirling speed of shaft.

List of Experiments:

1. Gyroscopic Couple Apparatus
2. Moment of inertia of bifilar.
3. Moment of inertia of Trifilar.
4. Natural frequency of single rotor system.
5. Natural frequency of two rotor system.
6. Natural frequency of Flywheel with and without damping.
7. Natural frequency of spring mass system.
8. Natural frequency of free vibrations of beam without damping.
9. Frequency of undamped forced vibrations of beam.
10. Frequency of damped force vibrations of beam.
11. Journal Bearing Apparatus.
12. Balancing of Reciprocating Masses.
13. Balancing of Rotating Masses.
14. Friction and Wear Apparatus.
15. Whirling Speed of rotating shaft.

Open Ended Experiment:

- Identification of crack in beam and validation using simulation.

Reference Books:

1. S.S. Rattan, “ Theory of Machines”, Tata Mc Graw Hill, 3rd Edition
S. S. Rao , Mechanical Vibrations , 4th Edition, Pearson-Prentice Hall

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RESEARCH METHODOLOGIES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- understand the objectives, motivation and significance of research.
- know research methodologies.
- define research problem and perform data analysis.
- write a research paper and report.

Learning Outcomes

Students will be able to

- Understand research approaches
- Understand various research methodologies
- Define a research problem
- Perform data analysis
- Write research papers and reports

Course Content

UNIT – I: Introduction

Introduction, Objectives and motivation of research, Types of research, Research approaches, Significance of research methods.

UNIT – II: Research Methodology

Research methods versus methodology, Research and scientific method, Importance of knowing how research is done, Research process. Criteria for good research.

UNIT – III: Defining Research Problem

The research problems, Necessity of defining the problem, Technique involved in defining a problem, Review of related literature, Purpose of literature survey, Identifying the current status, Presentation of literature survey findings. Critique, Survey and peer review process.

UNIT – IV: Research Design and Data Analysis

Meaning of research design, Features of good design, important concepts relating to research design, Different research designs, Basic principles of experimental designs.

Methods of Data Collection - Collection of primary data, Observation method, Interview method, Collection of data through questionnaires, Collection of data through schedules, Difference between questionnaires and schedules, Some other methods of data collection, Collection of secondary data, Selection of appropriate method for data collection, Case study method.

Processing and Analysis of Data - Processing operations, Some problems in processing, Elements, Types of analysis, Statistics in research.

UNIT – V: Research Paper and Report Writing

Final paper presentation. Significance of report writing, Different steps in writing report, Layout of the research report, Types of report, Precautions for writing research reports.

Text Books:

1. Research Methodology Methods and Techniques, C.R.Kothari, Wishwa Prakashan Publishers – Second Edition.

Reference Books:

1. Template of ASCE/ASME/IEEE for paper writing.

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FINITE ELEMENT METHODS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- Familiarize with the concepts of finite element method to solve engineering problems.

Learning Outcomes

Student will be able to

- apply variational and weighted residual methods to solve differential equations.
- apply finite element formulation in structural problems such as 1-D bar, truss and beam problems and determine displacements, stresses and strains
- develop finite element formulations and solve 2-D structural problems using triangular and rectangular elements.
- apply finite element formulation in dynamic problems in structures and determine frequencies and mode shapes.

Course Content

UNIT - I:

Formulation Techniques: Methodology, engineering problems and governing differential equations, variational methods-potential energy method, Raleigh Ritz method, strong and weak forms, weighted residual methods.

Finite Element Method: Concepts of discretization, types of elements, interpolation function, node numbering scheme, assembly and boundary conditions.

UNIT - II: Analysis of One Dimensional Problems

Bar, simple truss and beam elements - shape functions, stiffness matrix, and load vectors, determination of displacements, strains and stresses.

UNIT - III: Analysis of Two Dimensional problems

Analysis of 2-D problems using constant strain triangle element, axi symmetric formulations and problems.

UNIT - IV: Isoparametric Formulations

Sub, iso and super parametric elements, four noded quadrilateral element, numerical integration – Gaussian quadrature approach.

UNIT - V: Dynamic Analysis:

Finite element formulation in dynamic problems in structures using Lagrangian Method, consistent and lumped mass models, free vibration analysis, longitudinal and transverse vibrations , mode superposition methods and reduction techniques.

Text Books:

1. SS Rao , “The Finite Element Methods in Engineering”, Butterworth-Heinemann, 5th Edition (UNIT – I)
2. Chandraputla, Ashok and Belegundu , “Introduction to Finite Elements in Engineering “, Prentice – Hall, 2011 (UNITS – II, III, IV, V)

Reference Books:

1. Daryl L Logan, “A first course in finite element method”, Cengage Learning. 5th Edition
2. JN Reddy, “An introduction to Finite Element Method”, McGrawHill, 4th Edition.
3. Chandraputla, Ashok and Belegundu , “Introduction to Finite Elements in Engineering “, Prentice – Hall, 2011
4. C. S. Krishnamurthy, “Finite Element Analysis -Theory and Programming”, Tata Mc Graw Hill, 2nd Edition

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DESIGN WITH ADVANCED MATERIALS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- understand the importance of selection of materials used in manufacturing with their behaviour under service.

Learning Outcomes

Students will be able to

- analyze the elastic, yield and fracture behaviour of metals.
- select the material for the given applications.
- suggest the modern metallic and Non Metallic materials for the applications.
- choose the suitable smart material for manufacturing.

Course Content

UNIT – I: Fundamentals of Material Science

Elasticity in metals, mechanism of plastic deformation, slip twinning, role of dislocations, yield stress, shear strength of perfect and real crystals, strengthening mechanism, work hardening, solid solution, grain boundary strengthening, Poly phase mixture, precipitation, particle, fiber and dispersion strengthening, effect of temperature, strain and strain rate on plastic behavior, super plasticity.

Yield criteria: Von mises and Tresca criteria.

Unit – II: Manufacturing Considerations

Motivation of selection, cost basis and service requirements, selection for mechanical properties, strength, toughness, fatigue, impact and creep, use of material property charts for material selection.

Unit – III: Modern Metallic Materials

Dual phase steels, micro alloyed steels, high strength low alloy (HSLA) Steel, maraging steel, intermetallics, Ni and Ti aluminides, super alloys.

Unit – IV: Non Metallic Materials

Polymeric materials and their molecular structures, production techniques for fibers, foams, adhesives and coatings, structure, properties and applications of engineering polymers. composites; Introduction, reinforcement, types of composite materials, - properties, processing and application of composite materials.

Unit – V: Smart Materials

Properties, structure and applications of Smart materials, shape memory alloys, metallic glass, quasi crystal and nano crystalline materials, ceramic materials, ceremets, high temperature materials, refractory materials.

Text Books:

1. Thomas H.Courtney, “Mechanical behavior of materials” 2nd Edition, McGraw-Hill, 2000 (UNIT-I,II, IV &V)
2. George E.Dieter “Mechanical Metallurgy” McGraw Hill, 1998(UNIT-I, & II)
3. Material Selection in mechanical design by M.F Ashby. Bott(UNIT II & III)

Reference Books:

1. Budinski. G.K. and Budinski. K.M., “ Engineering Materials: Properties and Selection”, 7thEdition, Prentice Hall of India, 2010.
2. Filnn .R.A. and Trojan .P.K., “Engineering Materials and their Applications”, (4th Edition), Jai co, 1999.
3. Metals Hand Book, Vol. 10, “Failure Analysis and Prevention”, (10th Edition), 1994.

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DESIGN FOR MANUFACTURING AND ASSEMBLY

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- Familiarize with the design factors which will ease the manufacturing and assembly.

Learning Outcomes

Student will be able to

- incorporate the process constraints & other influencing factors for design.
- design a metal casting product considering trouble shooting elements.
- design a defect free weldment.
- select appropriate material and manufacturing process for product development.
- plan an assembly for ease of manufacture and automation.

Course Content

UNIT - I: Design for Manufacturing

Overview of the DFM Process, Reduce the cost of manufacturing process, understanding the process and constraints, standard components and process, consider the impact of DFM decisions and other factors.

UNIT - II: Design Consideration in Metal Casting

Mold and gating system design, directional solidification, trouble shooting and ease of assembly and automation.

UNIT - III: Design Considerations for Welding, Forging, Sheet Metal and Powder Metal Process

By considering joining, defects, minimize the residual stresses and ease of assembly and automation.

UNIT - IV: Design Considerations in Machining

By considering machinability, geometric factors, cutting conditions and ease of assembly and automation.

UNIT - V: Selection of Materials

Selection of materials for engineering applications using properties, process, shape, charts, ranking and choice.

Text Books:

1. George E. Dieter, "Engineering Design" ,McGraw Hill International, 4th Edition

Reference Books:

1. Geoffrey Boothroyd, Peter Dewhurst, "Product Design for Manufacture and Assembly", CRC Press, 3rd Edition.
2. O. Molloy , "Design for Manufacturing and Assembly: Concepts, Architectures and Implementation",Chapman and Hall, 1st Edition

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FRACTURE MECHANICS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize with the basic concepts of fracture mechanics and its applications..

Learning Outcomes

Students will be able to:

- understand different mechanisms of fracture failure.
- determine stress intensity factors by applying Linear Elastic and Elastic Plastic fracture mechanics.
- determine stresses induced at crack tip.
- apply different approaches to determine the plastic zone at the crack tip
- determine different fracture parameters.
- apply the nondestructive test methods to identify the cracks.

Course Content

UNIT – I: Introduction

History and over view, fracture mechanics approach to design, effect of material properties on fracture.

Fracture Mechanisms: Ductile fracture, cleavage, ductile-brittle transition, inter granular fracture, environment assisted cracking.

Linear Elastic Fracture Mechanics : Griffith energy balance , energy release rate , crack resistance , R curve , stable and unstable crack growth.

UNIT – II: Stress Analysis of Cracks

Modes of fracture - opening , sliding and shearing mode , Airy stress function , crack tip stress field using Westergaard approach, effect of finite size , relation between stress intensity factor and energy release rate.

UNIT – III: Crack Tip Plastic Zone

Plastic zone shape , Irwin plastic zone correction, Dugdale approach, shape of the plastic zone, plastic constraint factor, thickness effect.

UNIT – IV: Elastic-Plastic Fracture Mechanics

Crack-tip-opening displacement, J contour integral, relationships between J and CTOD, crack-growth resistance curves, J-controlled fracture.

UNIT – V: Test Methods

Introduction, K_{Ic} -test technique, test methods to determine J_{Ic} , test methods to determine G_{Ic} AND G_{IIc} , determination of critical CTOD.

Crack Detection Through Non-Destructive Testing: Introduction, examination through human senses, liquid penetration inspection, ultrasonic testing, radiographic imaging, magnetic particle inspection.

Text Books:

1. T. L. Anderson, Fracture Mechanics: Fundamentals and Applications, 3rd edition, CRC Press.(UNITS – I,II,III,IV)
2. Prashant Kumar, Elements Of Fracture Mechanics, First edition , Mcgraw Hill Education.(UNIT-V)

Reference Books:

1. David Broek, Elementary engineering fracture mechanics, 4th edition, Kluwer Academic Publishers
2. J.F. Knott, “Fundamentals of Fracture Mechanics”, Butterworths, 1973.
3. J.F. Knott, P Withey, “Worked examples in Fracture Mechanics”, Institute of Materials, 2nd Edition

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CONDITION MONITORING

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- understand the importance of types of maintenance with their limitations and to know the methods of condition monitoring in different industrial sectors.

Learning Outcomes

Student will be able to

- apply different maintenance strategies for the need of plant maintenance to reduce the maintenance cost.
- analyze the machine condition with the aid of measuring instruments.
- select appropriate test for fault identification of given application.
- carry out lubrication oil analysis and temperature analysis for given applications.
- analyze the case study including the fault identification and root causes of malfunction.

Course Content

UNIT - I: Maintenance

Introduction, maintenance strategies, introduction to condition monitoring.

rotating machinery - machine faults and root causes, ISO Standards for vibration analysis.

UNIT - II: Vibration Monitoring

Types and benefits of vibration analysis, vibration signature analysis.

Vibration Measuring Instruments : Vibration transducers –displacement, velocity and acceleration transducers. vibrometer- introduction, laser vibrometer. accelerometers – piezo resistive, capacitive and inductive type.

UNIT - III: Non-destructive Testing

Various techniques for fault detection, introduction to non-destructive testing, types, role of non-destructive testing in condition monitoring.

Flaw Detection: Discontinuity – origin and classification, ultrasonic testing and magnetic particle inspection, radiography , liquid penetration test

UNIT - IV: Wear Debris Analysis

Wear mechanisms, wear particles, wear process monitoring techniques – Ferrography - Applications, advantages and limitations, spectrometric oil analysis program (SOAP),

Temperature monitoring: Need for temperature monitoring, thermography, active and passive thermography, IR thermography, applications, advantages and limitations.

UNIT - V: Case studies

Gear box, induction motor, fault detection in roller bearings, reciprocating engine.

Text Books:

1. R.A. Collacott ,” Mechanical Fault Diagnosis and Condition Monitoring “,John Wiley and Sons .

Reference Books:

1. Isermann R., “Fault Diagnosis Applications”, Springer-Verlag, Berlin, 2011 .
2. Rao, J S., “Vibration Condition Monitoring”, Narosa Publishing House, 2nd Edition, 2000.
3. Allan Davies,”Handbook of Condition Monitoring”, Chapman and Hall, 2000.

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RAPID TOOLIGN AND PROTOTYPING

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize with Rapid Prototype tools and techniques for design and Manufacturing.

Learning Outcomes

Student will be able to

- assess the need of RPT in Product development.
- use appropriate RT Software for development of Prototype model.
- judge the correct RP Process for Product/Prototype development.
- predict the technical challenges in 3D printing.
- list the applications of RPT.

Course Content

UNIT - I: Introduction to Rapid Prototyping

Introduction to prototyping, traditional prototyping Vs. rapid prototyping (RP), need for time compression in product development, usage of RP parts, generic RP process, distinction between RP and CNC, other related technologies, classification of RP.

UNIT - II: RP Software

Need for RP software, MIMICS, magics, surgiGuide, 3D-doctor, simplant, velocity2, voxim, solidView, 3Dview, etc., software.

Software Issues of RP: Preparation of CAD models, problems with STI, files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

UNIT - III: Photopolymerization RP Processes

Sterolithography (SL), SL resin curing process, SL scan patterns, microstereolithography, applications of photopolymerization processes.

Powder Bed Fusion RP Processes : Selective laser sintering (SLS), powder fusion mechanism and powder handling, SLS metal and ceramic part creation, electron beam melting (EBM), applications of powder bed fusion processes.

Extrusion-Based RP Systems: Fused deposition modelling (FDM), principles, plotting and path control, applications of extrusion-based processes.

UNIT - IV: Printing RP Processes

3D printing (3DP), research achievements in printing deposition, technical challenges in printing, printing process modeling, applications of printing processes.

Sheet Lamination RP Processes: Laminated Object Manufacturing (LOM), ultrasonic consolidation (UC), gluing, thermal bonding, LOM and UC applications.

Beam Deposition RP Processes: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), processing – structure - properties, relationships, benefits and drawbacks.

UNIT - V: Rapid Tooling

Conventional Tooling Vs. Rapid Tooling, classification of rapid tooling, direct and indirect tooling methods, soft and hard tooling methods.

Errors in RP Processes: Pre-processing, processing, post-processing errors, part building errors in SLA, SLS, etc.,

RP Applications: Design, engineering analysis and planning applications, rapid tooling, reverse engineering, medical applications of RP.

Text Books:

1. Chua Chee Kai., Leong KahFai., Chu Sing Lim, “Rapid Prototyping: Principles and Applications in Manufacturing”, World Scientific

Reference Books:

1. Ian Gibsn., David W Rosen., Brent Stucker., “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 2010
2. Pham, D.T, Dimov, S.S, Rapid Manufacturing, Springer, 2001.

* * *

THEORY OF ELASTICITY

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- introduce the basic concepts of theory of elasticity

Learning Outcomes

Student will be able to

- determine stress distribution and strain components for simple and symmetric problems
- analyze three dimensional problems using equilibrium and compatibility equations
- determine stresses induced in beams of different cross sections
- apply concepts of plasticity to determine the shear stresses and strain energy

Course Content

UNIT - I:

Elasticity : Two dimensional stress analysis - plane stress - plane strain - equations of compatibility - stress function - boundary conditions.

Problem in Rectangular Coordinates : Solution by polynomials - Saint Venent's principles - determination of displacement - simple beam problems.

Problems in polar coordinates : General equations in polar coordinates - stress distribution symmetrical about axis - strain components in polar coordinates - simple and symmetric problems.

UNIT - II:

Analysis of Stress and Strain in Three Dimensions : Principle stresses – homogeneous deformations - strain spherical and deviatoric stress - hydrostatic strain.

General theorems : Differential equations of equilibrium and compatibility - displacement - uniqueness of solution - reciprocal theorem.

UNIT - III:

Bending of Prismatic Bars : Stress function - bending of cantilever beam - beam of rectangular cross-section - beams of circular cross-section.

UNIT - IV:

Plasticity : Plastic deformation of metals - structure of metals - deformation - creep stress relaxation of deformation - strain rate condition of constant maximum shear stress - condition of constant strain energy - approximate equation of plasticity.

UNIT - V:

Methods of Solving Practical Problems : The characteristic method - engineering method - compression of metal under press - theoretical and experimental data drawing.

Text Books:

1. S.P. Timoshenko & J.K Goodier , “Theory of Elasticity”, McGraw-Hill, 3rd Edition

Reference Books:

1. E.P. Unksov , “An Engineering Theory of Plasticity”, Butterworths scientific publications, 1961
2. Hoffman and Sacks , “Theory of Plasticity” , McGraw-Hill, New York, 1953.

* * *

GEOMETRIC MODELING

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- highlight the importance of geometric modeling in design and manufacturing.

Learning Outcomes

Student will be able to

- apply various mathematical equations to represent curves.
- select appropriate synthetic curves in modeling process.
- implement the surface modeling for design of various consumer products.
- judge the apt method to create a solid model of desired object

Course Content

UNIT - I: Introduction to Geometric modeling

Definition, applications. transformations, representation of curves explicit and implicit equations, parametric equations.

UNIT - II: Cubic Splines-1

Algebraic and geometric form of cubic spline, tangent vectors, parametric space of a curve, blending functions, four point form, reparametrization, truncating and subdividing of curves. graphic construction and interpretation, composite pc curves.

UNIT - III:

Bezier Curves: Bernstein basis, equations of Bezier curves, properties, derivatives.

B-Spline Curves: B-Spline basis, equations, knot vectors, properties and derivatives.

UNIT - IV: Surfaces

Bicubic surfaces, , Bezier surfaces, B-Spline surfaces, surfaces of revolutions, sweep surfaces, ruled surfaces, tabulated cylinder, bilinear surfaces, Gaussian curvature.

UNIT - V:

Fundamentals of solid modeling. Sweep representations, constructive solid geometry, boundary representations

Text Books

1. Ibrahim Zeid , “CAD/CAM – Theory and Practice”, Tata McGraw Hill,2009.(UNITS – I,II,III,IV,V)
2. Roger & Adams , “Mathematical Elements for Computer Graphics” , Tata McGraw Hill,2nd Edition.(UNITS- I,II,III,IV-Mathematical Aspects)

Reference Books:

1. Micheal E. Mortenson , “Geometric Modeling”, McGraw Hill ,3rd Edition. Computer Aided Design and Manufacturing, K.Lalit Narayan, K.Mallikarjuna Rao, MMM Sarcar, PHI Publishers, 2nd Edition.

* * *

TRIBOLOGY
II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- know the selection of lubricating system for different types of bearings in various environmental conditions;
- understand the genesis of friction, the theories/laws of sliding and rolling friction
- learn about the principles of lubrication, lubrication regimes, theories of Hydrostatic, hydrodynamic, elastohydrodynamic and mixed/ boundary lubrication.
- learn about tribology of different machine components

Learning Outcomes

Student will be able to

- select the appropriate bearing materials.
- select the rolling element bearing for the given conditions.
- design hydrostatic, hydrodynamic and air lubrication systems used in bearings.
- Minimize the boundary friction and dry friction.

Course Content

UNIT - I:

Introduction: Nature of surfaces and contact-surface topography, friction and wear mechanisms, effect of lubricants- methods of fluid film formation.

Lubrication: Choice of lubricants, types of oil, grease and solid lubricants-additives- lubrication systems and their selection.

UNIT - II:

Selection of Rolling Element Bearings: Nominal life, static and dynamic capacity-equivalent load, probabilities of survival- cubic mean load -pre loading of bearings, conditioning monitoring using shock pulse method.

UNIT - III:

Hydrostatic Bearings: Thrust bearings – pad coefficients- restriction optimum film thickness-journal bearings – design procedure –aerostatic bearings; thrust bearings and journal bearings – design procedure.

UNIT - IV:

Hydrodynamic bearings: Fundamentals of fluid formation – Reynolds's equation; hydrodynamic journal bearings – Sommerfeld number- performance parameters – optimum bearing with maximum load capacity – friction – heat generated and heat dissipated. hydrodynamic thrust bearings; Raimondi and Boyd solution for hydrodynamic thrust bearings - fixed tilting pads, single and multiple pad bearings- optimum condition with largest minimum film thickness.

UNIT - V:

Seals: Different type-mechanical seals, lip seals, packed glands, soft piston seals, mechanical piston rod packing, labyrinth seals and throttling bushes, oil flinger rings and drain grooves – selection of mechanical seals.

Failure of Tribological Components: Failure analysis of plain bearings, rolling bearings, gears and seals, wear analysis using soap and ferrography.

Text Books:

1. Rowe WW& O' Dionoghue," Hydrostatic and Hybrid bearing design", Butterworths & Co. Publishers Ltd,1983.(UNITS-I,III,IV,V)
2. Collacott R.A, "Mechanical Fault diagnosis and condition monitoring", Chapman and Hall, London ,1977.(UNITS-I,II)
3. Bernard J. Hamrock, "Fundamentals of fluid film lubricant", McGraw-Hill Co., 1994. (UNITS-I,II,III)

Reference Books:

1. Neale MJ, (Editor) "Tribology hand Book" ,Neumann Butterworths,1975.
2. Connor and Boyd JJO (Editors) "Standard hand book of lubrication engineers" ASLE, McGraw Hill Book & Co.,1968.
3. Shigley J, E Charles, " Mechanical Engineering Design", McGraw Hill Co.,6th Edition.

* * *

MODELING AND ANALYSIS LAB

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To impart the students

- skills required for modeling and analysis using software package.
- skills required for writing MAT lab code .

Learning Outcomes

Student will be able to

- model simple mechanical parts using modeling package
- analyze different engineering problems using analysis package.
- write and execute MAT Lab code for solving engineering problems.

List of Experiments:

a) Using Modeling Package:

1. Sketching of a drawing with dimensions
2. Modeling of Stuffing Box parts
3. Assembly of parts of Flanged Coupling
4. Modeling of parts of Eccentric and generation of orthographic views
5. Modeling of links of four bar mechanism and simulation of mechanism

b) Using analysis Package :

6. 2- D truss analysis.
7. Static Analysis of Beam.
8. Static Analysis of 3-D structure.
9. Steady state Heat Transfer Analysis.
10. Transient thermal analysis
11. Free vibration analysis of Beam.
12. Harmonic Analysis of a Beam
13. Analysis of Axisymmetric Problem.
14. Analysis of Plane Stress problem.
15. Stress analysis of a composite plate.

16. Buckling analysis of column.
17. Optimization of cantilever beam.

c) Using MATLAB:

Introduction to MATLAB – Vector and Matrix Manipulations – Matrix functions – Tools for Polynomials – Non linear algebraic equations - Solving Differential equations –writing function subroutines – basic input and output functions – plotting functions.

18. Analysis of Bar structure using Finite Element Method
19. Analysis of Beam Structure using Finite Element Method
20. Analysis of Truss using Finite Element Method
21. Displacement , velocity and acceleration analysis of four bar mechanism.

Open Ended Experiment:

- Analysis of connecting rod with composite material

Reference Books:

1. Sham Tickoo , SOLIDWORKS 2017 for Designers, CADCIM Technologies, 3rd Edition
2. Saeed Moaveni , Finite Element Analysis Theory and Application with ANSYS, Pearson Publishers
3. Rao V Dukkupati , MATLAB for Mechanical Engineers, New Age International Publishers

* * *

ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

EMBEDDED SYSTEMS

**Department of
Electronics and Communication Engineering**

M.Tech Two Year Degree Course

(Applicable for the batch 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
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 instill 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 leading centre of education and research in Electronics and Communication Engineering, making the students adaptable to changing technological and societal needs in a holistic learning environment.

Articulations

- * To be a leading centre of education and research hub in Electronics and Communication Engineering with holistic learning environment.

- * Students to be adaptable for the changes in technology and societal needs.
- * Students to be recognized and valued for their commitment to excellence and enthusiasm for learning..

Mission:

- * To produce knowledgeable and technologically competent engineers for providing services to the society.
- * To have a collaboration with leading academic, industrial and research organizations for promoting research activities among faculty and students.
- * To create an integrated learning environment for sustained growth in electronics and communication engineering and related areas.

Articulations

- * To craft the graduates knowledge and technologically competent engineers for providing services to the society.
- * To have alliance with leading academicians, industries and research organizations and encourage the faculty and students for performing research activities.
- * To develop a multidiscipline learning environment for continuous growth in electronics and communication engineering and its associated fields.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

To make the graduates of M. Tech Programme in Embedded Systems

PEO-I : Identify and use appropriate modern tools to solve real world problems in Embedded Systems domain.

PEO-II : Develop an ability of writing and presenting a substantial technical report/ document and demonstrate degree of mastery over the area of specialization.

PEO-III: Inculcate self learning to pursue research career in relevant areas.

IV. PROGRAM OUTCOMES (POs)

PO-1 : An ability to independently carry out research /investigation and development work to solve practical problems.

PO-2 : An ability to write and present a substantial technical report/document.

PO-3 : Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.

V. ACADEMIC REGULATIONS

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

1. Duration of the Program

The duration of the program is two academic years consisting of four semesters. However, a student is permitted to complete the course work of M.Tech program in the stipulated time frame of four academic years from the date of joining.

2. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

3. Program Credits

Each specialization of the M.Tech programs is designed to have a total of 70 credits and the student shall have to complete the two year course work and earn all the 70 credits for the award of M.Tech Degree.

4. Attendance Regulations

- 4.1 A student shall be eligible to appear for Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- 4.2 Condoning of shortage of attendance in aggregate up to 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 the College Academic Committee. 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.
- 4.3 A student shall be eligible to claim for condonation of attendance shortage only once during the two years (four semesters) course work.
- 4.4 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.
- 4.5 Shortage of Attendance below 65% in aggregate shall in *NO* case be condoned.

- 4.6 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that semester and their registration shall stand cancelled.
- 4.7 A fee stipulated by the college shall be payable towards condoning attendance shortage.

5. Examinations and Scheme of Evaluation

5.1 Theory Courses :

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 assignments and 30 marks are based on two mid-term examinations.
- ii) Each assignment carries 10 marks and the average of two assignments shall be taken as the marks for continuous assessment.
- iii) Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of four questions, each for 10 marks. All the questions need to be answered.
- 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 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 two questions, each for 20 marks, with internal choice. All the questions need to be answered. 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 8 questions, each for 12 marks, out of which 5 questions are to be answered.
- ii) 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.

5.2 Laboratory Courses :

- i) For practical subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 40 internal marks. Of the 40 marks for internal, 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 an internal examiner and an external examiner for 60 marks.

5.3 (a) Seminar:

- i) For seminar, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the literature and submit it to the department in a report form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of report and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh report towards the end of that semester and appear for evaluation by the committee.

(b) Term Paper:

- i) For term paper, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the research papers and submit it to the department in publication form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of paper and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh paper towards the end of that semester and appear for evaluation by the committee.

5.4 Project Work:

Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee.

- i) A Project Review Committee (PRC) shall be constituted for each specialization with Head of the Department / a Senior Faculty as Chairman and two other senior faculty members.
- ii) Registration of Project Work: A candidate who has been promoted to 3rd semester shall be eligible to register for the project work.
- iii) The eligible candidate can choose his project supervisor and submit the title, objective, abstract and plan of action of the proposed project work to the department for approval by the PRC. The candidate whose proposal is approved by the PRC shall register for the project work. The minimum duration of project work will be 36 weeks from the date of registration.
- iv) If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. In case of such changes, the candidate has to register afresh.
- v) There shall be three reviews on the progress of the project work by the PRC with an interval of 12 weeks. The candidate needs to submit a report on the progress of his work and present it before the PRC for assessment. The PRC may suggest for an extension of date of submission of dissertation if the progress of work is not satisfactory or absent himself for the review.
- vi) A candidate who has passed all the theory, laboratory, seminar and term paper examinations and shown satisfactory progress of project work is permitted to submit the dissertation after 36 weeks from the date of registration.
- vii) If a candidate fails to submit the dissertation by the end of the 4th semester, he has to take the permission for an extension by paying the semester(s) tuition fee.
- viii) Three copies of the Project Thesis certified by the supervisor shall be submitted to the Department.
- ix) Project evaluation and Viva-Voce examination is conducted at the end of 4th semester by a committee consisting of Project Supervisor, senior faculty of the department, HoD and an External Examiner nominated by the Chief Controller of Examinations out of a panel of three examiners suggested by the department.

The following grades are awarded for the project work:

- i. Excellent
- ii. Very Good
- iii. Good
- iv. Satisfactory
- v. Unsatisfactory

The Grade “unsatisfactory” is treated as Fail. Failed Students should take supplementary examination after making required modifications, if any, in the dissertation with a minimum gap of 8 weeks by paying the required examination fee.

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

6.1 Criteria for Passing a Course:

- i) A candidate shall be declared to have passed in individual theory / laboratory 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.
- ii) The candidate shall be declared to have passed in seminar / term paper viva-voce if he secures 50% marks.
- iii) The candidate shall be declared to have successfully completed the project work if he secures a minimum of ‘satisfactory’ grade in the project evaluation and viva-voce examination.
- iv) On passing a course of a program, the student shall earn assigned credits in that course.

6.2 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 /Elective /Laboratory /Seminar / Term Paper /Project Dissertation (%)	Grade Points	Letter Grade
≥ 90	10	O (Outstanding)
≥ 80 & < 90	9	A+ (Excellent)
≥ 70 & < 80	8	A (Very Good)
≥ 60 & < 70	7	B+ (Good)
≥ 50 & < 60	6	B (Above Average)
< 50	0	F (Fail)

6.3 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:

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

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.

6.4 Eligibility for Award of B.Tech Degree:

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

- Pursued a course of study for not less than two academic years and not more than four academic years.
- Registered for prescribed **70** credits and secured **70** credits.
- Students, who fail to complete their Two years Course of study within Four years or fail to acquire the prescribed **70** Credits for the award of the degree within four academic years from the year of their admission shall forfeit their seat in M. Tech course and their admission shall stand cancelled.

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

The CGPA is calculated as given below:

$$\text{CGPA} = \frac{\sum (CR \times GP)}{\sum CR} \quad \text{for entire program.}$$

where CR = Credits of a course

GP = Grade points awarded for a course

* CGPA is calculated for a candidate who passed all the prescribed courses excluding project work.

6.6 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
$\geq 6.5 \text{ \& } < 7.5$	First Class
$\geq 6.0 \text{ \& } < 6.5$	Second Class

7. Supplementary Examinations

- Supplementary examinations will be conducted once in a year along with regular examinations.

- 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.

8. Re-admission Criteria

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/-

9. Break in Study

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of M.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 shall be paid by the candidate to condone his break in study.

10. 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 he will be offered substitute subjects in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

11. 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 be withheld in such cases.

12. 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 / year. 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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.	Expulsion from the examination hall 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 / year. 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 / year.
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 / year 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.

13. Other Matters

- i) Deserving physically challenged candidates will be given additional examination time and a scribe based on the certificate issued by the concerned authority. 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.
- v) Wherever the word he, him or his occurs, it will also include she, her and hers.

VI. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits
1	Baisc Sciences (BS)	3	4.28
2	Humanities and Social Sciences (HSS)	3	4.28
3	Professional Core (PC)	25	35.72
4	Professional Electives (PE)	9	12.86
7	Others (Seminar, Term Paper, Dissertation, etc.)	30	42.86

COURSE STRUCTURE & SYLLABUS

COURSE STRUCTURE

I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	MA2902	Linear and Non-Linear Optimization Techniques	4	-	-	3
2	EC2903	Principles of Digital Design Using FPGA**	3	-	2	3
3	EC2904	Advanced Digital Signal Processing	4	-	-	3
4	EC2905	Advanced Microcontrollers	4	-	-	3
5	EC2906	Embedded C	4	-	-	3
6		Professional Elective - I	4	-	-	3
7	EC2910	Advanced Digital Design Lab	-	-	4	2
Total			23	-	6	20

II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Research Methodology	4	-	-	3
2	EC2911	Advanced Embedded Systems **	3	-	2	3
3	EC2912	Principles of CMOS Analog Design	4	-	-	3
4	EC2913	Internet of Things	4	-	-	3
5		Professional Elective - II	4	-	-	3
6		Professional Elective - III	4	-	-	3
7	EC2920	Embedded Systems Lab	-	-	4	2
8		Seminar	-	-	-	2
Total			23	-	6	22

** Project Based Theory Course

L : Lecture T : Tutorial P : Practical

III Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Term Paper	-	-	4	2
2		Dissertation (Initiated in third semester)	-	-	-	-
Total			-	-	4	2

IV Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Dissertation (Carried out in third & Fourth Semester)	-	-	52	34
Total			-	-	52	34

Professional Electives:

Professional Elective - I

- EC2907 Embedded Networking
- EV2908 Sensors and Actuators
- EE2909 Low Power CMOS Digital Design

Professional Elective - II

- EC2914 SoC Design
- EC2915 Embedded Real Time Operating Systems
- EC2916 Embedded System Design

Professional Elective - III

- EC2917 Advanced Computer Networks
- EC2918 Hardware Software Co-Design
- EC2919 Wireless Sensor Networks

SYLLABUS

LINEAR AND NON-LINEAR OPTIMIZATION TECHNIQUES

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- familiarize different optimization techniques and approaches.
- provide the concepts of various classical and modern methods of constrained and constrained problems in both single and multivariable
- understand Non – Linear optimization problems.
- know evolutionary optimization methods

Learning Outcomes

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

- apply the knowledge of Mathematics in analyzing on engineering problems.
- formulate optimization problem
- develop an optimization problem in standard form and assess the optimality of a solution.
- solve various constrained and unconstrained problems in single variable as well as multi variable.
- apply the concepts of optimality criteria for various types of optimization problems.

Course Content

Unit-I: Linear Optimization

Formulation of LPP, graphical solution, standard form of linear programming problem, simplex method, big-M method.

Unit-II: Classical Optimization Techniques

Introduction-single-variable optimization-multivariable optimization, nonlinear programming: one-dimensional minimization methods : introduction –unimodal function –elimination methods: unrestricted search - exhaustive search-dichotomous search - interval halving method- fibonacci method - golden section method.

Unit-III: Nonlinear Programming I: Unconstrained Optimization Techniques

Introduction –direct search methods: random search methods-univariate method-pattern directions- Powell’s method- indirect search (descent) methods: gradient of a function -steepest descent (Cauchy) method - conjugate gradient (Fletcher–Reeves) method.

Unit-IV: Nonlinear Programming II: Constrained Optimization Techniques

Optimization with equality and inequality constraints, direct methods, indirect methods using penalty functions, lagrange multipliers, geometric programming.

Unit- V: Modern Methods of Optimization

Genetic algorithms: introduction – representation of design variables, representation of objective function and constraints, genetic operators - ant colony optimization: introduction, basic concepts, ant searching behavior, path retracing and pheromone updating, pheromone trail evaporation algorithm.

Text Books:

1. Singiresu S.Rao, “Engineering Optimization, Theory and Practice”, New Age International (P) Limited Publishers. 4th edition. (Units- I to V)
2. Kalyan moy Deb, “Optimization for Engineering Design”, PHI, Delhi, 2014.

References:

1. S.D. Sharma, “Operations Research”, Kedarnath Publishers, 8th edition, 2007.
2. E.J. Haug and J. S. Arora, “Applied Optimal Design”, Wiley, New York.
3. Marco Dorigo and Thomas stutzle, “Ant colony optimization”, MIT press, 2004.
4. S.N.Sivanandan, S.N. Deepa, “Introduction to genetic Algorithms”, Springer.

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PRINCIPLES OF DIGITAL DESIGN USING FPGA

I Semester

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

Course objectives

To make the students

- familiarize with design steps and various families of FPGA architecture.
- explore the design of digital circuits using FPGAs.

Learning Outcomes

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

- identify FPGA architectures and resources.
- select suitable device family of FPGA for a given application.
- implement various digital logic circuits using FPGAs.

Course Content

UNIT-I: Introduction

Overview, design methodologies, why FPGAs, design flow, verification and testing, design implementation (CAD) tools.

UNIT-II: Field Programmable Gate Arrays

Introduction, programming technology, device architecture- Xilinx logic cell array, - Xilinx 2000, 3000, 4000, general features of Virtex device family FPGAs; Actel ACT device architecture-ACT1, ACT2, ACT3, technology trends.

UNIT-III: Finite State Machines

Introduction, finite state machines, state transition table, state assignment for FPGAs, hazard and one-hot encoding.

UNIT-IV: Placement and Routing

Introduction, placement and routing- min-cut placement, iterative improvement, simulated annealing, segment channel routing and maze routing, routability and routing resources, net delays.

UNIT-V: Design Guidelines and Case Studies

Introduction, combinational circuits-parallel adder, sequential circuits- decade counter, asynchronous inputs, static RAM tester, pseudorandom number generation.

Text Books:

1. Pak.K.Chan, Samiha Mourad, Digital Design Using Field Programmable Gate Arrays, Pearson Education, 1994. (UNITS-I,III,IV,V)
2. Stephen M. Trimberger, Field-Programmable Gate Array Technology, Springer, 2007. (UNIT-II)

References:

1. John V. Oldfield, Richard C. Dorf (1995), Field-Programmable Gate Arrays, Wiley.
2. Ian Grout (2009), Digital Systems Design With FPGAs and CPLDs, Newness.
3. https://www.xilinx.com/support/documentation/data_sheets/3000.pdf.
4. https://www.xilinx.com/support/documentation/data_sheets/4000.pdf.
5. https://www.xilinx.com/support/documentation/data_sheets/ds031.pdf.
6. https://www.xilinx.com/support/documentation/data_sheets/ds112.pdf.

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ADVANCED DIGITAL SIGNAL PROCESSING

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- familiarize with concepts of different types of filter banks and structures.
- familiarize with different adaptive algorithms and its applications on various fields.

Learning Outcomes

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

- understand the fundamentals of multirate signal processing and its applications.
- design perfect reconstruction filter bank system
- understand the fundamentals of adaptive systems and its applications.

Course Content

Unit-I: Basic Multirate Operations

Decimation and interpolation, time-domain characterization, frequency-domain characterization, cascade equivalences, filters in sampling rate alteration systems, polyphase decomposition.

Unit-II: Filter Banks

Digital filter banks- uniform DFT filter banks, polyphase implementation of uniform filter banks, nyquist filters. two channel Quadrature-Mirror Filter (QMF) bank-filter bank structure, analysis of two channel QMF bank, alias free filter bank, alias free realization, alias free FIR QMF bank, alias free IIR QMF bank, perfect reconstruction two channel QMF bank.

Unit-III: Adaptive Systems

Adaptive systems- definitions and characteristics- properties, adaptive linear combiner-input signal and weight vectors - performance function-gradient and minimum mean square error.

Unit-IV: Adaptive Algorithms

Searching performance surface-stability and rate of convergence - learning curve-gradient search - Newton's method - method of steepest descent – comparison. LMS algorithm- convergence of weight vector. The LMS/Newton algorithm.

Unit-V: Applications of Adaptive Systems

Applications-adaptive modeling and system identification-adaptive modeling for multipath communication channel, geophysical exploration, FIR digital filter synthesis.

Text Books:

1. Sanjit K. Mitra, “ Digital Signal Processing: A computer based approach”, McGraw Hill, 1998. (Units – I&II)
2. Bernard Widrow and Samuel D. Stearns, “Adaptive Signal Processing”, Pearson Education, 2005. (Units – III,IV& V).

Reference Books:

1. P.P. Vaidyanathan, “Multirate Systems and Filter Banks.” Prentice Hall. PTR. 1993.
2. Simon Haykin, “Adaptive Filter Theory”, Pearson Education, 2003.
3. J.G. Proakis. D.G. Manolakis. “Digital Signal Processing: Principles. Algorithms and Applications”, 3rd Edn. Prentice Hall India, 1999.
4. N.J. Fliege. “Multirate Digital Signal Processing “ John Wiley 1994.

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ADVANCED MICROCONTROLLERS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives:

To make the students

- familiarize with architecture and the instruction set of different microcontrollers.
- familiarize with assembly language programming of various microcontrollers.

Learning Outcomes:

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

- understand the internal architecture of Atmel, PIC and ARM microcontrollers.
- understand ARM architecture support for high level languages, system level development and operating systems.
- apply knowledge of soft skills and other resources for system level development.
- discriminate the performance of different microcontrollers.

Course Content

UNIT - I: Atmel Microcontrollers

Introduction to Atmel microcontrollers (89CXX and 89C20XX), architectural overview and pin description of 89C51 and 89C2051, precision analog comparator in 89C2051, ADC using precision analog comparator, power saving options, pulse generation, PWM, pulse width measurement and frequency counter.

UNIT - II: PIC Microcontrollers

Overview and features, PIC 16C6X/7X: architecture, addressing modes, instruction set, memory organization, I/O ports, interrupts, timers, ADC. PIC 16F8XX: pin diagram, program memory, data memory, Interrupts, I/O ports and timers. CCP module in PIC 16F877, MSSP module, USART.

UNIT - III: ARM Processors

Introduction, architecture, assembly language programming, ARM organization and implementation, instruction set, thumb instruction set, architectural support for high level languages.

UNIT - IV: ARM Architectural Support for System Development

The ARM memory interface, memory hierarchy, the Advanced Microcontroller Bus Architecture (AMBA), the ARM reference peripheral specification, hardware system prototyping tools, the ARMulator, the JTAG boundary scan test architecture, the ARM debug architecture, embedded trace, signal processing support.

UNIT - V: Architectural Support for Operating Systems

Introduction to operating systems, ARM system control coprocessor, CP15 protection unit registers, ARM protection unit, CP15 MMU registers, ARM MMU architecture, synchronization, context switching.

Text Books:

1. Ajay V Deshmukh, "Microcontrollers-Theory and Applications", TMH Publications, 1st Edition, 2005 (Unit-I, II).
2. Stephen B Furber, "ARM system on chip Architecture", Pearson Publications, 2nd Edition. (Unit-III, IV, V).

References:

1. M. Ali Mazidi and J. Gillispie Mazidi, "The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2nd Edition.
2. Lucio Bi Jasio, "PIC Microcontrollers", Newnes Publishers, 1st Edition, 2008.

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EMBEDDED C

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

To make the students

- understand the basic concepts of embedded systems, processors, and programming languages.
- familiarize with various interfaces, memory, and power consumption.

Learning Outcomes

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

- distinguish C and Embedded C.
- select the processor, memory and operating system for an application.
- design and develop an application using Embedded C.

Course Content

UNIT - I: Programming Embedded Systems in C

Introduction to embedded system, selection: processor, programming language and operating system; steps in developing embedded software.

External interface of the standard 8051, reset requirements, clock frequency and performance, memory issues, I/O pins, timers, interrupts, serial interface, power consumption

UNIT - II: I/O Port Programming

Basic techniques for reading from port pins, reading and writing bytes, reading and writing bits (simple version), reading and writing bits (generic version), need for pull-up resistors, dealing with switch bounce, reading switch inputs (basic code), example: counting goats.

UNIT - III: Object Oriented Concepts

Object-oriented programming with C, the project header (MAIN.H), the port header (PORT.H), restructuring the goat-counting example.

UNIT - IV: Real-time Constraints

Introduction, creating 'hardware delays' using timer 0 and timer 1, generating a precise 50 ms delay, creating a portable hardware delay, use of timer 2, need for

'timeout' mechanism, creating loop timeouts, testing loop timeouts, reliable switch interface, creating hardware timeouts, testing a hardware timeout.

UNIT - V: Applications

Timer program, keyboard scanner, serial port programming, LCD programming.

Text Books:

1. Michael J. Pont, "Embedded C", Pearson Education, 2nd Edition, 2008.(Units I-IV)
2. Zdravko Karakehayov, Knud Smed Christensen, Ole Winther, "Embedded Systems Design with 8051 Microcontrollers", Marcel Dekker, Special Indian Edition, 2010.(Unit V)

Reference Books:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, 2nd Edition, 2008.
2. Michael Barr, "Programming Embedded Systems in C and C++", Oreilly, 2003.

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EMBEDDED NETWORKING

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- know the concepts of SPI, I²C and CAN Interfaces.
- familiarize with networking basics and security.

Learning Outcomes

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

- understand the principles of SPI, I²C, and CAN Interfaces.
- understand the basic concepts of networking and security.

Course Content

UNIT – I: SPI and I²C Interface

Serial peripheral interface: introduction, SPI mode, SPI C library functions, applications of SPI.

Inter-Integrated Circuit: the I²C Protocol, PIC18 MSSP module in I²C mode, registers for I²C operation, PIC18 I²C master and slave mode.

UNIT – II: CAN Principles

Overview of Controller Area Network, CAN messages, error handling, fault confinement, CAN message bit timing, synchronization issue, PIC18 CAN module, CAN modes of operation, CAN module registers, CAN module functional modes.

UNIT – III: CAN Transmission and Reception

CAN message buffers, CAN message transmission, message reception, message acceptance filters and masks, baud rate setting and timing parameters, physical CAN bus connection.

UNIT – IV: Networking Basics

Sockets, TCP/IP networking, Ethernet, Wi-Fi and IEEE 802.11, Bluetooth.

UNIT – V: Platform and Content Security

Principles, concepts and building blocks, platform support for security.

Text Books:

1. Han-Way Huang, "PIC Microcontroller: An Introduction to Software and Hardware Interfacing", Thomson publishers. (Units: I,II&III).
2. Peter Barry and Patrick Crowley, "Modern Embedded Computing", 1st Edition, Elsevier/Morgan Kaufmann, 2012. (Units: IV&V)

Reference Books:

1. Frank Vahid, Givargis, "Embedded Systems Design: A Unified Hardware/Software Introduction", Wiley Publications.
2. Jan Axelson, "Parallel Port Complete", Penram publications.
3. Dogan Ibrahim, "Advanced PIC Microcontroller Projects in C", Elsevier Publishers, 2008.
4. Glaf P.Feiffer, Andrew Ayre and Christian Keyold, "Embedded Networking with CAN and CAN open", Embedded System Academy 2005.

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SENSORS AND ACTUATORS

I Semester

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

Course Objectives

To make the students

- familiarize with various types of sensors and actuators.
- understand the concepts of smart sensors.

Learning Outcomes

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

- understand the principles of different sensors and actuators.
- use sensors in practical applications.

Course Content

UNIT - I: Introduction to Systems

Measurement systems, control systems, microprocessor based controllers, data loggers, single and multichannel data acquisition systems, sensor based data acquisition systems, electro mechanical A/D converter, digital transducer.

UNIT - II: Mechanical and Electromechanical Sensors

Selection of a sensor, acoustic temperature sensor, dielectric constant and refractive index thermo sensors ,thermometer – resistance change type thermometric sensors, thermo emf sensors, thermal radiation sensors, quartz crystal thermoelectric sensors, heat flux sensors, force/stress sensors using quartz resonators, pyrometers, ultrasonic sensors.

UNIT - III: Magnetic Sensors

Introduction, principles, Hall effect sensors, eddy current sensors, angular/rotary movement transducers – synchros – synchro-resolvers, electromagnetic flow meters, switching magnetic sensors, SQUID sensor.

UNIT - IV: Smart Sensors

Introduction, primary sensors, excitation, amplification, filters, converters, compensation, information coding processing, data communication, the automation. Sensors applications: Introduction, on-board automobile (automotive) sensors, home appliance sensors.

UNIT – V: Actuators

Actuation systems, pneumatic and hydraulic systems, directional control valves, pressure control valves, cylinders, process control valves, rotary actuators.

Mechanical actuation systems: Types of motion, kinematic chains, cams, gears, ratchet and pawl, belt and chain drives, bearings.

Text Books:

1. D. Patranabis, “Sensors and Transducers”, PHI Learning Private Limited, 2nd Edition, 2006. (Units: II, III, IV)
2. W. Bolton, “Mechatronics”, Pearson Education Limited, 3rd Edition, 2003. (Units: I, V)

Reference Books:

1. D. Patranabis, “Sensors and Actuators”, PHI, 2nd Edition, 2013.
2. H..S.kalsi, “Electronic Instrumentation”, TMH, 3rd Edition, 2012.

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LOW POWER CMOS DIGITAL DESIGN

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives:

To make the students

- familiarize with the limits of power and sources of power consumption in CMOS digital circuits.
- understand various approaches for minimizing power consumption.

Learning Outcomes

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

- understand the various sources of power consumption in CMOS digital circuits.
- understand the techniques for minimizing power consumption.
- identify various methodologies for the design of low power circuits.

Course Content

UNIT-I : Limits of Power and Sources of Power Consumption

Introduction, background, theoretical limits, quasi-adiabatic microelectronics, practical limits, switching component of power, short-circuit component of power, leakage component of power, static power.

UNIT-II : Voltage Scaling Approaches

Reliability-driven voltage scaling, technology-driven voltage scaling, energy x delay minimum based voltage scaling, voltage scaling through optimal transistor sizing, voltage scaling using threshold reduction, architecture-driven voltage scaling.

UNIT-III : Adiabatic Switching

Adiabatic charging, adiabatic amplification, adiabatic logic gates, stepwise charging, pulsed-power supplies.

UNIT-IV : Minimizing Switched Capacitance

Algorithmic optimization, architecture optimization, logic optimization, circuit optimization, physical design.

UNIT-V : Low Power Design Methodology

Low power physical design, low power gate-level design, low power architecture-level design, algorithmic-level power reduction, power estimation techniques.

Text Books :

1. Anantha P. Chandrakasan and Robert W. Brodersen, "Low Power Digital CMOS Design", Springer Science, 1st Edition, 1995 (Units I-IV).
2. Abdellatif Bellaouar and Mohamed Elmasry, "Low-power Digital VLSI design : Circuits and Systems", Springer Science, 1st Edition, 1995 (Unit V).

Reference Books:

1. Jan M. Rabaey and Massoud Pedram, "Low Power Design Methodologies", Springer International Series, 1st Edition, 1996.
2. Jan Rabaey, "Low Power Design Essentials", Springer US, 2009.
- Gary K. Yeap, "Practical Low Power Digital VLSI Design", Springer, 1998.

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ADVANCED DIGITAL DESIGN LAB

I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

To make the students

- familiarize with the design and implementation of various digital systems.

Learning Outcomes

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

- design digital circuits
- implement various combinational and sequential circuits in FPGA.
- perform power and delay analysis on the designed circuits in back-end environment.

List of Experiments:

- For Part-1, develop the program in HDL, perform simulation, synthesis and implement in FPGA.
- For Part-2, perform transistor level circuit realization and simulation.

Note: Any four from a to f of part-1 and any three from a to d of part-2 to be performed.

i) Part-1:

- a) Serial and parallel data transfer systems.
- b) Digital display decoder systems.
- c) Adder/subtractor module.
- d) Barrel shifter module.
- e) Dual port RAM module.
- f) ALU.
- g) Design of ASIP– Open ended experiment.

ii) Part-2:

- a) Basic Logic gates
- b) Full Adder.
- c) Multiplexer.
- d) Data flip-flop/register.

References:

1. Leo Chartrand, "Advanced Digital Systems: Experiments and Concepts with CPLDs", Thomson Delmar Learning, 2005.
2. R. Jacob Baker, "CMOS: Circuit Design, Layout, and Simulation", IEEE Press, Wiley, 2010.

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RESEARCH METHODOLOGIES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize the objectives, motivation and significance of research.
- know research methodologies.
- define research problem and perform data analysis.
- write a research paper and report.

Learning Outcomes

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

- understand research approaches
- understand various research methodologies
- define a research problem
- perform data analysis
- write research papers and reports

Course Content

UNIT – I: Introduction

Introduction, objectives and motivation of research, types of research, research approaches, significance of research methods.

UNIT – II: Research Methodology

Research methods versus methodology, research and scientific method, importance of knowing how research is done, research process. criteria for good research.

UNIT – III: Defining Research Problem

The research problems, necessity of defining the problem, technique involved in defining a problem, review of related literature, purpose of literature survey, identifying the current status, presentation of literature survey findings. critique, survey and peer review process.

UNIT – IV: Research Design and Data Analysis

Meaning of research design, features of good design, important concepts relating to research design, different research designs, basic principles of experimental designs.

Methods of data collection - collection of primary data, observation method, interview method, collection of data through questionnaires, collection of data through schedules, difference between questionnaires and schedules, some other methods of data collection, collection of secondary data, selection of appropriate method for data collection, case study method.

Processing and analysis of data - processing operations, some problems in processing, elements, types of analysis, statistics in research.

UNIT – V: Research Paper and Report Writing

Final paper presentation. significance of report writing, different steps in writing report, layout of the research report, types of report, precautions for writing research reports.

Text Books:

1. C.R.Kothari, “Research Methodology Methods and Techniques”, Wishwa Prakashan Publishers, Second Edition.

Reference Books:

1. Template of ASCE/ASME/IEEE for paper writing.

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ADVANCED EMBEDDED SYSTEMS

II Semester

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

Course Objectives

To make the students

- familiarize with advanced embedded systems.
- familiarize with computing aspects, optimization techniques used in advanced embedded systems.

Learning Outcomes:

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

- know the characteristics of advanced embedded systems.
- understand the concepts of embedded computing.
- demonstrate the architecture of Intel atom processor.

Course Content

UNIT-I: Attributes and Future of Embedded System

Embedded platform characteristics: Central Processing Unit (CPU), integration level, power consumption, form factor, expansion, application-specific hardware, certification, reliability/availability, user interfaces, connectivity, security

The future of embedded systems: Technology trends, connectivity, storage, sensing; issues, applications, and initiatives: energy, security, health, challenges and uncertainties: open systems, internet access, and neutrality, privacy, successful commercialization

UNIT-II: Embedded Computing

Complex systems and microprocessors, embedded system design process, CPUs-CPU performance, CPU power consumption.

UNIT-III: Program Design and Analysis

Program optimization, program-level performance analysis, software performance optimization, program-level energy and power analysis and optimization, analysis and optimization of program size, program validation and testing

UNIT-IV: Power Optimization and parallel Processing

Basics, power profile of an embedded computing system, constant versus dynamic power, simple model of power efficiency, advanced configuration and power interface,

optimizing software for power performance, types and levels of parallelism, classification of parallel architectures, basic parallel techniques.

UNIT-V: Architecture of Intel E6XX Processor

Intel Atom E6XX series platforms, multi-radio communications design, multimedia design, modular references.

Text Books:

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Morgan Kaufman Publishers, 2004. (UNITS II & III).
2. Peter Barry and Patrick Crowley, "Modern Embedded Computing", 1st Edition, Elsevier/Morgan Kaufmann, 2012. (UNITS I, IV & V)

Reference Books:

1. DezsoSima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architectures", Pearson Education Ltd.
2. Tammy Noergaard, "Embedded Systems Architecture", Newnes, 2005.
3. Joseph A. Fisher, Paolo Faraboschi and Cliff Young, "Embedded Computing – A VLIW Approach to Architecture, Compilers and Tools", Elsevier/Morgan Kaufmann, 2005

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PRINCIPLES OF CMOS ANALOG DESIGN

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize with the MOS transistor operation and its models
- understand the operation of various analog circuits.
- familiarize with types of noise in circuit elements and noise models.

Learning Outcomes

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

- understand the operation and modelling of MOS transistor.
- understand the operation of current mirrors, single-stage amplifiers, opamps, and switched capacitor circuits.
- understand the compensation of opamps.
- model the noise components in circuit elements and analyze them in various circuits.

Course Content

UNIT-I : MOS transistors operation and modelling

Symbols for MOS transistors, basic operation, large-signal modelling, body effect, p-channel transistors, low- and high-frequency small-signal modelling in the active region, small-signal modelling in the triode and cutoff regions, analog figures of merit and trade-offs, advanced MOS modelling - subthreshold operation, mobility degradation, parasitic resistances, short-channel effects, leakage currents.

UNIT-II : Basic current mirrors and single-stage amplifiers

Simple CMOS current mirror, common-source amplifier, source-follower or common-drain amplifier, common-gate amplifier, source-degenerated current mirrors, cascode current mirrors, cascode gain stage, MOS differential pair and gain stage.

UNIT-III : Basic opamp design and compensation

Two-stage CMOS opamp - opamp gain, frequency response, slew rate, n-channel or p-channel input stage, systematic offset voltage; opamp compensation - dominant-pole compensation and lead compensation, compensating the two-stage

opamp, making compensation independent of process and temperature; folded-cascode opamp - small-signal analysis, slew rate; fully differential opamps - fully differential folded-cascode opamp, alternative fully differential opamps, low supply voltage opamps.

UNIT-IV : Noise, linearity analysis and modelling

Time-domain analysis - root mean square (rms) value, SNR, units of dbm, noise summation; frequency-domain analysis - noise spectral density, white noise, $1/f$, or flicker, noise, filtered noise, noise bandwidth, piecewise integration of noise, $1/f$ noise tangent principle; Noise models for circuit elements – resistors, diodes, bipolar transistors, MOSFETs, opamps, capacitors and inductors, sampled signal noise, input-referred noise noise analysis examples - opamp example, CMOS differential pair example, fiber-optic transimpedance amplifier example; dynamic range performance - total harmonic distortion (THD), third-order intercept point (IP3), spurious-free dynamic range (SFDR), signal-to-noise and distortion ratio (SNDR).

UNIT-V : Switched capacitor circuits

Switched capacitor circuits : Basic building blocks – opamps, capacitors, switches, non-overlapping clocks; basic operation and analysis - resistor equivalence of a switched capacitor, parasitic-sensitive integrator, parasitic-insensitive integrators, signal-flow-graph analysis; noise in switched-capacitor circuits; first-order filters - switch sharing, fully differential filters; biquad filters - low-Q and high-Q biquad filter; charge injection, switched-capacitor gain circuits - parallel resistor-capacitor circuit, resettable gain circuit, capacitive-reset gain circuit, correlated double-sampling techniques.

Text Books :

1. Tony Chan Carusone, David A. Johns, Kenneth W. Martin, "Analog Integrated Circuit Design", John Wiley & Sons, 2nd Edition, 2012.

Reference Books :

1. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 4th Edition, 2001.
2. Behzad Razavi' " Design of Analog CMOS Integrated Circuits", McGraw-Hill International Edition, 2001.

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INTERNET OF THINGS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- understand the concepts of M2M to IoT.
- familiarize with data and knowledge management and usage of devices in IoT technology.

Learning Outcomes

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

- understand the concepts of M2M to IoT.
- use devices, gateways and data management in IoT.
- apply IoT in industrial and commercial building automation.

Course Content

UNIT-I: M2M to IoT

The vision-introduction, from M2M to IoT, M2M towards IoT-the global context, a use case example, differing characteristics.

UNIT-II: M2M to IoT – A Market Perspective

Introduction, some definitions, M2M value chains, IoT value chains, an emerging industrial structure for IoT, the international driven global value chain and global information monopolies. **M2M to IoT-An Architectural Overview**– Building an architecture, main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT-III: M2M and IoT Technology Fundamentals

Devices and gateways, Local and Wide Area Networking, data management, business processes in IoT, everything as a service(XaaS), M2M and IoT analytics, knowledge management.

UNIT-IV: IoT Architecture

State of the Art- Introduction, state of the art, **Architecture reference model**- introduction, reference model and architecture, IoT reference model, **IoT reference architecture**- introduction, functional view, information view, deployment and operational view, other relevant architectural views.

UNIT-V: Real World Design and IoT Applications

Real-World Design Constraints- introduction, technical design constraints- hardware is popular again, data representation and visualization, Interaction and remote control. **Industrial Automation-** service-oriented architecture-based device integration. **Commercial Building Automation-** Introduction, case study: phase one-commercial building automation today, case study: phase two- commercial building automation in the future.

Text Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

Reference Books:

1. Rajkamal, "Internet of Things: Architecture, Design Principles And Applications", McGraw Hill Higher Education
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Academic press Publications, 2013

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SOC DESIGN

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- understand the concepts of System-On-Chip design technology.
- introduce components in a typical SoC system.
- familiarize with the concept of different processor cores.

Course Outcomes:

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

- understand architecture, design issues, core libraries and EDA tools required for SoC design.
- understand design methodology for logic cores, soft and hard cores, memory and analog cores.
- perform SoC design validation, prototyping and verification.

UNIT - I: Introduction to Architecture Designs

Architecture and design issues of SoC, hardware software co-design, co-design flow, core libraries, EDA tools and web pointers.

UNIT - II: Design Methodology for Logic Cores, Soft and Firm Cores

Logic Cores: SoC design flow, guidelines for design reuse and physical design.

Soft and Firm Cores: Soft core design flow, design process for hard cores, sign-off checklist, deliverables and system integration.

UNIT - III: Design methodology for Memory Cores and Analog Cores

Memory Cores: Embedded memories and design methodology, specifications of analog circuits, circuit techniques, memory compiler, simulation models.

Analog Cores: Analog-to-digital converter, digital-to-analog converter, phase-locked loops, high speed circuits

UNIT - IV: Design Validation

Core-level validation, core validation plan, test benches, core-level timing verification, core interface verification, protocol verification, gate-level simulation, SoC design validation, co-simulation, emulation, hardware prototypes.

UNIT - V: Core Design Examples

Micro processor cores, V830 R/AV super scalar RISC core, design of power PC 603e G2 core, memory core generators, core integration and on-chip bus.

Text Books:

1. Rochit Raj Suman, "System-on-a-chip: Design and Test", Artech House, 2000.

Reference Books:

1. Jason Andrews – Newness "Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) ", BK and CDROM.
2. Prakash Rashinkar, Peter Paterson and Leena Singh L "System on Chip Verification – Methodologies and Techniques", Kluwer Academic Publishers, 2001.
3. Ricardo Reis, "Design of System on a Chip: Devices and Components", 1st Ed., Springer 2004.

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EMBEDDED REAL TIME OPERATING SYSTEMS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- introduce the basic concepts and applications of real time operating systems.
- familiarize with the basic concepts and programming of Unix/Linux and RT Linux.

Learning Outcomes

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

- understand the concepts of real time operating systems.
- develop software for embedded systems.
- develop the hardware and software architectures for digital camera application.

Course Content

UNIT – I: Introduction to Real Time Operating System

OS services, process management, timer functions, event functions, memory management, device, file and IO systems management, interrupt routines in RTOS environment and handling of interrupt source calls, Real-Time Operating Systems, basic design using an RTOS, RTOS task scheduling models, interrupt latency and response of the tasks as performance metrics, OS security issues.

UNIT – II: Real Time Operating Systems for Embedded systems.

Basic functions and types of RTOS for embedded systems - μ COS-II, VxWorks, Windows CE, OSEK.

UNIT – III: Case Study-Program Modeling with RTOS

Case study - digital camera hardware and software architecture, coding for sending application layer byte streams on a TCP/IP network using RTOS VxWorks.

UNIT – IV: Target Image Creation

Off-the-shelf operating systems, operating system software, target image creation for Windows XP embedded, porting RTOS on a microcontroller based development board.

UNIT – V: Programming in Linux and RTLinux

Overview and programming concepts of Unix/Linux, shell programming, system programming – fork demo, semaphores. Overview of RT Linux, core RT Linux API, program to display a message periodically, semaphore management.

Text Books:

1. Rajkamal, “Embedded Systems-Architecture, Programming and Design”, Tata McGraw Hill Publications, Second Edition, 2008 (units: I,II & III).
2. Dr. K.V.K.K. Prasad, “Embedded/Real-Time Systems” Dream Tech Publications, (units: IV & V).

Reference Books:

1. Labrosse, “Embedding system building blocks “, CMP publishers.
2. Rob Williams,” Real time Systems Development”, Butterworth Heinemann Publication.

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EMBEDDED SYSTEM DESIGN

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- To introduce the concepts of embedded system hardware and software.
- To familiarize with embedded system design and development.

Learning Outcomes

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

- understand the concepts of embedded system.
- identify hardware and software requirements for an embedded system.
- design an embedded system.

Course Content

UNIT-I: Introduction

An embedded system-definition, examples, current technologies, integration in system design, embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, embedded processors – ISA architecture models, internal processor design, processor performance, board memory – ROM, RAM, auxiliary memory, memory management of external memory, board memory and performance. embedded board input / output – serial versus parallel I/O, interfacing the I/O components, I/O components and performance, board buses – bus arbitration and timing, integrating the bus with other board components, bus performance.

UNIT-III: Embedded Software

Device drivers, device drivers for interrupt-handling, memory device drivers, on-board bus device drivers, board I/O drivers, explanation about above drivers with suitable examples. Embedded operating systems –Multitasking and process management, memory management, I/O and file system management, OS

standards example – POSIX, OS performance guidelines, board support packages, middleware and application software – middle ware, middleware examples, application layer software examples.

UNIT-IV: Embedded System Design and Development

Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- host and target machines, linking and locating software, getting embedded software into the target system, issues in hardware-software design and co-design.

UNIT-V: Embedded System Design implementation and Case Study

Implementing the design-the main software utility tool, CAD and the hardware, translation tools, debugging tools, testing on host machine, simulators, laboratory tools, system boot-up. case study - processor design approach of an embedded system –power PC processor based and micro blaze processor based embedded system design on Xilinx platform

Text Books:

1. Tammy Noergaard “Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers”, Elsevier(Singapore) Pvt. Ltd. Publications, 2005.(Units I-V)
2. Frank Vahid, Tony D. Givargis, “Embedded system Design: A Unified Hardware/Software Introduction”, John Wily & Sons Inc.2002.(Unit-II)

Reference Books:

1. Peter Marwedel, “Embedded System Design”, Science Publishers, 2007.
2. Arnold S Burger, “Embedded System Design”, CMP.
3. Rajkamal, “Embedded Systems: Architecture, Programming and Design”, TMH Publications, Second Edition, 2008.

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ADVANCED COMPUTER NETWORKS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- understand Congestion & Quality of Service(QoS) techniques in Networks.
- familiarize with the concepts of wireless LAN, WPAN, WWAN and MAN's.
- gain knowledge about cellular systems and ATM Reference model & AAL Layers.

Course Outcomes

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

- use appropriate congestion control principles Qos Techniques and given network.
- differentiate various wireless networks.
- analyze various cellular systems.
- design ATM networks.
- analyze the various network algorithms.

Course Content

UNIT-I: Congestion and Quality of Service (QoS)

Data traffic, congestion, congestion control, two examples, quality of service, techniques to improve QOS, integrated services and differential services. Queue management: passive-drop, drop tail, drop front, random drop, active- early random drop, random early detection.

UNIT-II: X.25 Standards

X.25 Layers, X.21 protocol, frame relay: introduction, frame relay operation, frame relay layers, congestion control, leaky bucket algorithms, ATM: Design goals, ATM architecture, switching, switch Fabric, ATM layers, service classes, ATM applications.

UNIT-III: Interconnection Networks

Introduction, Banyan networks, properties, crossbar switch, three stage class networks, rearrangeable networks, folding algorithm, Benes Networks, Lopping

algorithm, bit allocation algorithm. SONET/SDH: synchronous transport signals, physical configuration, SONET layers, SONET frame.

UNIT-IV: Spread Spectrum

Introduction, basic concept, protection against jamming, spreading codes (PN sequence), generation, properties, types of spread spectrum modulation, application of spread spectrum. Private networks: virtual private networks, network address translation next generation: IPV6 Transition from IPV4 to IPV6 ,mobile IP: addressing, agents, three phases, inefficiency in mobile IP

UNIT-V:Wireless Networks

Wireless LAN: IEEE802.11, architecture, MAC sub layer, addressing mechanism, physical layer. Bluetooth: architecture, Bluetooth layers, radio layer, base band layer, L2CAP, wireless WAN: The cellular concept, cell, frequency reuse, principle, channel assignment strategies, interference and system capacity, types of interference, improving capacity in cellular system, handoff, AMPS, D-AMPS, GSM, CDMA, GPRS, 3G & 4G technologies.

Text Books:

1. B. A. Forouzan, "Data Communication and Networking", TMH, 4th edition, 2004. (UNITS I-V)
2. B. A. Forouzan, "TCP/IP Protocol Suite", 4th Edition, TMH. (UNIT IV)

Reference Books:

1. Abhishek Yadav, "Wireless Communication System", University Sciences Press.
2. Kamilofeher, "Wireless Digital Communications", PHI, 1999.
3. Mahaboob Hassan, Jain Raj, "High Performance TCP-IP Networking", PHI.
4. N. N. Biswas, "ATM Fundamentals" Adventure Book Publishers, 1998.

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HARDWARE SOFTWARE CO-DESIGN

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize with the concepts of hardware/software co-design.
- familiarize with various target architectures and methods of prototyping, emulation, retargetable compilation and verification tools.

Learning Outcomes

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

- demonstrate the fundamental principles of hardware/software co-design issues.
- understand the methods of prototyping and emulation on target devices.
- understand compilation technologies and languages for system level specification.

Course Content

UNIT – I: Co-Design Issues

Hardware software co-design introduction, issues in co-design - models, architectures, languages; generic co-design methodology.

UNIT – II: Prototyping and Emulation

Introduction, prototyping and emulation techniques, prototyping and emulation environments, architecture specialization techniques, system communication infrastructure.

UNIT – III: Target architectures

Target architectures and application system classes, architecture for control dominated systems (MC68332), data dominated systems (ADSP21060), mixed systems (Intel i960).

UNIT – IV: Compilation Techniques and Embedded Processor Architectures

Modern embedded architectures, embedded software development needs, compilation technologies, practical considerations in a compiler development environment.

UNIT – V: Languages for System Level Specification and Design

System-level specification, design representation for system level synthesis, system level specification languages, heterogeneous specification and multi-language co-simulation.

Text Books:

1. Jorgen Staunstrup, Wayne Wolf, “Hardware/software co- design Principles and Practice”, Springer, 2009.

Reference Books:

1. Patrick Schaumont, “A Practical Introduction to Hardware/Software Co-design”, 2nd Edition, 2012.
2. R. Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer Academic Publishers, 1995.
3. Jean-Michel Bergé, Oz Levia, Jacques Rouillard, “Hardware/Software Co-Design and Co-Verification”, Springer, 1997.

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WIRELESS SENSOR NETWORKS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize with wireless sensor networks and their architectures.
- understand the MAC, link layer and routing protocols.

Learning Outcomes

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

- understand the design principles for wireless sensor networks.
- distinguish the functions of different layers.
- apply appropriate routing protocols.
- use various data centric and aggregation techniques for reliable data transfer.

Course Content

UNIT - I: Overview of Wireless Sensor Networks and Architectures

Introduction to sensor networks, comparison of sensor network with Adhoc network, challenges for sensor networks, advantages, applications and enabling technologies for wireless sensor networks. Single-node architecture - hardware components, energy consumption of sensor nodes, operating systems and execution environments, network architecture - sensor network scenarios, design principles for WSNs.

UNIT - II: Physical Layer

Introduction, wireless channel and communication fundamentals – frequency allocation, modulation and demodulation, wave propagation effects and noise, channels models, spread spectrum communication, packet transmission and synchronization, quality of wireless channels and measures for improvement, physical layer and transceiver design considerations in wireless sensor networks-energy usage profile, choice of modulation scheme, dynamic modulation scaling, antenna considerations.

UNIT - III: MAC Protocols and Link Layer Protocols

Fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention based protocols, schedule based protocols, link layer

protocols- fundamental task and requirements, error control, framing, link management.

UNIT - IV: Routing Protocols for Wireless Sensor Networks

Introduction, background, data dissemination and gathering, routing challenges and design issues in wireless sensor networks, routing strategies in wireless sensor networks.

UNIT - V: Data Centric and Content Based Networking and Transport layer

Introduction, data centric routing, data aggregation, data centric storage, the transport layer and QoS in wireless sensor networks, coverage and deployment, reliable data transport single packet delivery, block delivery, congestion control and rate control.

Text Books:

1. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005. (Units: I, II, III, V)
2. Kazem Sohraby, Daniel Minoli and Taieb Znati, "Wireless Sensor Networks Technology, Protocols and Applications", John Wiley & Sons, 2007. (Unit: IV)

Reference Books:

1. Feng Zhao and Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
3. C.S.Raghavendra, Krishna M.Sivalingam and TaiebZnati, "Wireless Sensor Networks", Springer Publication, 2004.

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EMBEDDED SYSTEMS LAB

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives:

To make the students

- familiarize with the Assembly/high level language programming and I/O interfacing of ARM.
- familiarize with verification of concepts in signal processing.

Learning Outcomes

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

- perform I/O interface with ARM processor.
- perform various signal processing operations using MATLAB.

List of Experiments:

Note: Any four from a to f of part-1 and any three from a to d of part-2 to be performed.

Part - 1 :

Assembly/High level language programming and porting it on a ARM processor

- a. 32-bit Booth multiplier.
- b. 32-bit ALU with addition, subtraction and multiplication operations.
- c. Simulate an elevator movement.
- d. Read data from a sensor and process.
- e. Transmission and reception of serial data.
- f. I2C Interface on IDE environment.
- g. Design of embedded controller (Open ended).

Part-2

The following experiments are to be implemented on MATLAB environment.

- a. DFT calculations.
- b. Correlation of given sequences.
- c. Power spectral density calculations.
- d. Decimation and interpolation.

References:

1. Stephen B Furber , “ARM system on chip Architecture”, Pearson Publications, 2nd edition.
2. G. John Proakis and G. Dimitris Manolakis, “Digital Signal Processing, Pearson Education”, 4th edition.
3. Ze Tian, Dun-shan Yu, and Yu-lin Qiu, “A high effective algorithm of 32-bit multiply and MAC instructions’ VLSI implementation with 32/spl times/8 multiplier-accumulator in DSP applications” 6th IEEE International Conference on Signal Processing, 26-30 Aug. 2002, Beijing, China, China.
- 4 <https://www.pantechsolutions.net/microcontroller-tutorials/how-to-interface-lm35-sensor-with-lpc2148-arm7-starter-board>.

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ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

**Department of
Computer Science and Engineering**

M.Tech Two Year Degree Course

(Applicable for the batch 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
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)

To make the graduates of M. Tech Programme in Embedded Systems

PEO-I : Identify, analyze and solve computing related and multidisciplinary engineering problems to fulfill the needs of industry and society.

PEO-II : Communicate effectively which helps to work in a team and practice the profession in accordance with professional ethics with societal responsibilities.

PEO-III: Pursue a successful career in academia, research, industry, government and have the ability for lifelong learning to fulfill their goals.

IV. PROGRAM OUTCOMES (POs)

PO-1 : An ability to independently carry out research /investigation and development work to solve practical problems.

PO-2 : An ability to write and present a substantial technical report/document.

PO-3 : Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

V. ACADEMIC REGULATIONS

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

1. Duration of the Program

The duration of the program is two academic years consisting of four semesters. However, a student is permitted to complete the course work of M.Tech program in the stipulated time frame of four academic years from the date of joining.

2. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

3. Program Credits

Each specialization of the M.Tech programs is designed to have a total of 70 credits and the student shall have to complete the two year course work and earn all the 70 credits for the award of M.Tech Degree.

4. Attendance Regulations

- 4.1 A student shall be eligible to appear for Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- 4.2 Condoning of shortage of attendance in aggregate up to 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 the College Academic Committee. 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.
- 4.3 A student shall be eligible to claim for condonation of attendance shortage only once during the two years (four semesters) course work.
- 4.4 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.
- 4.5 Shortage of Attendance below 65% in aggregate shall in *NO* case be condoned.

- 4.6 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that semester and their registration shall stand cancelled.
- 4.7 A fee stipulated by the college shall be payable towards condoning attendance shortage.

5. Examinations and Scheme of Evaluation

5.1 Theory Courses :

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 assignments and 30 marks are based on two mid-term examinations.
- ii) Each assignment carries 10 marks and the average of two assignments shall be taken as the marks for continuous assessment.
- iii) Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of four questions, each for 10 marks. All the questions need to be answered.
- 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 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 two questions, each for 20 marks, with internal choice. All the questions need to be answered. 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 8 questions, each for 12 marks, out of which 5 questions are to be answered.
- ii) 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.

5.2 Laboratory Courses :

- i) For practical subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 40 internal marks. Of the 40 marks for internal, 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 an internal examiner and an external examiner for 60 marks.

5.3 (a) Seminar:

- i) For seminar, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the literature and submit it to the department in a report form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of report and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh report towards the end of that semester and appear for evaluation by the committee.

(b) Term Paper:

- i) For term paper, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the research papers and submit it to the department in publication form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of paper and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh paper towards the end of that semester and appear for evaluation by the committee.

5.4 Project Work:

Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee.

- i) A Project Review Committee (PRC) shall be constituted for each specialization with Head of the Department / a Senior Faculty as Chairman and two other senior faculty members.
- ii) Registration of Project Work: A candidate who has been promoted to 3rd semester shall be eligible to register for the project work.
- iii) The eligible candidate can choose his project supervisor and submit the title, objective, abstract and plan of action of the proposed project work to the department for approval by the PRC. The candidate whose proposal is approved by the PRC shall register for the project work. The minimum duration of project work will be 36 weeks from the date of registration.
- iv) If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. In case of such changes, the candidate has to register afresh.
- v) There shall be three reviews on the progress of the project work by the PRC with an interval of 12 weeks. The candidate needs to submit a report on the progress of his work and present it before the PRC for assessment. The PRC may suggest for an extension of date of submission of dissertation if the progress of work is not satisfactory or absent himself for the review.
- vi) A candidate who has passed all the theory, laboratory, seminar and term paper examinations and shown satisfactory progress of project work is permitted to submit the dissertation after 36 weeks from the date of registration.
- vii) If a candidate fails to submit the dissertation by the end of the 4th semester, he has to take the permission for an extension by paying the semester(s) tuition fee.
- viii) Three copies of the Project Thesis certified by the supervisor shall be submitted to the Department.
- ix) Project evaluation and Viva-Voce examination is conducted at the end of 4th semester by a committee consisting of Project Supervisor, senior faculty of the department, HoD and an External Examiner nominated by the Chief Controller of Examinations out of a panel of three examiners suggested by the department.

The following grades are awarded for the project work:

- i. Excellent
- ii. Very Good
- iii. Good
- iv. Satisfactory
- v. Unsatisfactory

The Grade “unsatisfactory” is treated as Fail. Failed Students should take supplementary examination after making required modifications, if any, in the dissertation with a minimum gap of 8 weeks by paying the required examination fee.

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

6.1 Criteria for Passing a Course:

- i) A candidate shall be declared to have passed in individual theory / laboratory 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.
- ii) The candidate shall be declared to have passed in seminar / term paper viva-voce if he secures 50% marks.
- iii) The candidate shall be declared to have successfully completed the project work if he secures a minimum of ‘satisfactory’ grade in the project evaluation and viva-voce examination.
- iv) On passing a course of a program, the student shall earn assigned credits in that course.

6.2 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 /Elective /Laboratory /Seminar / Term Paper /Project Dissertation (%)	Grade Points	Letter Grade
≥ 90	10	O (Outstanding)
≥ 80 & < 90	9	A+ (Excellent)
≥ 70 & < 80	8	A (Very Good)
≥ 60 & < 70	7	B+ (Good)
≥ 50 & < 60	6	B (Above Average)
< 50	0	F (Fail)

6.3 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:

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

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.

6.4 Eligibility for Award of B.Tech Degree:

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

- Pursued a course of study for not less than two academic years and not more than four academic years.
- Registered for prescribed **70** credits and secured **70** credits.
- Students, who fail to complete their Two years Course of study within Four years or fail to acquire the prescribed **70** Credits for the award of the degree within four academic years from the year of their admission shall forfeit their seat in M. Tech course and their admission shall stand cancelled.

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

The CGPA is calculated as given below:

$$\text{CGPA} = \frac{\sum (CR \times GP)}{\sum CR} \quad \text{for entire program.}$$

where CR = Credits of a course

GP = Grade points awarded for a course

* CGPA is calculated for a candidate who passed all the prescribed courses excluding project work.

6.6 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
$\geq 6.5 \text{ \& } < 7.5$	First Class
$\geq 5.5 \text{ \& } < 6.5$	Second Class

7. Supplementary Examinations

- Supplementary examinations will be conducted once in a year along with regular examinations.

- 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.

8. Re-admission Criteria

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/-

9. Break in Study

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of M.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 shall be paid by the candidate to condone his break in study.

10. 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 he will be offered substitute subjects in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

11. 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 be withheld in such cases.

12. 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 / year. 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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 / year. The candidate is also debarred for two consecutive semesters from class work and all 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.	Expulsion from the examination hall 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 / year. 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 / year.
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 / year 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.

13. Other Matters

- i) Deserving physically challenged candidates will be given additional examination time and a scribe based on the certificate issued by the concerned authority. 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.
- v) Wherever the word he, him or his occurs, it will also include she, her and hers.

VI. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits
1	Baisc Sciences (BS)	3	4.28
2	Humanities and Social Sciences (HSS)	3	4.28
3	Professional Core (PC)	25	35.72
4	Professional Electives (PE)	9	12.86
7	Others (Seminar, Term Paper, Dissertation, etc.)	30	42.86

COURSE STRUCTURE & SYLLABUS

COURSE STRUCTURE

I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	MA2903	Statistics with R Programming	4	-	-	3
2	CS2901	Advanced Data Structures & Algorithm Analysis	4	-	-	3
3	CS2902	Wireless Networks	4	-	-	3
4	CS2903	Object Oriented Software Engineering	4	-	-	3
5	CS2904	Business Intelligence **	3	-	2	3
6		Professional Elective - I	4	-	-	3
7	CS2908	Advanced Data Structures & Algorithm and R Programming Lab	-	-	4	2
Total			23	-	6	20

II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Research Methodology	4	-	-	3
2	CS2909	Information Security	3	-	2	3
3	CS2910	Scripting Languages	4	-	-	3
4	CS2911	Data Analytics **	3	-	2	3
5		Professional Elective - II	4	-	-	3
6		Professional Elective - III	4	-	-	3
7	CS2917	Information Security & Scripting Languages Lab	-	-	4	2
8		Seminar	-	-	-	2
Total			23	-	6	22

** Project Based Theory Course

L : Lecture T : Tutorial P : Practical

III Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Term Paper	-	-	4	2
2		Dissertation (Initiated in third semester)	-	-	-	-
Total			-	-	4	2

IV Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Dissertation (Carried out in third & Fourth Semester)	-	-	52	34
Total			-	-	52	34

Professional Electives:

Professional Elective - I

- CS2905 Embedded Networking
- CS2906 Sensors and Actuators
- CS2907 Low Power CMOS Digital Design

Professional Elective - II

- CS2912 SoC Design
- CS2913 Embedded Real Time Operating Systems
- CS2914 Embedded System Design

Professional Elective - III

- CT2901 Advanced Computer Networks
- CS2915 Hardware Software Co-Design
- CS2916 Wireless Sensor Networks

SYLLABUS

STATISTICS WITH R PROGRAMMING

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives:

To make the students

- with necessary statistical skills and techniques that are essential part of R programming.
- to write the R program and interpret the statistics to analyze and make decision to the data.

Learning Outcomes

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

- install the R software and writing the R programming
- interpret the statistical data analysis with R programming.
- import, review, manipulate and summarize data-sets in R.
- perform appropriate statistical tests using R.
- create and edit visualizations with R

Course Content

UNIT - I: R Basics

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays.

UNIT –II: R Programming Structures

Control Statements, Loops, - Looping Over Non vector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objects, No Pointers in R, Recursion, A Quick sort Implementation.

UNIT - III: Doing Math and Simulation in R

Math Function, Extended Example : Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions for Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files.

UNIT - IV: Graphics

creating Graphs, The Workhorse of R Base Graphics, the plot () Function – Customizing Graphs, Saving Graphs to Files.

UNIT - V: Probability Distributions, Statistics & Linear Models

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions, Basic Statistics, Correlation and Covariance, T-Tests, -ANOVA. Linear Models, Simple Linear Regression, Multiple Regression.

Text Books:

1. Norman Matloff, The Art of R Programming, Cengage Learning. (Units-2, 3, 4)
2. Lander, R for Everyone, Pearson (**Units-1, 5**)

Reference Books:

1. Paul Teetor, R Cookbook, Oreilly.
2. Rob Kabacoff, R in Action, Manning

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ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to familiarize with various types of data structures.
- to analyze the asymptotic performance of algorithms.

Learning Outcomes

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

- recognize the importance of algorithm analysis and analyze the performance of algorithms in terms of time and space complexities.
- apply different sorting and searching techniques on the given data and analyze their performance to pick up the best technique.
- construct binary trees and binary search trees for any given data and perform the basic operations such as insertion, deletion and search on them.
- recognize the use of AVL and B+ trees and perform the operations on them.
- explain graphs, representation of graphs using linked lists and adjacency matrices and perform graph traversals on any given graph.
- apply dynamic-programming paradigm to solve a class of problems.

Course Content

UNIT- I: Algorithm Analysis, Searching, Sorting

Preliminaries of Algorithm Analysis: Time and Space Complexity, Asymptotic Notations.

Searching: Linear and Binary Search Methods.

Sorting: Quick Sort, Merge Sort.

UNIT –II: Trees-I

Binary Trees: Properties, Representation and Traversals, Expression Trees (Infix, Prefix, Postfix).

Binary Search Trees: ADT, Operations- Searching, Insertion, Deletion, Implementation.

UNIT – III: Trees-II

AVL Trees: Introduction, Operations- Insertion, Deletion and Searching.

B+ Trees: Introduction, Operations-Insertion, Deletion and Search.

UNIT- IV: Graphs & Hashing

Graphs: Basic Concepts, Representation and Traversals, Minimum Cost Spanning Trees – Prim's & Kruskal's Methods.

Hashing: Hash Table Representation, Hash functions, Collision Resolution- Separate Chaining, Open Addressing-Linear Probing, and Double Hashing.

UNIT –V: Dynamic Programming

Introduction, Matrix Chain Multiplication, Optimal Binary Search Trees, Travelling Sales Person Problem, 0/1 knapsack problem.

Text Books:

1. Richard F. Gilberg, Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, Second Edition. Cengage publications. (Units-2, 3, 4)
2. Ellis Horowitz, Satraj Sahni and Rajasekharam, "Fundamentals of Computer Algorithms", Galgotia publications pvt. Ltd. (Units-1, 4, 5)

Reference Books:

1. Allen Weiss, "Data structures and Algorithm Analysis in C", Second edition, Pearson education.
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, "Introduction to Design and Analysis of Algorithms A strategic approach", Mc Graw Hill.

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WIRELESS NETWORKS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to gain knowledge of the underlying networking technologies, architectures and protocols
- understand the routing algorithms in wireless networks
- analyze existing network protocols and networks.

Learning Outcomes

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

- Understand state-of-the-art wireless technologies. ·
- Apply the routing algorithms in any large scale dynamic networks. ·
- Design the wireless sensor applications
- Apply the Data retrieval techniques in wireless networks
- Design and simulation the wireless network applications.
- Design a secure Ad Hoc and wireless sensor networks.

Course Content

UNIT- I: Introduction

Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc wireless networks, characteristics of MANETs, applications of MANETs, issues and challenges of MANETs.

Routing in MANETs- Classification of routing protocols, topology- based versus position – based approaches, topology based routing protocols; position based routing.

UNIT-II: MANETs

Data Transmission in MANETs – The broadcast stream, multicasting, Geocasting, TCP over Ad Hoc Networks- TCP protocol overview, TCP and MANETs, solutions for TCP over Ad Hoc Networks.

Security in MANETs – Security in Ad Hoc wireless networks, key management, secure routing, cooperation in MANETs.

UNIT - III: Wireless Sensor Networks

Basics of Wireless Sensors and Applications – The mica mote, sensing and communication range, design issues, energy consumption, clustering of sensors, applications.

Data Retrieval in Sensor Networks – Classification of WSNs, MAC layer, routing layer, high-level application layer support, adapting the Inherent dynamic nature of WSNs.

UNIT - IV: Sensor Network Platforms and Tools

Sensor Node Hardware, Sensor Network Programming challenges, Node- Level Software Platforms, Node- Level simulators.

UNIT –V: Security in WSNs

Security in wireless sensor networks, key management in wireless sensor networks, secure data aggregation in wireless sensor networks, introduction to vehicular Ad Hoc networks, introduction to wireless mesh networks.

Text Books:

1. Carlos de Moraes Cordeiro and Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications” , World Scientific Publications / Cambridge University Press, 2006. (Units- 1,2)
2. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks: An Information Processing Approach”, Elsevier Science Imprint, MK Publishers, 2005. (Units- 1,2,3,4,5)

Reference Books:

1. C. Siva Ram Murthy and B.S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols” , Pearson Education, 2004.
2. Sudip Misra, Issac Woungang, and Subhas Chandra Misra, “Guide to Wireless Ad Hoc Networks”, Springer International Edition, 2011.
3. Sudip Misra, Issac Woungang, and Subhas Chandra Misra, “Guide to Wireless Sensor Networks” , Springer International Edition, 2012.
4. Thomas Krag and Sebastin Buettrich, “Wireless Mesh Networking”, O’ Reilly Publishers, 2007.

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OBJECT ORIENTED SOFTWARE ENGINEERING

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to gain knowledge of real time software development process.

Learning Outcomes

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

- Understand basic concepts of software engineering and software problems.
- Choose appropriate software development life cycle model for developing software product.
- Prepare a document for different artifacts of the software engineering process.
- Design and implement a software product.
- Conduct project closure activities and obtain formal project acceptance.

Course Content

UNIT- I: Introduction, Software Processes

Introduction to software Engineering: software, software crisis, Evolution of software engineering methodologies, software engineering challenges, software engineering principles.

Software Processes: software process, process classification, phased development life cycle, software development process models.

UNIT- II: Requirements Engineering

software requirements, Requirements engineering process, Requirements elicitation, structured analysis, data-oriented analysis, object-oriented analysis, prototyping analysis, SRS document, Requirements validation, Requirements management.

UNIT- III: Software Design

software design process, characteristics, design principles modular design, software architecture, design methodologies, structured design, structured design methodology, detailed design, design verification, Object-oriented analysis and design, object-oriented concepts.

UNIT - IV: Modelling

importance of modelling, principles of modelling, object-oriented modelling. Introduction to UML: overview of the UML, conceptual model of the UML, Architecture.

UML Diagrams- Use case diagram, class diagram, Object diagram, sequence diagram, Collaboration diagram, State chart Diagram, Activity diagram ,Component diagram, Deployment diagram.

UNIT - V: Software Project management

project management essentials, project management team, project life cycle, project management process, software configuration management, risk management.

Project planning and Estimation: project planning activities, software metrics and measurements, project size estimation, effort estimation techniques, staffing and personnel planning, project scheduling and milestones.

Text Books:

1. Ugrasen suman," Software Engineering Concepts and Practices", Cengage learning. (Units-1, 2, 3, 5)
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language", Pearson. (Unit-4)

Reference Books:

1. Ivica Crnkovic, "Component-based Software Engineering", 7th international symposium, CBSE 2004, Springer.
2. Stephen R. Schach,"Object Oriented and Classical Software Engineering", 7/e, TMH
3. Timothy Lethbridge, Robert Laganieri,"Object oriented and Classical Software Engineering", TMH

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BUSINESS INTELLIGENCE

I Semester

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

Course Objectives

To make the students

- to design and build a Business Intelligence solution.
- to acquire knowledge on how to design BI solutions for different BI targets.

Learning Outcomes

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

- understand the need of Business Intelligence.
- analyze the appropriate Data warehouse technique for Business Intelligence.
- apply data mining techniques in Business Intelligence.
- apply various reporting techniques to take an appropriate decision.

Course Content

UNIT- I: Introduction to Business Intelligence

Effective and timely decisions- Data, information and knowledge- Role of mathematical models- Business intelligence architectures: Cycle of a business intelligence analysis- Enabling factors in business intelligence projects- Development of a business intelligence system- Ethics and business intelligence.

UNIT –II: Data Warehousing for BI

Definition and concepts, Data warehouse architecture, ETL process, data warehouse development, drill down, drill up, Data Mart vs.EDW, Implementation issues, Real-time data warehousing.

UNIT- III: Analytics for BI

Classification, Association rule mining, Clustering, Text Mining, Web Mining.

UNIT-IV: BI Applications

Marketing Models: Relational Marketing, Salesforce Management, Business case studies.

UNIT-V: Knowledge Delivery

Visualization: Charts, Graphs, Widgets, 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, 2009. (Units-1, 2, 3)
2. Efraim Turban, Jay E Aronson, Teng-Peng Liang, Ramesh Sharda, "Decision Support Business Intelligence Systems", 8th Edition, Pearson.(Units -1, 4, 5)

Reference Books:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" 2nd edition.
2. David Loshin Morgan Kaufman, "Business Intelligence: The Savvy Manager's Guide", Second Edition, 2012. (Units-2,3)
3. Larissa T. Moss, S.Atre, "Business Intelligence Roadmap: The complete Project Life Cycle of Decision Making", Addison Wesley, 2003.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw- Hill, 2007.

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ADVANCED COMPUTE ARCHITECURE
I Semester

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

Course Objectives

To make the students

- to impart knowledge on advanced design issues of computer architecture.

Learning Outcomes

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

- apply appropriate addressing mode for increasing the level of parallelism.
- choose appropriate software or hardware techniques for parallelism.
- design a strategy for reducing the cache miss rate.
- analyze various problems associated with interconnecting networks.

Course Content

UNIT- I: Fundamentals of Computer Design

Fundamentals of Computer design, technology trends, cost, measuring and reporting performance quantitative principles of computer design.

UNIT- II : Instruction Set

Instruction set principles and examples, classifying instruction set, memory addressing, type and size of operands, addressing modes for signal processing, operations in the instruction set, instructions for control flow, encoding an instruction set, the role of compiler.

UNIT- III: Instruction Level Parallelism (ILP)

overcoming data hazards, reducing branch costs, high performance instruction delivery, hardware based speculation, limitation of ILP, ILP software approach, compiler techniques, static branch protection, VLIW approach, H.W support for more ILP at compile time, H.W verses S.W Solutions

UNIT- IV: Memory Hierarchy Design

cache performance, reducing cache misses penalty and miss rate, virtual memory, protection and examples of VM. Multiprocessors and thread level parallelism-symmetric shared memory architectures- distributed shared memory-Synchronization- multi threading.

UNIT – V: Storage Systems

Types , Buses , RAID, errors and failures, bench marking a storage device, designing a I/O system. Inter connection networks and clusters, interconnection network media, practical issues in interconnecting networks, examples, clusters-designing a cluster.

Text Books:

1. John L. Hennessy & David A. Patterson, “Computer Architecture A Quantitative Approach” , Morgan Kaufmann (An Imprint of Elsevier), 3rd edition (Units-1,2,3,4,5)

Reference Books:

1. Kai Hwang and A.Briggs “Computer Architecture and parallel Processing” International Edition McGraw-Hill.
2. Dezso Sima, Terence Fountain, Peter Kacsuk, “Advanced Computer Architectures”, Pearson.
3. David E. Culler, Jaswinder Pal singh with Anoop Gupta, “Parallel Computer Architecture, A Hardware / Software Approach”, Elsevier

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DIGITAL IMAGE PROCESSING
I Semester

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

Course Objectives

To make the students

- to describe and explain basic principles of digital image processing
- to discuss 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: Basics of Image Processing

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 & Image Segmentation

Morphological Image Processing- Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms

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/PHI. (Units-1, 2, 3, 4, 5)

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, B.S.Publications
3. William K. Prat, “Digital Image Processing”, Wily 3rd Edition
4. B. Chanda, D. Datta Majumder, “Digital Image Processing and Analysis”, Prentice Hall of India, 2003.

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Professional Elective - I

E-COMMERCE

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To familiarize the basic and advanced functions of e-commerce.

Learning Outcomes

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

- analyze the risks involved in e-payment systems
- analyze the reasons for adoption of e-commerce and e-business.
- analyze the business challenges related to e-business and e-commerce for an organisation.
- design an e-business application.
- market their products in online.

Course Content

UNIT -I: Introduction

Introduction, E-commerce or Electronic Commerce- An Overview, Advantages and Disadvantages, Electronic Commerce – Cutting edge, Electronic Commerce Framework.

UNIT- II: Infrastructure of Network and E-Commerce

Network Infrastructure: Introduction, Network Infrastructure- An Overview, The Internet Hierarchy, Basic Blocks of e-commerce, Networks layers & TCP/IP protocols, The Advantages of Internet, World Wide Web.

E-commerce Infrastructure: Introduction, E-commerce Infrastructure- An Overview, Hardware, Software, Server Operating System.

UNIT –III: Process Models & EDI

E-Commerce Process Models: Introduction, Business Models, E-business Models Based on the Relationship of Transaction Parties, e-commerce Sales Life Cycle (ESLC) Model.

Electronic Data Interchange(EDI): The Meaning of EDI, History of EDI, EDI Working Concept, Implementation difficulties of EDI, Financial EDI, EDI and Internet.

UNIT- IV: Payment Systems and Risks

Electronic Payment Systems: Introduction, Electronic Cash, Smart Cards and Credit Card /Debit Card Based Electronic Payment Systems, Risks in Electronic Payment Systems.

Management of Risk: Introduction, Disaster Recovery Plans, Risk Management Paradigm.

UNIT- V: E-Marketing & its Future

The scope of E-Marketing, Internet Marketing Techniques.

Website Design Issues: Factors that Make People Return to Your Site, Strategies for Website Development.

Future Directions: Software Agents, Technology Behind Software Agents, Types of Software Agents, Characteristics and Properties of Software Agents, Framework for Software Agent-based e-commerce, m-commerce - Architecture, Areas of Potential Growth and Future for m-commerce.

Text Books:

1. Kenneth C.Laudon, carol guercio traver , “E-Commerce: Business, Technology, Society”, 4/e. (Units-1, 2, 3, 5)
2. Kalakata, Whinston, “Frontiers of electronic commerce” , Pearson. (Units-3, 4)

Reference Books:

1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley, “E-Commerce fundamentals and applications”.
2. S.Jaiswal, “E-Commerce”, Galgotia.
3. Efrain Turbon, Jae Lee, David King, H.Michael Chang, “E-Commerce”.
4. Gary P.Schneider & Thomson, “Electronic Commerce”.

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ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS AND R PROGRAMMING LAB

I Semester

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

Course Objectives

- To impart practical knowledge about data structures and R programming.

Learning Outcomes

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

- develop programs for various types of data structures.
- implement basic concepts using R programming.

PART - I

Data Structures and Algorithms

1. Perform different types of searching techniques on a given list
 - (i) Sequential search
 - (ii) Binary search
2. Perform different types of sorting on a given list
 - (i) Quick sort
 - (ii) Merge sort
3. Perform various operations on Binary search tree.
4. Perform operations on AVL trees.
5. Implement BFS and DFS Graph Traversals.
6. Implement dictionaries using hashing techniques.

PART - II

R-Programming

1. Write a function to display the contents of a call Frame.
2. Write a program to implement Quick sort with recursion.
3. Write a program to calculate the probability. Suppose we have n independent events, and the i th event has the probability p_i of occurring. What is the probability of exactly one of these events occurring.
4. Write a program to calculate the vector cross product.

5. Write a program for reading and writing files.
6. Write a program to draw the graph for the function $f(x) = 1 - e^{-x}$ and adds a rectangle that approximates the area under the curve $x=1.2$ to $x=1.4$.
7. Write a program using linear regression to predict sons' height using fathers' height.
8. Write a program to create graphs and use of `plot()` function in R.

Reference Books and URL's:

1. Ellis Horowitz, Satraj Sahni and Rajasekharam, "Fundamentals of Computer Algorithms", Galgotia publications pvt. Ltd.
2. Norman Matloff, The Art of R Programming, Cengage Learning.
3. Lander, R for Everyone, Pearson Publications
4. <https://www.tutorialspoint.com/r/>
5. <https://www.programiz.com/r-programming>.

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RESEARCH METHODOLOGIES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize with the objectives, motivation and significance of research.
- know research methodologies.
- define research problem and perform data analysis.
- write a research paper and report.

Learning Outcomes

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

- understand research approaches
- understand various research methodologies
- define a research problem
- perform data analysis
- write research papers and reports

Course Content

UNIT – I: Introduction

Introduction, objectives and motivation of research, types of research, research approaches, significance of research methods.

UNIT – II: Research Methodology

Research methods versus methodology, research and scientific method, importance of knowing how research is done, research process. criteria for good research.

UNIT – III: Defining Research Problem

The research problems, necessity of defining the problem, technique involved in defining a problem, review of related literature, purpose of literature survey, identifying the current status, presentation of literature survey findings. critique, survey and peer review process.

UNIT – IV: Research Design and Data Analysis

Meaning of research design, features of good design, important concepts relating to research design, different research designs, basic principles of experimental designs.

Methods of data collection - collection of primary data, observation method, interview method, collection of data through questionnaires, collection of data through schedules, difference between questionnaires and schedules, some other methods of data collection, collection of secondary data, selection of appropriate method for data collection, case study method.

Processing and analysis of data - processing operations, some problems in processing, elements, types of analysis, statistics in research.

UNIT – V: Research Paper and Report Writing

Final paper presentation. significance of report writing, different steps in writing report, layout of the research report, types of report, precautions for writing research reports.

Text Books:

1. C.R.Kothari, "Research Methodology Methods and Techniques", Wishwa Prakashan Publishers, Second Edition. **(Units- 1,2,3,4,5)**

Reference Books:

1. Template of ASCE/ASME/IEEE for paper writing.

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INFORMATION SECURITY

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to familiarize basic concepts, principles, and mechanisms when designing a secure system.
- to assess threats for their significance, and how to gauge the protections and limitations provided by today's technology.

Learning Outcomes

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

- familiar with information security and a clear understanding of its importance.
- differentiate various cryptographic techniques such as conventional and modern encryption techniques.
- analyze the various security issues over networks.
- apply security mechanisms for software applications and web applications.
- master in information security governance, and related legal and ethical issues.

Course Content

UNIT- I: Classical Encryption Techniques

Introduction: Security attacks, services & mechanisms, Symmetric Cipher Model, Substitution Techniques, Transportation Techniques.

UNIT- II: Symmetric Key Cryptography

Traditional Block Cipher Structure, DES, AES, Blowfish, IDEA, Block Cipher Modes of Operations.

Asymmetric Key Cryptography: Principles, public key cryptography algorithm: RSA Algorithm, Diffie Hellman Key Exchange.

UNIT –III: Network Security

TCP/IP security issues, DNS security issues and defences, TLS/SSL, Network Intrusion detection and prevention systems, Firewalls.

UNIT- IV: Software & Web Security

Software Security - Vulnerability auditing, penetration testing, Sandboxing, Control flow integrity. **Web Security** - User authentication, authentication-via-

secret and session management, Cross Site Scripting, Cross Site Request Forgery, SQL Injection.

UNIT –V: Legal and Ethical Issues

Cybercrime and computer crime, Intellectual property, copyright, patent, trade secret, Hacking and intrusion, Privacy, identity theft.

Text Books:

1. William Stallings, "Cryptography & Network Security: Principles and Practices", PEA, Sixth edition. (Units-1, 2)
2. Matt Bishop, "Computer Security: Art and Science" 2nd Edition. (Units-3, 4, 5)

Reference Books:

1. Keith Martin, "Everyday Cryptography, Fundamental Principles & Applications", Oxford
2. Bernard Menezes, "Network Security & Cryptography", Cengage, 2010
3. Chwan Hwa Wu, J. David Irwin, "Introduction to Computer Networks & Cyber Security", CRC press.

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SCRIPTING LANGUAGES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to provide students with the knowledge and ability to write computer scripts using client and server-side scripting languages commonly used on the web to interact with and dynamically generate HTML code.
- to develop web applications using scripting languages which solve client and server side problems with good connectivity.

Learning Outcomes

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

- gain the skills and project-based experience needed for entry into web design and development careers.
- identify good candidate administrative functions for scripting.
- understand the benefits and challenges of scripting.
- write basic PHP scripts that process user input from a web form.
- integrate PHP with AJAX.
- create a simple CGI script in Perl.

Course Content

UNIT- I: Introduction to Python

Features of Python, Installing Python, Running Python, Program Input /Output, Comments, Operators, Variables, Python Types, Indentation, Conditionals, Loops.

UNIT – II: Functions and classes in Python

Functions, Classes, Modules, Strings, Tuples, Lists.

UNIT- III : PHP

Introduction, Creating and running a PHP Script, Using variables, constants, Data types and Operators. Control statements, Arrays and Functions.

UNIT – IV: Working with Forms and Databases using PHP

Forms: Processing a Web form, Validating a Web Form and Enforcing data rules.

Using PHP and MySQL: Introduction to MySQL, Connecting to MySQL Server using PHP and performing Select, Insert, Delete, Alter and Update operations.

UNIT –V: AJAX A New Approach

Introduction, Creating XMLHttpRequest object, Integrating AJAX with PHP, Retrieving data from a database using PHP and AJAX.

WEB Services in AJAX: Introduction to web services, architectures of *Simple Object Access Protocol* (SOAP), Web Services Description Language (WSDL), *Universal Description, Discovery and Integration* (UDDI).

Text Books :

1. Wesley J. Chun, “Core Python Programming”, Prentice Hall PTR (**Units- 1,2**)
2. Kogent Learning Solutions, “Web Technologies, Black book”, Dreamtech press. (**Units- 3,4,5**)

Reference Books:

1. Uttam K Roy, “Web Technologies”, Oxford
2. Chris Bates, WILEY, “Web Programming: building internet applications”, Dreamtech, 2nd edition.
3. Robert W Sebesta , “Programming the World Wide Web”, Pearson publications, Fourth edition

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DATA ANALYTICS

II Semester

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

Course Objectives

To make the students

- to familiarize the fundamental concepts of Apache Hadoop (Big data framework).
- to gain knowledge of HDFS file system, Map Reduce frameworks and relevant tools.

Learning Outcomes

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

- know the fundamentals of Big data and architecture of Hadoop
- use HDFS file structure and Map reduce frameworks to solve complex problems.
- analyze relational data in a Hadoop environment using Hive and Pig tools.

Course Content

UNIT- I: Introduction to Big Data

what is Big Data. 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. LINUX refresher; VM Ware installation of Hadoop.

UNIT - II : The Hadoop Distributed File System

The design of HDFS, HDFS concepts, HDFS Architecture, command line interface to HDFS, Hadoop file systems, interfaces, java interface : Reading and writing Data using file system API , anatomy of a file read, anatomy of a file write, replica placement.

UNIT – III: Introduction to MapReduce

Introduction, analyzing weather data set with unix tools, analyzing weather dataset with hadoop, java map reduce classes ,data flow, combiner functions, running distributed map reduce job, configuration API, managing configuration, the Map Reduce WebUI.

UNIT – IV: Working of MapReduce

Classic map reduce, job submission, job initialization, task assignment, task execution, progress and status updates, job completion, shuffle and sort on map and reducer side, input formats, output formats .

UNIT –V: Hive & Pig

The Hive Shell, Hive services, Hive clients, the meta store, comparison with traditional databases, Hive QL, pig execution types, running pig programs, Pig Latin structures , statements, expressions, types , schemas , functions.

Text Books:

1. Tom White, “Hadoop - The Definitive Guide”, 3rd Edition, O’Reilly Publications, 2012. (Units-1, 2, 3, 4, 5)
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch ,”Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data”, 1st Edition, TMH,2012. (Units-1)

Reference Books:

1. Frank J.Ohlhorst, “Big Data Analytics: Turning Big Data Into Big Money”, 2nd edition, TMH,2012.

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ADVANCED OPERATING SYSTEMS

II Semester

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

Course Objectives

To make the students

- to learn the fundamentals of operating systems
- to gain knowledge on distributed operating system concepts that includes architecture, mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
- to gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- to know the components and management aspects of real time, mobile operating systems

Learning Outcomes

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

- discuss the various synchronization, scheduling and memory management issues
- demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
- discuss the various resource management techniques for distributed systems
- identify the different features of real time and mobile operating systems

Course Content

UNIT-I: Fundamentals of Operating Systems

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT –II: Distributed Operating Systems

Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT -III : Distributed Resource Management

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous, Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol.

UNIT - IV : Real Time Systems

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing.

UNIT- V: Mobile Operating Systems

Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

Text Books :

1. Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001. **(Units- 1,2,3,4)**
2. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006. 5. Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011. **(Units- 5)**

References Books:

1. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.
2. Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O’Reilly, 2005.

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MACHINE LEARNING

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- understand a wide variety of learning algorithms.
- understand how to apply a variety of learning algorithms to data.
- understand how to perform evaluation of learning algorithms and model selection

Course Outcomes:

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

- develop an appreciation for what is involved in learning from data.
- analyze different classifications and regression
- build the learning model.
- apply machine learning algorithms to solve problems of moderate complexity.
- formulate machine learning problems corresponding to different applications.

Course Content

UNIT- I : Introduction to Machine Learning

Why Machine learning, Examples of Machine Learning Problems, Structure of Learning, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks.

Machine learning Models: Geometric Models, Logical Models, Probabilistic Models.

Features: Feature types, Feature Construction and Transformation, Feature Selection.

UNIT -II :Classification and Regression

Classification: Binary Classification- Assessing Classification performance, Class probability Estimation- Assessing class probability Estimates, Multiclass Classification.

Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression

UNIT- III :Linear Models

Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity

UNIT- IV: Logic Based and Algebraic Models

Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based Clustering-K-Means Algorithm, Hierarchical Clustering,

Rule Based Models: Rule learning for subgroup discovery, Association rule mining

Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees.

UNIT- V :Probabilistic Models

Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models

Text Books

1. Peter Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”, Cambridge University Press, Edition 2012. (Units- 2,3,4,5)
2. Hastie, Tibshirani, Friedman, “Introduction to Statistical Machine Learning with Applications in R”, Springer, 2nd Edition-2012. (Units - 1)

Reference Books

1. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer 1st Edition-2013.
2. Ethem Alpaydin, “Introduction to Machine Learning”, PHI 2nd Edition-2013.
3. Parag Kulkarni, “Reinforcement and Systematic Machine Learning for Decision Making”, Wiley-IEEE Press, Edition July 2012.

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SOFTWARE TESTING METHODOLOGIES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- to learn how to design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.

Learning Outcomes

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

- Understand the myths and facts of software testing.
- Analyze and design test cases using black box testing technique which includes decision tables domain testing and graph-based testing.
- Apply path testing on any given program and uncover bugs present in the program.
- Distinguish between verification and validation.
- Select the appropriate tests to regression test your software after changes have been made.
- Understand the need of automated testing tools and various kinds of automated testing tools.

Course Content

UNIT-I: Introduction

Introduction, Myths & Facts, Goals, Model for testing, Effective Vs Exhaustive Software Testing. **Software Testing Terminology And Methodology:** 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, Decision table based testing, Cause-Effect Graphing based testing.

UNIT-III: Dynamic Testing I

White-Box Testing Techniques: Need, Logic coverage criteria, Basis path testing, Loop testing, mutation testing **Static Testing:** Inspections, Structured Walkthroughs, Technical reviews.

UNIT-IV: Verification And Validation

Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify code, Validation, Validation Activities

UNIT-V: Regression Testing

Objectives of regression testing, When regression testing done? Regression testing types, Regression testing techniques

Software Quality Management: Software Quality metrics, SQA models, Debugging: process, techniques, correcting bugs.

Automation And Testing Tools: Need for automation, categorization of testing tools, selection of testing tools, Cost incurred, overview of some commercial testing tools.

Text Books:

1. Software Testing, Principles and Practices, Naresh Chauhan, Oxford (Units-1,2,3,4,5)

Reference Books:

1. Baris Beizer, "Software Testing Techniques", International Thomson computer press, second edition.
2. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson Software Testing- Yogesh Singh, CAMBRIDGE.

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Professional Elective - III

CLOUD COMPUTING

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- To gain knowledge Virtualization, Virtual Machine and different models of VM.
- To familiarize Cloud computing architecture and its security aspects.

Learning Outcomes

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

- distinguish Virtualization and Virtual Machine, physical and virtual networks.
- know Cloud Scale and value of Cloud Computing.
- apply various disaster management techniques.
- design a Cloud for an Enterprise.

Course Content

UNIT – I: Introduction

Introduction to virtualization and virtual machine, virtualization in cluster / grid context virtual network, information model & data model for virtual machine, Software as a Service (SaaS), SOA, On Demand Computing (ODC).

UNIT – II: Cloud Computing

Introduction, what it is and what it isn't, from collaborations to cloud, cloud application architectures, value of cloud computing, cloud infrastructure models, scaling a cloud infrastructure, capacity planning, cloud scale.

UNIT - III : Data Center to Cloud

move into the cloud, know your software licenses, the shift to a cloud cost model, service levels for cloud applications.

UNIT- IV: Security

Disaster recovery, web application design, machine image design, privacy design, database management, data security, network security, host security, compromise response.

UNIT – V: 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, Integration-as-a-Service, Security-as-a-Service, Management/Governance-as-a-Service, Testing-as-a-Service Infrastructure-as-a-Service.

Text Books:

1. Michael Miller, “Cloud Computing – Web Based Applications That change the way you work and Collaborate Online”, Person Education. (Units- 1,2,3)
2. George Reese, “Cloud Application Architectures”, 1st edition, O’Reilly Media. (Units-4,5)

Reference Books:

1. David S. Linthicum, “Cloud Computing and SOA Convergence in your Enterprise : A Step-by-Step Guide”, Addison-Wesley Professional.
2. Kai Hwang, Geoffery C.Fox,Jack J, Dongarra,” Distributed & Cloud Computing From Parallel Processing to the Internet of Things”.

* * *

SOFT COMPUTING

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to gain knowledge on working of neural networks and its learning techniques, back propagation networks.
- to be familiar with Soft Computing techniques like GA, Fuzzy logic, Artificial Neural Network and their hybrid systems which are used for solving different problems and their applications.

Course Outcomes

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

- understand various soft computing techniques and its applications
- explain the architecture of Artificial neural networks and various learning techniques
- understand the working of Back propagation networks, back propagation algorithm and learning methods
- differentiate between fuzzy sets and crisp sets and can perform various operations on Fuzzy sets
- apply if-then rules on fuzzy sets and can interpret various fuzzy algorithms, Fuzzifications & Defuzzifications
- analyze working principle, procedures, representations of genetic algorithm and its applications

Course Content

UNIT- I: Introduction

Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

UNIT -II : Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.

UNIT- III: Neural Networks-II (Back Propagation Networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perceptron model; back propagation learning methods, effect of learning rule co-efficient, Back Propagation algorithm, factors affecting back propagation training, applications.

UNIT- IV: Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT- V: Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Text Books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India. **(Units-1,2,3,4,5)**
2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems" Oxford University Press. **(Units- 2,3,4,5)**

Reference Books:

1. Siman Haykin, "Neural Networks" Prentice Hall of India
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
3. Kumar Satish, "Neural Networks" Tata Mc Graw Hill.

* * *

INTERNET OF THINGS

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to understand the fundamentals of Internet of Things.
- to build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- to apply the concept of Internet of Things in the real world scenario.

Learning Outcomes

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

- design a portable IoT using Arduino/ equivalent boards and relevant protocols.
- develop web services to access/control IoT devices.
- deploy an IoT application and connect to the cloud.
- analyze applications of IoT in real time scenario.

Course Content

UNIT- I : FUNDAMENTALS OF IOT

Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoT vs M2M.

UNIT- II : IOT DESIGN METHODOLOGY

IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.

UNIT -III : BUILDING IOT WITH RASPBERRY PI

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services.

UNIT- IV: BUILDING IOT WITH ARDUINO

Interfaces - Arduino IDE – Programming - APIs and Hacks.

UNIT- V: CASE STUDIES and ADVANCED TOPICS

Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for IoT.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015. (Units- 1,2,3,4,5)
2. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen (Units-4,5)

Reference Books:

1. Manoel Carlos Ramon, “Intel Galileo and Intel Galileo Gen 2:API Features and Arduino Projects for Linux Programmers”, Apress Open.
2. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

* * *

INFORMATION SECURITY AND SCRIPTING LANGUAGES LAB

II Semester

Lecture : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

To make the students

- to familiarize the implementation of various security algorithms.
- to provide students with the knowledge and ability to write computer scripts using client and server-side scripting languages.

Learning Outcomes

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

- implement various security algorithms in computer networks
- Write basic Python and PHP scripts that process user input from a web form.
- Integrate PHP with AJAX.

PART - I

Information Security

1. Implement different substitution and transposition techniques.
2. Implement DES encryption & decryption algorithm.
3. Implement Diffie - Hellman key exchange algorithm.
4. Implement RSA algorithm to generate key
5. Use RSA algorithm to encrypt text data.
6. Use RSA algorithm to decrypt text data.
7. Implement any virus application.

PART-II

Scripting Languages

1. Write a python program to find the sum of all the primes below hundred.
2. Write a python program to find the sum of the even-valued terms in the Fibonacci sequence whose values do not exceed ten thousand.
3. Write a python program that accepts a string from a user and re-displays the same after removing vowels from it.
4. Write a python program to sort a Tuple of values.

5. Write a python program that scans an email address and forms a tuple of user name and domain name.
6. Write a python program to print sum and average of the elements present in the list.
7. Write a python program that forms a list of first character of every word present in another list.
8. Write a PHP program to validate the fields of the login page
9. Write a PHP program to insert the details entered by the user in the Registration form into database (MySQL)
10. Write a PHP program that displays the list of all registered users stored in the database
11. Write an AJAX program that uses the content of a text file dynamically.
12. Write an AJAX program that demonstrates the integration of PHP with AJAX.

Reference Books and URL's:

1. William Stallings, "Cryptography & Network Security: Principles and Practices", PEA, Sixth edition
2. Bernard Menezes, "Network Security & Cryptography", Cengage, 2010
3. Wesley J. Chun, "Core Python Programming", Prentice Hall PTR
4. Kogent Learning Solutions, "Web Technologies, Black book", Dreamtech press.
5. https://www.w3schools.com/php/php_examples.asp
6. <https://www.javatpoint.com/php-example>
7. <https://www.programiz.com/python-programming/examples>

* * *

ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

MASTER OF BUSINESS ADMINISTRATION

(Applicable for the batch 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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ACADEMIC REGULATIONS

ACADEMIC REGULATIONS

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

1. Duration of the Program

The duration of the program is two academic years consisting of four semesters. However, a student is permitted to complete the course work of MBA program in the stipulated time frame of **FOUR** years from the date of joining.

2. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

3. Program Credits

MBA program is designed to have a total of 90 credits and the student shall have to complete the two year course work and earn all 90 credits for the award of MBA Degree.

4. Attendance Regulations

4.1 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.

4.2 Condoning of shortage of attendance in aggregate up to 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. 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.

4.3 A student shall be eligible to claim for condonation of attendance shortage for a maximum of one time during the two year (four semesters) course work of MBA. However, additional one time condonation exclusively during II Year (3rd or 4th Semester) shall be considered on genuine valid reasons.

4.4 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.

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

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

4.7 A fee stipulated by the college shall be payable towards condoning attendance shortage.

5. Examinations and Scheme of Evaluation

5.1 Theory Courses

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 seminar / presentation and 30 marks are based on two mid-term examinations.
- ii) Of the 10 marks for continuous assessment, 5 marks are for seminar report and 5 marks are for presentation.
- iii) Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of four questions, each for 10 marks. All the questions need to be answered.
- 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..

External Assessment

- i) The semester end examination shall be conducted for a duration of three hours with A, B & C Sections (Section-A consists of 6 two marks questions, Section-B consists of three essay questions with internal choice, each for 12 marks & Section-C contains case study for 12 marks). All sections are to be answered.

5.2 Laboratory Course

- i) For practical subjects 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 the 40 marks for internal, 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.

5.3 Comprehensive Viva-Voce

Comprehensive Viva-Voce examination is conducted in all the subjects of four semesters of the course for 100 marks at the end of fourth semester by a committee consisting of two senior faculty members of the department.

5.4 Project Work

- i) The final project work shall be carried out during the 4th 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 end semester Viva-Voce.
- 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 semester.

6. Criteria for Passing a Course and Award of Grades

6.1 Criteria for Passing a Course

- i) A candidate shall be declared to have passed in individual theory/ laboratory / project course if he secures a minimum of 50% aggregate marks (internal & semester end examination marks put together), subject to a minimum of 40% marks in the semester end examination.
- ii) A candidate shall be declared to have passed in comprehensive viva-voce if he secures a minimum of 50% marks.
- iii) On passing a course of a program, the student shall earn assigned credits in that course.

6.2 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 / Elective (%)	Laboratory / Seminar / Term Paper / Project Dissertation (%)	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)
< 50	< 50	0	F (Fail)

6.3 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:

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

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.

6.4 Eligibility for Award of MBA Degree

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

- (a) Pursued a course of study for not less than two academic years and not more than four academic years.
- (b) Registered for **90** credits and secured **90** credits.
- (c) Students, who fail to complete their Two years Course of study within Four years or fail to acquire the **90** Credits for the award of the degree within four academic years from the year of their admission shall forfeit their seat in MBA course and their admission shall stand cancelled.

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

The CGPA is calculated as given below:

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

where CR = Credits of a course

GP = Grade points awarded for a course

6.6 Award of Division

After satisfying the requirements prescribed for the completion of the program, the student shall be eligible for the award of MBA 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

7. 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) **Advanced Supplementary Examinations:** Candidate(s), who failed in theory / comprehensive Viva-Voce / project work courses in 4th semester can appear for advanced supplementary examination conducted within one month after declaration of the revaluation results. However, those candidates who fail in these advanced supplementary examinations shall appear for subsequent examination along with regular candidates in the examinations conducted at the end of the respective semester.

8. 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 external examiner, other than the first examiner, shall reevaluate 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.

9. Readmission Criteria

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/-.

10. Break in Study :

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of MBA 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 shall be paid by the candidate to condone his break in study.

11. Transitory Regulations:

a) Regular course:

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 he will be offered substitute subjects in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

b) Transfer candidates (from non-autonomous college affiliated to JNTUK):

- 11.1** A student who is following JNTUK curriculum, transferred from other college to this college in second year first semester (third 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 student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to be secured for the award of the degree will be the sum of the credits upto previous semester under JNTUK regulations 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.

c) Transfer candidates (from an autonomous college affiliated to JNTUK):

- 11.4** 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 (third 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 upto 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.

12. 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 be withheld in such cases.

13. 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.

II. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits	% of Credits as per UGC
1	Basic Sciences (BS)	6	15.88	15 - 20
2	Humanities (H)	3	10.00	10 - 15
3	Professional Core (PC)	50	34.13	25 - 35
4	Professional Electives (PE)	24	8.82	8 - 12
5	Others (Project work, Vomprensive Viva-voce, etc.)	7	8.82	8 - 10

COURSE STRUCTURE & SYLLABUS

COURSE STRUCTURE

I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	EG2901	Business Communication	4	-	-	3
2	MA2901	Quantitative Analysis for Business Decisions	3	1	-	3
3	BA2901	Perspectives of Management	4	-	-	3
4	BA2902	Managerial Economics	4	-	-	3
5	BA2903	Accounting for Managers	4	-	-	3
6	BA2904	Business Environment and Legislation	4	-	-	3
7	BA2905	Business Law	4	-	-	3
8	BA2906	Information Technology Lab for Business Management	-	-	4	2
Total			27	1	4	23

II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	MA2903	Business Research Methods	3	1	-	3
2	BA2907	Financial Management	4	-	-	3
3	BA2908	Marketing Management	4	-	-	3
4	BA2909	Human Resource Management	4	-	-	3
5	BA2910	Production & Operations Management	4	-	-	3
6	BA2911	International Business	4	-	-	3
7	BA2912	Organizational Behaviour	4	-	-	3
Total			27	1	-	21

L : Lecture T : Tutorial P : Practical

III Semester

Sl. No.	Course Code	Name of the Course / Laboratory		No.of Periods per week			No.of Credits
				L	T	P	
1	BA2913	Business Policy & Strategic Management		4	-	-	3
2	BA2914	Logistics & Supply Chain Management		4	-	-	3
3	BA2915	E-Business		4	-	-	3
4	BA2916	Business Ethics & Corporate Governance		4	-	-	3
5		Specialisation - I	Marketing subjects common to all	4	-	-	3
6		Specialisation - II		4	-	-	3
7		Specialisation - III	Finance (or) HR	4	-	-	3
8		Specialisation - IV		4	-	-	3
Total				32	0	0	24

IV Semester

Sl. No.	Course Code	Name of the Course / Laboratory		No.of Periods per week			No.of Credits
				L	T	P	
1	BA2923	Entrepreneurship & Project Management		4	-	-	3
2		Specialisation - V	Marketing subjects common to all	4	-	-	3
3		Specialisation - VI		4	-	-	3
4		Specialisation - VII	Finance (or) HR	4	-	-	3
5		Specialisation - VIII		4	-	-	3
6		Project Report		-	-	-	6
7		Comprehensive Viva-Voce		-	-	-	1
Total				20	0	0	22

Specialisations:

III Semester	IV Semester
Marketing BA2917 Advertising & Brand Management BA2918 Consumer Behaviour Finance BA2919 Security Analysis & Portfolio Mgt. BA2920 International Financial Management HR BA2921 Training and Development BA2922 Industrial Relations and Labour Laws	Marketing BA2924 Marketing of Services BA2925 Sales & Distribution Management Finance BA2926 Financial Derivatives BA2927 Financial Institutions and Services HR BA2928 Compensation Management BA2929 Management of Change and Development

SYLLABUS

BUSINESS COMMUNICATION

I - Semester

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

Course Objectives

- To obtain knowledge about the general terms related to the academic study of organization communication.
- To understand how individual personality traits and human temperament effect organizational communication and cohesion.
- To examine how supervisors and subordinates communicate with each other effectively.

Learning Outcomes

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

- apply the knowledge of overcoming the Barriers of communication.
- asses the role played by nonverbal communication and different personality traits.
- apply the types of communication which are effective in organizations.
- examine the deliverability take part in interviews, presentations, discussions, etc.

UNIT - I: Role of Communication in Business

Objective of communication, the process of human communication, media of communication, written communication, oral communication - visual communication, audio visual communication, silence – case study.

UNIT - II: Managing Organization Communication

Formal and informal communication, intrapersonal communication, models for Inter personal communication, managing motivation to influence interpersonal communication, communication styles, gateways to effective interpersonal communication - case study.

UNIT - III: Business Writing Skills

Significance of business correspondence, essentials of effective business correspondence, business letters and forms, meeting, telephone communication, use of technology in business communication - case study.

UNIT - IV: Report Writing

Meaning and significance - structure of reports, negative, persuasive and special reporting, informal report, proposals. formal report – preparation and organization of press report - case study.

UNIT - V: Presentation Skills

Techniques of presentation, types of presentation, video conferencing and formats, interview, formal and informal, interview techniques, communication etiquettes - case study.

Text Books

1. Rajendra Pal, JS Korlahhi: “Essentials of Business Communication”, Sultan Chand & Sons, New Delhi, 1st edition 2012.

Reference Books

1. Leena Sen: “Communication Skills”, Prentice Hall of India Pvt. Ltd., New Delhi, 2nd edition 2012.
2. Krishna Mohan, Meera Banerji: “Developing Communication Skills”, Macmillan India Ltd, 2nd edition 2015.
3. Daniel G Riordan, Steven E.Pauley, Biztantra: “Technical Report Writing Today” 8th Edition, New Delhi.
4. Lesiker and Flatley: “Basic Business Communication”, 10th Edition, Tata McGraw-hill.
5. RK Madhukar: “Business Communication”, Vikas Publishing House Pvt. Ltd.,
6. Meenakshi Rama: “*Business Communication*”, Oxford University Press, New Delhi.

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QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS

I - Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objective

- To familiarize the techniques of optimization and their applications in decision making.
- To introduce transportation and assignment models.
- To determine how to plan, monitor and control projects with use of PERT.

Learning Outcomes

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

- analyse decision making situations
- evaluate the linear programming problems using graphical method and simplex method.
- assess optimal cost for Transportation models and assignment models.
- examine the network diagrams for different projects and identify critical path.
- apply the methods to replace an existing old machine.

UNIT - I: Basic Mathematical & Statistical Techniques

Matrices, elementary operations of matrices, concept of probability – addition, conditional and multiplicative probability rules, normal distributions - characteristics, applications on area property.

UNIT - II: Introductions to Decision Theory and Business Analytics

Steps involved in decision making, different environments in which decisions are made, criteria for decision making, decision making under uncertainty, decision making under conditions of risk.

Meaning, definition and importance of business analytics, analytics v/s analysis, business analytics v/s business intelligence and data mining.

UNIT - III: Linear Programming

Mathematical formulations of LP models for product-mix problems – graphical method, simplex method and its applications, artificial variable techniques - big method.

UNIT - IV: Transportation, Assignment Models & Game Theory

Transportation problem - introduction, methods for finding initial solution – optimum solution, assignment problem, hungarian method - finding optimal assignment.

Game Theory: Introduction – two person zero, sum game, pure strategy, games with saddle point, mixed strategies, rules of dominance, solution of games without saddle point.

UNIT - V: PERT & C.P.M. and Replacement Model

Drawing networks – identifying critical path, probability of completing the project within given time, project crashing – optimum cost and optimum duration.

Replacement models: individual replacement, money value constant and money value change models.

Relevant cases have to be discussed in each unit and in semester end examinations case study question is compulsory which may be from any unit.

Text Books

1. J. K. Sharma, Operations Research: Theory and Applications, 4th edition, Macmillan Publishers, India.
2. Sancheti, DC & VK Kapoor, Business Mathematics, S.Chand and Sons, New Delhi

References Books

1. Berry Render, Ralph M. Stair Jr, Michael E. Hanna – Quantitative Analysis for Management, Prentice Hall, 2011
2. N.D.Vohra, Quantitative Techniques in Management, Tata-McGraw Hill Private Limited, New Delhi, 2011.
3. Gupta S.P: Statistical Methods, S. Chand and Sons, New Delhi.
4. Anand Sharma, Quantitative Techniques for Business decision Making, Himalaya Publishers, New Delhi, 2012.

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PERSPECTIVES OF MANAGEMENT

I - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course objectives

- To make students understand fundamental concepts and principles of management, including the basic roles, skills, and functions of management.
- To make students knowledgeable of historical development, theoretical aspects and practice application of managerial process.
- To define the concept of management and discuss why organizations are needed, why managers are necessary, and why management is a challenge.
- To identify and differentiate between the various tools and processes used in planning; compare the advantages and disadvantages of the participatory approach to planning.

Learning Outcomes

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

- discuss and communicate the management evolution and how it will affect future managers.
- observe and evaluate the influence of historical forces on the current practice of management.
- practice the process of management's four functions: planning, organizing, leading, and controlling.
- evaluate leadership styles to anticipate the consequences of each leadership style.
- gather and analyze both qualitative and quantitative information to isolate issues and formulate best control methods.
- describe the communications process; discuss barriers to communication and suggest remedies to overcome communications difficulties.
- explain why planning is needed in organizations and why long-term objectives are necessary for successful planning.
- identify the essential characteristics of decision making and indicate the range and types of decisions a manager is asked to make.
- explain the importance of delegation in organizations and describe the relationship between authority, responsibility and accountability.
- describe the characteristics of the informal organization and discuss the role it plays in a company.

UNIT - I: Introduction to Management

Management - concept, nature, process and significance of management, managerial roles (Henry Mintzberg), management art or science, management as profession, management vs. administration, levels of management, role and functions of a manager. Evolution of Management thought - early contributions, Taylor and scientific management, Fayol's administrative management, bureaucracy (Max Weber), Hawthorne experiments and human relations, social systems approach and decision theory approach.

UNIT - II: Planning

Concept of Planning - nature, scope, significance and objectives of planning, types of planning, process of planning, importance and limitations of planning, barriers to effective Planning.

Decision Making - concept, characteristics, types of decisions, decision making process, importance of decision making. Decision Making Models - classical, administrative and political, group decision making techniques - delphi, nominal and lotus blossom technique.

UNIT - III: Organising

meaning, importance, principles of organising, forms of organisational structure. Authority and Responsibility- bases for authority, power and responsibility. Delegation and Decentralization- concept and significance of delegation, guidelines for delegation and its limitations, barriers and overcoming barriers to delegation. factors influencing decentralization, centralization vs. decentralization. Span of Management- factors influencing span, span and organisation structure. Line and Staff- concepts and conflicts, resolution of conflicts.

UNIT - IV: Leading and Controlling

Directing- elements, motivation-nature and importance, types and theories. Leadership-nature, trait and charismatic approach, leadership styles. Communication- nature, process, networks, types and barriers. Coordination: nature, methods and techniques. controlling-nature and scope, types of control, control process, modern techniques of control and requirements of effective controlling.

UNIT - V: International Management

International Management- challenges of present day management and factors influencing it, International Organisational Design-organizational structure in international organisations. Leadership in International Organisations- leadership traits and preferences in international organisations, communication in international organisations, best management practices across the world (India, Japan, USA and China), recent developments in the field of management in a global perspective.

Text Books

1. Koonz, Weihrich and Aryasri: "Principles of Management", Tata McGraw Hill, 2004.
2. Daft: "The New Era of Management", Cengage Learning , New Delhi, 2009.

Reference Books

1. Rao, VSP: "Management Text and cases", Excel books, New Delhi, 2006
2. Stoner, Free man and Gilbert: "Management", Pearson Education, New Delhi, 2002.
3. Prem Vrat, K.K.Ahuja, P K Jain: "Case Studies in Management", Vikas Publishing House Limited, 2002.
4. Mrityanjay Kumar Srivastava: "Transformational Leadership", Macmillan India Limited, 2003.
5. Ramaswamy, T: "Principles of Management", Himalaya Publishing House, Mumbai, 2008.
6. Meeenakshi Gupta: "Principles of Management", PHI Private Limited, New Delhi, 2009.
7. J S Chandan: "Management Theory and Practice", Vikas Publishing House Limited, 2009.
8. Robert KReitner, Mamata Mohapatra: "Management" Biztantra, dreamtech Press, New Delhi, 2008.
9. Anil Bhat, Arya Kumar: "Management", Oxford University, New Delhi, 2008.
10. Schermerhorn Jr.: "Management ", Wiley-India, New Delhi, 2008.
11. Gupta R S, Sharma B D Bhalla N S: "Principles and Practice of Management", Kalyani Publications, Hyderabad, 2008.

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MANAGERIAL ECONOMICS

I - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To develop specific tools – quantitative as well as broadly analytical – that are useful for tackling basic managerial economics problems.
- To apply knowledge of a series of basic economic principles to the decision making process within the firm.
- To demonstrate a knowledge and understanding of management and business practices, such as risk and change management, and understand their limitations.
- To identify and solve issues related to optimal pricing strategies, demand forecasting, optimal financing, and investment decisions, among others, can be successfully tackled with managerial economics tools.

Learning Outcomes

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

- demonstrate an appreciation of the economic perspective on and process of quantitative problem solving and its applicability to decision making.
- apply the economic way of thinking to individual decisions and business decisions.
- analyze the economic environment in which business entities operate and understand how managerial decisions can vary under different constraints.
- address microeconomic issues ranging from pricing, cost determination, compensation, entry into and exit from markets, and output decisions.
- measure the responsiveness of consumers' demand to changes in the price of a good or service, the price of other goods and services, and income.
- derive the equilibrium conditions for cost minimization and profit maximization.

UNIT - I: Introduction to Managerial Economics

definition, nature and scope, relationship with other areas in economics, the role of managerial economics in decision making, basic economic principles - case study.

UNIT - II: Theory of Demand - Demand Analysis

elasticity of demand, types and significance of elasticity of demand – measurement of price elasticity of demand, demand determinants – demand forecasting techniques - case study.

UNIT - III: Production Analysis & Cost Theory

meaning of Production function - Cobb Douglas production function, diminishing marginal returns, marginal rate of technical substitution, the production iso-quant, the production iso-cost. cost concepts – cost – volume- profit analysis- case study.

UNIT - IV: Market Structure and Pricing Practices

features and types of different markets - price-output determination in perfect competition, monopoly in the long run and short run. pricing methods in practice – case study.

UNIT - V: Introduction to National Income

introduction to national income – national income concepts, models of national income determination, economic indicators - economic transition in India – case study.

Text books

1. Varshney, R.L and Maheswari, K L: “Managerial Economics”, Sultan Chand and Sons, New Delhi, 2002.
2. Hirschey: “Economics for Managers”, Cengage Learning, New Delhi, 2009.

Reference Books

1. M.L Trivedi: “Managerial Economics”, Tata McGrawHill, New Delhi, 2004
2. Siddiqui S A, Siddiqui A S: “Managerial Economics and Financial Analysis”, New Age International Publishers, New Delhi, 2008.
3. Craig H. Petersen, Cris Lewis, Sudhir k Jain: “Managerial Economics”, Pearson Education, New Delhi, 2009.
4. Dominick Salvatore: “Managerial Economics”, Oxford University Press, New Delhi, 2009.
6. Mithani D M: “Managerial Economics”, Himalaya Publishing House, Mumbai, 2008.
5. Dwivedi D N: “Managerial Economics”, Vikas Publishing House Private Limited, New Delhi, 2009.
6. William f, Samuelson, Stephen G, Marks: “Managerial Economics”, Wiley India Publishers, New Delhi, 2008.

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ACCOUNTING FOR MANAGERS

I - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To develop an insight of principles and techniques of accounting and utilization of financial and accounting information for planning and decision-making.
- To design a framework for the analysis of financial statements.

Learning Outcomes

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

- apply the knowledge of Accounting Rules and Regulations to the organizations.
- acquire the knowledge of Human Resource Accounting.
- evaluate the Concept of Inventory Management for managerial decision making.
- assess the performance of Organization based on the Ratios Analysis.

UNIT - I: Accounting Process

definition of accounting, accounting cycle, classification of accounts, accounting equation static and dynamic nature of accounting, users of accounting information, books of original entry, ledger, trial balance, terminal accounts. accounting concepts and conventions and their implications on the data generation- case study.

UNIT - II: Understanding Terminal Accounts

preparation and presentation of income statement, balance sheet. accounting standards their rationale and growing importance in global accounting environment, IAS-IFRS-US GAAP; human resource accounting concept and importance valuation of human resources. preparation and presentation of final accounts of companies- case study.

UNIT – III: Inventory Valuation

methods of inventory valuation, issue of shares, issue of shares at premium and discount –Case study.

UNIT – IV: Financial Analysis-I

ratio analysis liquidity, activity, structural, coverage and profitability ratios; predictive power of ratio analysis; inflation and financial analysis; applications of financial analysis, emerging concepts of inflation accounting -case study.

UNIT - V: Financial Analysis-II

funds flow analysis- concepts of funds,ascertaining funds from operations,sources of funds,uses of funds,preparation and analysis of funds flow statement, preparation of cost sheet -case study.

Text Books

1. Asish K. Bhattacharyya: “*Essentials of Financial Accounting*”, PHI Private Limited, New Delhi, 2009.
2. Vijaya Kumar.P, Ravindra P.S.Accounting for Managers,Himalaya Publishing House, New Delhi, 2013.
3. G.Prasad, Accounting for Managers, Jai bharat Publications.

Reference Books

1. Ramachandran N, RamKumar Kakani: Financial Accounting for Management, McGraw Hill 2013.
2. Ashok Banerjee: Financial Accounting, a managerial Emphasis, Excel books, New Delhi, 2012.

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BUSINESS ENVIRONMENT AND LEGISLATION

I - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To develop ability to understand and scan business environment in order to analyze the opportunities and take decisions under the uncertainty.
- To understand the economic structure and planning in India.
- To understand impact political-Legal and Socio-Cultural issues on business.
- To provide the knowledge of environmental protection laws pertaining to business.

Learning Outcomes

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

- assess the internal external forces of business environment in managing organisation.
- chalk out the strategies based on the changes in policy frame work for achieving the organisational goals.
- adopt the changes in political-legal and socio-cultural issues to fine tune to the business decision making.
- apply the knowledge of Environment Laws to business organisation.

UNIT - I: Introduction to Business Environment

business – concept, functions, scope, significance and objectives, types of business organizations, business environment- meaning, characteristics, scope and significance, components of business environment. environmental analysis and techniques, benefits and limitations-case study.

UNIT - II: Economic Environment

economic Systems- concept and types. structure of indian economy. basic economic challenges- poverty, rural development, unemployment, infrastructure. economic planning in india - objectives, importance and role of five year plans - NITI Ayog -case study.

UNIT - III: Policy Frame Work in Indian Economy

industrial policies since independence, fiscal policy - public revenue, expenditure and debt. monetary policy. LPG – economic reforms, disinvestment mechanism. SEZ policy, policy on research and development, technology transfer-case study.

UNIT - IV: Political-Legal and Socio Cultural Environment

elements of political environment- structure of indian government, constitutional framework of India, role of government in business, elements of social cultural environment, consumerism in india, corporate social responsibility- case study.

UNIT - V: Environmental Legislation

sick industrial companies (Special Provisions) act, 1985. the environment (Protection) Act, 1986. the air (Prevention and Control of Pollution) act 1981, the water (Prevention and Control of Pollution) act 1974- case study.

Text Books

1. A.C. Fernando: *Business Environment* -Pearson Education India, 2011
2. Francis Cherunilam: *Business Environment-Text and Cases*, Himalaya Publishing House, Mumbai, 25th revised edition.
3. Aswathappa K: *Essentials of Business Environment*, Himalaya Publishing House, Mumbai, 13th revised edition.
4. Justin Paul: *Business Environment*, Tata McGraw Hill, New Delhi, 2006.

Reference Books

1. Shaikh Saleem: *Business Environment*, Pearson Education, New Delhi, 3rd edition, 2008.
2. Uma Kapila: *Indian Economy: Performance and Policies*, Academic Foundation, 27th edition, 2015.
3. Dutt and Sundaram: "*Indian Economy*", S. Chand, New Delhi, 72nd edition 2016.
4. V.K Puri and S.K. Mishra: *Indian Economy*, Himalaya Publishing House; Revised Edition, 2015.

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BUSINESS LAW

I - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the nature of the contractual relationship and list the elements required to create a contract (offer, acceptance, genuine agreement, consideration, capacity and legality).
- To identify the classifications of contracts: valid, void, voidable, unenforceable, express, implied, oral, and written.

Learning Outcomes

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

- identify potential risks in contracts and interest of the consumers.
- understand about the offer and acceptance.
- analyze and determine the Agent Duties, rights and about Termination of Agency.

UNIT - I: Importance of Commercial Law

the Indian contracts act, 1872 – nature of the act and classification of contracts ,essentials of a valid contract,offer and acceptance,capacity,consideration –free consent,legality of object –performance of a contract,discharge of a contract, breach of a contract and remedies-case study.

UNIT - II: Sales of Goods Act

introduction to act – distinction between sales and agreement to sell,conditions and warranties, performance of contract of sale ,transfer of ownership,rights of an unpaid seller-case study.

Consumer Protection Act, 1986: introduction to act – consumer right, machinery for redressal of consumer grievances,information technology act 2000 - case study.

UNIT - III: Contract of Agency

meaning and nature of agency – kinds of agents, creation of agency,duties and rights of principal, duties and rights agents principal's liability for the acts of the agent,personal liability of agent,termination of agency-case study.

UNIT - IV: Negotiable Instruments Act, 1881 & Indian Partnership Act

characteristics of negotiable instruments–kinds of a negotiable instrument, endorsement,presentation of negotiable instrument, discharge of a negotiable instrument-meaning and essentials of partnership,registration,Tests of Partnership,Duties and Rights of Partners – Dissolution of Partnership.

UNIT - V: Company Act,1956 and Company Act 2013 amendments.

nature and types of companies – formation, memorandum of association, articles of association ,duties of directors,winding up-case study.

Text Books

1. Ravindra Kumar: Legal Aspects of Business, Cengage learning, New Delhi, 2009
2. Pathak: Legal Aspects of Business, Tata McGraw Hill, New Delhi, 2010.
3. S. N. Maheshwari, S.K.Maheshwari: A Manual of Business Laws, Himalaya Publishing House, Mumbai, 2009.
4. N. D. Kapoor: Business Law, Sultan Chand, New Delhi.
5. Chandra Bose: Business Law, PHI Learning, New Delhi, 2010.
6. S. S. Gulshan: Business Law, Excel Books, New Delhi, 2010.

Reference Books

1. Satish B, Mathur: Business Law, Tata McGraw Hill, New Delhi, 2010.
2. S.S.Gulshan, G.K.Kapoor: Business Law Including Company Law, New-Age Publishers, New Delhi, 2008.
3. K.C.Garg, V,K.Sareen: Business Law, Kalyani Publication, New Delhi, 2007.
4. P.K.Goyal: Business Law for Managers, Biztntra, New Delhi, 2010.

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INFORMATION TECHNOLOGY LAB FOR BUSINESS MANAGEMENT

I - Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To develop an understanding of various software systems in business, improve communication and presentation skills using MS Power Point and Microsoft Word.
- To familiarize the students with spreadsheet (MS Excel) as a financial modeling tool and understand its capabilities and limitations.
- To gain the knowledge of Data Collection and Analyzing Techniques and implement them effectively.
- To Helps the students to understand SQL for Database Applications

Learning Outcomes

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

- demonstrate the knowledge of Microsoft office tools like Microsoft word, Power Point to prepare effective presentations and documentation of project work.
- apply the knowledge of Microsoft Excel in Financial modeling.
- select an appropriate Data Analysis technique and data collection method.
- demonstrate the knowledge of charts and flow diagrams in management decisions.

UNIT - I: Introduction to MS Office

introduction of various software used for business and their significance in the current business environments; Introduction to ms-office.

UNIT - II: Statistics for Management

statistics for management - data presentation techniques. Spread sheet showing the monthly payments with changing interest rate over a period of loan. (using excel).

UNIT - III: Data Collection and Analyzing Techniques

data Collection and analyzing techniques - charts, flow diagrams TQM methodologies.

UNIT - IV: Presentations of Mini Projects

preparation and presentations of mini projects/seminars assigned for course work of first semester.

UNIT - V: Introduction to SQL

Introduction to SQL, DML –update, delete, insert commands, DDL- create, alter and drop commands.

Text Books

1. Alexis Leon, Introduction to Computers with MS Office 2000, TMH, New Delhi, 2000.
2. Bayross, Oracle Teach Yourself SQL / PL SQL using Oracle 8i and 9i with SQLj, BPB, 2002.

Reference Books

1. Shelly, Cashman: “Microsoft copies 2007”, Cengage Learning, New Delhi. 2012
2. Courter, Mastering Microsoft Office for Business Professional, Techmedia, 2003.

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BUSINESS RESEARCH METHODS

II - Semester

Lecture : 3 Tutorial : 1

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand different Business Research Methods.
- To have a general understanding of statistics applicable to business.

Learning Outcomes

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

- apply the suitable sampling techniques for the given population.
- apply different statistical tests suitably for different problems and give inferences.
- evaluate the gap between theories and practice by discussing and analyzing relevant case studies.

UNIT - I: Introduction to Research

Nature and Importance of research, the role of business research, types of research-research process, Data Base-Primary data and secondary data, methods of collecting primary and secondary data.

UNIT - II: Sampling design and sampling procedures:

random Vs. non-random sampling techniques, determination of sample size and an appropriate sampling design, designing of questionnaire –measurement and scaling ,nominal scale,ordinal scale, interval scale,ratio scale,Guttman scale – Likert Scale

UNIT - III: Survey research and data analysis:

media used to communicate with respondents, personal interviews, telephone interviews, self-administered questionnaires, selection of an appropriate survey research design, the nature of field work, principles of good interviewing and field work management. Editing- coding,classification of data,tables and graphic presentation,preparation and presentation of research report-Case study.

UNIT - IV: Univariate analysis-Statistical Inference(One sample tests)

univariate analysis :measures of central tendency,measures of dispersion,simple correlation and regression.

Statistical Inference: introduction,tests of hypothesis, null hypothesis vs alternative hypothesis, procedure for testing of hypothesis, one sample tests: z-test for means and proportions

UNIT - V: Bivariate analysis-statistical inference(two sample tests) – multivariate analysis

Bivariate analysis- simple correlation and regression

two sample tests- t- test for difference of means ,paired t-test, chi-square test for independence of attributes and goodness of fit- ANOVA-one way & two way classifications.

Multivariate Analysis- nature of multivariate analysis, classifying multivariate techniques, analysis of dependence, analysis of interdependence-applications on multiple regression

Text Books

1. C.R. Kothari: “*Research Methodology*”, Wishwa Prakashan, 2009.

Reference Books

1. Panneerselvam R: “*Research Methodology*”, PHI Learning Private Limited, New Delhi, 2009.
2. Willam G.Zikmund: “*Business Research Methods*”, Cengage Learning, New Delhi, 2006.
3. S.Shajahan: “*Research Methods for management*”, JAICO Publishing House, New Delhi, 2009.
4. Battacharya, DK: “*Research Methodology*”, Excel Books, New Delhi.
5. Alan Bryman, Emma Bell: “*Business Research Methods*”, Oxford University Press, New Delhi, 2008.
6. Cooper R.Donald and Schindler S. Pamela: “*Business Research Methods*”, 9/e, Tata MCGraw Hill, New Delhi.
7. CR Kothari: “*Research Methodology Methods and Techniques*”, New Age International Publishers, New Delhi, 2009.
8. Ajai S.Gaur and Sanjaya S.Gaur: “*Statistical Methods for Practice and Research*”, Sage Publications, New Delhi, 2007.
9. Sachdeva: “*Business Research Methods*”, Himalaya Publishing House, Mumbai.

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FINANCIAL MANAGEMENT

II - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To identifying the firm's earnings available to the equity share holders, market price of the share & their price earning capacity.
- To provide safety on investment made by the organization
- To plan a sound capital structure of an organization.

Learning Outcomes

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

- assess the fundamental decision issue in working capital management and the trade-offs involved in making these decisions.
- develop the relationship between profitability, liquidity, and risk in the management of working capital.
- design appropriate dividend policy that has to be adopted which helps in maximizing the wealth of the share holders & growth of the firm.

UNIT - I: The Finance Function

Objective - profit or wealth maximization and EPS maximization, an overview of managerial finance functions, time value of money - present value, future value of money and the basic valuation models - case study.

UNIT - II: Investment Decisions

nature of capital budgeting decisions - techniques of capital budgeting: pay back method, average rate of return and time-adjusted methods: IRR and NPV, profitability index, and excess present value index, advanced problems and cases in capital budgeting - case study.

UNIT - III: Cost of Capital & Working Capital Management

Cost of Capital - concept and measurement of cost of capital, debt vs. equity, cost of equity, preference shares, equity capital and retained earnings, weighted average cost of capital and marginal cost of capital. importance of cost of capital in capital budgeting decisions.

Working Capital Management - components of working capital, gross vs. net working capital, determinants of working capital needs the operating cycle approach. planning of working capital, financing of working capital through bank finance and trade credit. management of current assets - case study.

UNIT - IV: Capital Structure Decisions

capital structure vs financial structure, capitalisation, financial leverage, operating leverage and composite leverage. EBIT-EPS analysis, indifference point/break even analysis of financial leverage, capital structure theories –the Modigliani Miller Theory – Case study.

UNIT - V: Dividend Decisions

dividends and value of the firm , relevance of dividends, the MM hypothesis, factors determining dividend policy, dividends and valuation of the firm, the basic models, declaration and payment of dividends, bonus shares. rights issue, share-splits, Walter Model and Gordon Model - case study.

Text Books

1. Prasanna Chandra: Financial Management (Tata McGrawHill), 9th edition 2012.
2. I M Pandey: Financial Management (Vikas Publishing), 2015.

Reference Books

1. James C Van Horne: Financial Management & Policy (Pearson Education), 12th edition 2004.
2. Eugene F.Brigham, et.al: **Financeial Management**, (Harcourt college), 2015.

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MARKETING MANAGEMENT

II - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To identify different options for marketing activities within the target market.
- To identify the factors that influences a company's decision to make adaptations to its product marketing.

Learning Outcomes

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

- assess the internal and external environment through scanning the marketing environment.
- design the steps in designing & developing a product.
- develop a number of pricing tactics & decide alternative pricing strategies.
- ascertain the alternative strategies for product promotion and distribution.
- explore the possibilities and the challenges of the Internet as a channel in global perspectives.

UNIT - I: Introduction to Marketing

Core Concepts - needs, wants, demand, products, market, exchange, transactions, marketing, marketing concepts/orientations. consumer market Vs Industrial market; marketing environment- macro and micro components, their impact on marketing decisions, Indian Marketing environment.

UNIT - II: Market Analyses and Selection

Consumer Behaviour - factors influencing buyer behaviour, buying decision process- Industrial buying process, market segmentation, segmenting consumer and Institutional markets, market segmentation, targeting and positioning (STP).

UNIT - III: Product Development and Pricing

product - new product development, product life cycle; branding, packaging and labeling pricing Strategy, objectives of pricing, factors influencing price- methods of pricing, adopting price, initiating the price cuts, responding to competitor's price changes.

UNIT - IV: Promotion and Distribution

promotion mix - the role of marketing communication, communication mix, advertising, personal selling, sales promotion, publicity, public relations and direct marketing, distribution decisions, channel functions, channel design, choice and management of distribution channels.

UNIT - V: Marketing Control and Emerging Issues

marketing research- process, methodology. marketing organization and control, evolution of marketing department, organizing the marketing department, marketing implementation and control techniques, emerging trends in marketing, social marketing, green marketing and web marketing.

** Relevant cases have to be discussed in each unit.*

Text Books

1. Philip Kotler, Marketing Management, Prentice Hall, New Delhi, 13th edition 2009.
2. Stanton, Etzel, Walker, Fundamentals of Marketing, Tata-McGraw Hill, New Delhi, 14th edition, 2017.
3. Saxena, Rajan, Marketing Management, Tata-McGraw Hill, New Delhi, 4th edition, 2009.
4. Tapan K Panda: "Marketing Management Text and Cases", Excel Books, New Delhi, 2nd edition, 2008.

Reference Books

1. VS Ramaswamy, S.Namakumari:, "Marketing Management", 3/e, Macmillan, New Delhi, 2003.
2. Karunakaran: "Marketing Management", Himalaya Publishing House, Mumbai, 2010
3. M.Govindarajan: "Marketing Management, Concepts, Cases, Challenges and Trends", PHI Private Limited, New Delhi, 2007.
4. T.N.Chhabra, SK.Grover: "Marketing Management", Dhanpat Rai and Co., New Delhi, 2010.

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HUMAN RESOURCE MANAGEMENT

II - Semester

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

Course Objectives

- To develop an understanding of various HR related ethical issues.
- To provide basic knowledge on training needs of an organisation.
- To familiarize different performance evaluation techniques.
- To create awareness on how to resolve disputes, safety and welfare aspects as well.

Learning Outcomes

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

- develop proper interview and selection techniques according to the requirements in an organization.
- select appropriate performance evaluation technique for assessing the performance of individuals of an organization and be able to prepare the training needs matrix of an organization.
- evaluate the operational issues associated with trade unions and industry relations.

UNIT - I: Introduction to HRM

definition and functions, evolution of HRM, principles – role of HRM – HR policies, strategies to increase firm performance, cross-cultural problems, HRM at global perspective, emerging trends in HRM, Ethical issues in HRM, HR planning, Demand and supply forecasting, HRIS, HR audit, Case study.

UNIT - II: Procurement and Development

sources of recruitment, selection process, tests and interview, induction and placement, techniques of training and development, Job retention, Job analysis, MDPs – case study.

UNIT - III: Retain and Reward

methods of performance appraisal, career planning and development, concepts, principles and influencing factors of compensation, current trends in compensation, compensation mechanisms at international level – case study.

UNIT - IV: Salary and Wage Administration

wage structure – wage and salary policies, legal frame work, determinants of payment of wages, wage differentials, job design and evaluation, incentive payment systems – case study.

UNIT - V: Integration and Maintenance

quality of work life, managing industrial relations, trade unions, employee participation schemes, collective bargaining, grievance and disputes resolution mechanism. safety and welfare - Types of welfare measures, Nature and importance of safety, Safety mechanism, work hazards – case study.

Text Books

1. Subba Rao P: “**Personnel and Human Resource Management-Text and Cases**”, Himalaya Publications, Mumbai, 5th edition, 2011.
2. Gary Dessler: “**Human Resources Management**”, PHI Private Limited, New Delhi, 2007.
3. K Aswathappa: “**Human Resource and Personnel Management**”, Tata McGraw Hill, New Delhi, 2007.

Reference Books

1. Biswanath Ghosh: “**Human Resources Development and Management**”, Vikas Publishing House Private Limited, New Delhi, 2008.
2. Biswajeet Pattanayak: “**Human Resources Management**”, PHI Private Limited, New Delhi, Third edition, 2005.
3. Mirza S Saiyadain: “**Human Resources Management**”, Tata McGraw hill, Third edition, 2004.
4. T.N.Chhabra: “**Human Resources Management**”, Dhanpat Rai & Co, New Delhi, Fifth edition, 2005.
5. Subba Rao P: “**Essentials of Human Resource Management and Industrial Relations**”, Himalaya Publications, New Delhi, Fourth Edition, 2016.

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PRODUCTION AND OPERATIONS MANAGEMENT

II - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To develop an understanding of layout facilities in the organization.
- To get acquainted with the basic aspects of Production/Operations Management.
- To familiarize the effective and efficient ways to utilize the resources
- To enable students basics of one of the functional areas of management Viz. Production or Operations.
- To familiarize the standards of Quality and its measures.

Learning Outcomes

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

- apply the knowledge of Production process to Manufacturing organizations.
- evaluate the Sequence of operations as per the master production schedule.
- develop an understanding of plant location and its layout.
- Analyze the different methods of work study concept.
- appraise the economic issues in published research by adapting economic reasoning tools to real world problems.
- evaluate the quality standards for the manufacturing organizations.

UNIT - I: Introduction

overview of production and operations management (POM) function, historical development of POM, POM scenario today. product and process design, product and process development, manufacturing process technology, CAD/CAM, value analysis - case study.

UNIT - II: Facilities Management

location of facilities, layout of facilities, optimization of product/process layout, flexible manufacturing and group technology - case study.

UNIT - III: Aggregate Planning

preparation of aggregate demand forecast, specification of organizational policies for smoothing capacity utilization, determination of feasible production alternatives and determination of optimal production strategy - Case study.

UNIT - IV: Scheduling

scheduling In job, shop type production, shop-loading, assignment and sequencing, scheduling In aass, continuous and project type production, linebalancing , methods of production control, world class production, work study - case study.

UNIT - V: Quality Management

economics of quality assurance inspection and quality control, acceptance sampling, theory of control charts, control charts for variables and control charts for attributes,total quality management-ISO 9000 series standards, six sigma. case study.

Text Books

1. Chase, Aquilano, Jacobs: "Operations Management for Competitive Advantage", Tata McGraw Hill, New Delhi, 2007.
2. Elwood S.Buffa and Rakesh K.Sarin: "Modern Production and Operations Management", Wiley India, New Delhi, 2008.
3. Aswathappa K : "Production and Operation Management", Himalaya Publishing House, Mumbai.

Reference Books

1. James R.Evans and David A. Collier: "Operations Management", Cengage Learning India Private Limited, New Delhi, 2009.
2. .R. Panneerselvam: "Production and Operations Management", PHI Learning Private Limited, New Delhi, 2009.
3. SN Chary: "Production and Operations management, Tata McGraw Hill, New Delhi, 2008.
4. Mahadevan: "Operations Management", Pearson Education, New Delhi.
5. Upendra Kachru: "Production and Operations Management-Text and Cases", Excel Books, New Delhi.
6. Nair N G: "P Tata McGraw Hill, New Delhi, 2009.
7. William J Stevenson, "Operations management", Tata McGraw Hill, New Delhi, 2009.

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INTERNATIONAL BUSINESS

II - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the process of globalization and the role of MNC's in the context of International Business.
- To identify the role of Economic Institutions and Trade Agreements for the promotion of International Business.
- To understand the marketing phenomena in international context.
- To acquaint with the International Human Resource Management practices.

Learning Outcomes

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

- Identify business opportunities in International Markets.
- Understand the impact of International Lending and Trade Agreements.
- Develop the strategies for International Marketing.
- Implement the HRM Practices in Global Business.

UNIT - I: Introduction to International Business

international business (IB)-importance, nature and scope, modes of entry into I B. differences between domestic business and international business. trade - types and barriers to trade. free trade Vs protectionism. theories of international trade.

UNIT - II: Globalization and MNCs

history of globalization and reasons- features and stages of globalization, advantages and disadvantages of globalization. globalization impact on indian economy. multinational corporations (MNCs) – factors contributed for the growth of MNCs, advantages and disadvantages, role of MNCs in india.

UNIT - III: International Economic Institutions and Agreements

balance of payments (BOP) – concepts, disequilibrium in BOP: methods of correction - international economic institutions-IMF, World Bank, ADB. trade agreements- world trade organisation (WTO), TRIPS, TRIMS. regional trade blocks-EU, NAFTA, UNCTAD, SAARC, ASEAN.

UNIT - IV: International Marketing

international marketing- understanding international consumers, segmentation, targeting and positioning. international marketing strategies-product policies, globalization of markets and brands, pricing, promotion strategies, product life cycle (PLC), establishing and managing international marketing channels.

UNIT - VI International Human Resources Management

factors influencing HRM in international business. global recruitment, selection process, expatriates, performance appraisal, training and development, compensation and benefits. women in international business. international industrial relations.

Text Books

1. Justin Paul – International Business, PHI 6th Edition, www.phindia.com/justinpaul
2. P. SubbaRao – International Business, Himalaya Publishing House, Mumbai, 4th revised edition, 2014.
3. K. Aswathappa – International Business Tata McGrawHill, New Delhi. 6th edition.

Reference Books

1. Francis Cherunilam – International Business Environment, Himalaya Publishing House, Mumbai. 7th revised edition, 2012.
2. John D. Daniels, Lee H. Radebaugh, Daniel P. Sullivan Prasant Salwan, International Business Environment and Operations, Pearson, 15th edition.
3. Crinkota, Ronkainen and Moffett, International Business, 6th edition, Cengage, New Delhi.

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ORGANIZATIONAL BEHAVIOUR

II - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To provide a basic knowledge of main ideas and key theories relating to organizational behavior.
- To understand the basic concepts and theories underlying individual behavior besides developing better insights into one's own self.
- To make students aware of Individual behavior in groups, dynamics of groups and team building besides developing a better awareness of how they can be better facilitators for building effective teams as leaders themselves.
- To Explain Organizational Change and Development; and Identify Organizational Dynamics and Changes.

Learning Outcomes

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

- develop the various numbers of established theorists, theories and studies relating to organisational behavior.
- evaluate the key assumptions on which behaviour in organisations is currently managed and assess the effect of these ideas on employee attitudes and actions.
- apply problem solving and critical thinking abilities to analyse the kinds of choices available for developing alternative organisational behaviour approaches in the workplace.
- highlighting and discussing Organizational Structure and Culture, Discussing organizational Change and Development and Human Performance and Organizational Behaviour.

UNIT - I: Introduction to Organisational Behaviour

Organisational Behaviour - definition, nature and scope, disciplines contributing to the field of OB. **models of OB** (autocratic, custodial, supportive, collegial and SOBC), challenges and opportunities in OB. **approaches to OB** (cognitive, behaviouristic and psychoanalytic).

Individual dimensions of OB - individual differences, models of man.

UNIT - II: Perception, Learning, Personality and Attitude

Perception - concept, nature, process, importance and factors influencing perception, perception and sensation, perceptual organisation, distortion in person's perception, managerial and behavioural implications of perception. **Learning** - meaning and components of learning process, learning theories. **Attitudes** - concept, process and importance, theories of attitude formation, factors in attitude formation, attitudes and workforce diversity. **Personality** - concept, nature and

determinants of personality, theories of personality (Sigmund Freud, Erik Erikson, A. H. Maslow, Chris Argyris, Kurt Lewin.)

UNIT - III: Foundations of Group Behaviour

Group Behaviour - definition, types of groups, stages and reasons in group formation, group dynamics, group cohesiveness, formal and informal groups.

Organisational Power and Politics - concept, sources of power, distinction between power, authority and influence, approaches to power, political implications of power, dysfunctional uses of power. **Group Decision Making** - meaning and nature, decision making in groups, process and styles, advantages and disadvantages.

UNIT - IV: Conflict and Stress Management

Conflict and Stress Management - concept, sources, types, functionality and dysfunctionality of conflict, classification of conflicts (intra, individual, interpersonal, intergroup, and organisational). resolution of conflict, conflict process, johari window.

Stress Management - meaning and concept of stress, stress in organisation, sources of stress and factors contributing to stress, coping strategies, stress and performance.

UNIT - V: Dynamics of Organisational Behaviour

Organizational change - concept, nature, Kurt Lewin theory of change, Implementing change internal and external factors responsible for change, resistance to change and managing resistance to change. **Organisational Development** - meaning, need, limitations, OD and management development, steps in OD, OD interventions. **Organisational Culture** - concept, process and implications of organisational culture. role and types of culture, ethical issues, creating and sustaining culture. **Organisational Effectiveness** - concept and measurement.

Text Books

1. K.Asathappa: "Organizational Behavior-Text, Cases and Games", Himalaya Publishing House, New Delhi, 2008,
2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "Organizational Behavior", Tata McGraw Hill Education, New Delhi, 2008.
3. Organisational Behaviour, L.M. Prasad, Sultan Chand & Sons; Fifth edition (2014) New Delhi.

Reference Books

1. Stephen P. Robbins, Organisational Behaviour, Pearson Education; 15 edition (2013), New Delhi.
2. Pareek Udai: "Understanding Organizational Behavior", Oxford University Press, New Delhi, 2007.
3. Sharma VS, Veluri: "Organizational Behavior", JAICO Publishing House, New Delhi, 2009.
4. P. Subbarao, Organisational Behaviour: Text and Cases, Himalaya Publishing House, Mumbai.

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BUSINESS POLICY AND STRATEGIC MANAGEMENT

III - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To impart knowledge on formulation of objectives/goals for an enterprise.
- To analyze the pros and cons for a company internally and externally through standard matrices.
- To formulate the hierarchy levels ranging from corporate to functional units.

Learning Outcomes

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

- formulate policies, procedures, goals for an organisation.
- apply a strategy that fits the company's structure and culture.
- analyse the performance through strategic audit facilitate to make necessary future changes in crafting a strategy.

UNIT - I: Concepts in Strategic Management

concepts in strategic management — strategic management as a process, developing a strategic vision, mission, objectives, policies – factors that shape a company's strategy, criteria for effective strategy – case study.

UNIT - II: Environmental Scanning

corporate planning process, SWOT analysis, strategy and competitive advantage. Porter's five force model, BCG matrix, GE model – case study.

UNIT - III: Strategy Formulation and Implementation

Porter's value chain analysis, competitive advantage of a firm, exit and entry barriers – formulation of strategy at corporate, business and functional levels, strategy and structure, strategy and leadership, 7'S framework, strategies for competing in globalising markets – case study.

UNIT - IV: Diversification Strategies

turnaround strategy, strategies for mergers, acquisitions, takeovers and joint ventures. types of diversification strategies, the concept of core competence, strategies and competitive advantage in diversified companies – case study.

UNIT - V: Strategy Evaluation and Control

establishing strategic controls, guidelines for proper control, role of the strategist using qualitative and quantitative benchmarking to evaluate performance, measuring and evaluating performance, strategic information system, strategic surveillance, strategic audit – case study.

Text books

1. P.Subba Rao: “**Business Policy and Strategic Management**”, Himalaya Publishing House, New Delhi, 2010.
2. Vijaya Kumar P. Hitt A: “**Strategic Management**”, Cengage learning, New Delhi, 2010.
3. Kazmi:”**Strategic Management and Business Policy**”, Tata McGraw Hill, 2009.
4. R.Srinivasn: “**Strategic Management**”, PHI Learning, New Delhi, 2009.

Reference Books

1. Jauch & William E Glueck: “**Strategic Management and Business Policy**”, Tata McGraw Hill, 1989.
2. Raghavan Parthasarthy: “**Fundamentals of Strategic Management**”, Biztantra, New Delhi, 2008.
3. Thomas L Wheelen, J.David Hunger, Krish Rangarjan: “**Concepts in Strategic Management and Business Policy**”, Pearson education, Ninth edition, 2004.
4. N.S.Guptha : “**Business Policy and Strategic Management**”, Himalaya Publishing House, New Delhi, 2013.
5. Appa Rao, Parvatheshwar Rao, Shiva Rama Krishna: “**Strategic Management and Business Policy**”, Excel Books, New Delhi, 2008.
6. U.C.Mathur: “**Strategic Management**”, McMillan Pulishers, New Delhi, 2009.
7. Amita Mital: “**Cases in Strategic Management**”, Tata McGraw Hill, New Delhi, 2008.

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LOGISTICS AND SUPPLY CHAIN MANAGEMENT

III - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To introduce the basic concepts and process of Logistics and supply chain management with a focused approach to reduction of total cost.
- To develop an understanding the principles, practices and application of logistics and supply chain management to improve corporate performance by achieving customer service Excellence.

Learning Outcomes

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

- apply the knowledge of various functional areas of Logistics and supply chain management and to develop the integrated supply chain.
- analyze the resources and technical tools of logistics and supply chain management in ensuring customer satisfaction and success.
- evaluate and select warehousing and transportation options and recommend appropriate business solutions.

UNIT - I: Introduction to Logistics and Supply Chain Management

nature and importance of logistics and supply chain management, evolution of SCM, functions of logistics management, integrated logistics system, objectives and importance of supply chain management, process view of supply chain, supply chain synchronization, emerging trends in logistics and supply chain management - case study

UNIT - II: Customer Service Dimension

the marketing and logistics interface, elements of customer service, importance of logistics /supply chain customer service, customer retention, service driven logistics systems, value added services, customer satisfaction and success-case study

UNIT - III: Supply chain Planning and Strategies

supply chain strategies, achieving strategic fit , supply chain strategy frame work, logistics/supply chain control model, benchmarking the logistics process, supply chain relationships, customer relationship management – case study

UNIT - IV: Measuring Logistics costs and Designing the Logistics /Supply Chain network

principles of logistics costing, total cost analysis and its concepts, customer profitability analysis, cost –drivers and activity based costing, supply chain design

, logistics/supply chain network design process, factors influencing network design decisions, the role of network design in the supply chain – case study.

UNIT - V: Sourcing and Transportation, Managing Global supply chain

sourcing decisions in a supply chain , procurement process, e-procurement, role of transportation in supply chain, factors effecting transportation decisions, role of IT in the supply chain,the concept of global logistics and global supply chain, global logistics management process ,issues and challenges in global supply chain management–case study .

Text Books

1. Alane E Branch: Global Supply Chain Management and International Logistics, Routledge Publishers, New Delhi, 2009
2. Narayan Rangaraj: Supply Chain Management in Competative Advantage, TMH, New Delhi, 2009
3. Anurag Sexena: Logistics and Supply Chain Management, Jaico Publishing House, New Delhi, 2009

Reference Books

1. Donald J.Bowersox and David J.Closs, Logistical Management: The Integrated Supply Chain Process, TMH, 2003.
2. Edward J Bradi, John J Coyle: A Logistics Approach to Supply Chain Management, Cengage learning, New Delhi, 2010.
3. D.K.Agrawal: Logistics and Supply Chain Management, MacMillan Publishers, 2010.
4. Sunil Chopra and Peter Meindl: *Supply chain Management: Strategy, Planning and Operation*, 2/e, Pearson Education, New Delhi 2009.
5. Rahul V Altekar: Supply Chain Management, PHI Learning Ltd, New Delhi, 2009.
6. K.Sridhar Butt: Logistics and Supply Chain Management, Himalaya Publishing, New Delhi, 2009.
7. B.Rajashekhar, Acharyulu: Logistics and Supply Chain Management, Excel Books, New Delhi,2009.
8. R.P.Mohanthy: Supply Chain Management, Biztantra, New Delhi, 2010.
9. Donald Waters: Global Logistics, Kogan page, New Delhi,2010.

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E - BUSINESS

III - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To Understand the basic concepts and technologies used in the field of management information systems.
- To identify the major management challenges to building and using information systems.

Learning Outcomes

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

- evaluate the role of the major types of information systems in a business environment and their relationship to each other
- assess the impact of the Internet and Internet technology on business electronic commerce and electronic business.
- understand the processes of developing and implementing information systems.

Unit – I: Introduction to E-Business

E-commerce - the revolution is just beginning, ecommerce: a brief history, understanding e-commerce: organizing themes.

Unit – II: E- Business Models and The Internet

e- business models, major business to consumer (B2C) business models, major business to business (B2B) business models, business models in emerging e-Business areas. The internet -technology background, the internet today, the world wide web, the internet and the web - features.

Unit – III: Building an Ecommerce Web Site

building an e-commerce web site - a systematic approach, the e-commerce security environment, security threats in the e-commerce environment, and e-commerce payment system.

Unit – IV: E-Business Marketing Concepts

consumer online -the internet audience and consumer behaviour, basic e - marketing concepts, internet marketing technologies, B2C and B2B e-business marketing and business strategies.

Unit – V: Online Retailing and Social Networks

the retail sector, e-tailing business models, the service sector - offline and online, online travel services, online career services. social networks and online communities, online auctions, e-commerce portals.

Text Books

1. Kenneth C. Laudon, E-Commerce: Business, Technology, Society, 4th Edition, and Pearson.
2. S. J. Joseph, E-Commerce: an Indian perspective, PHI, 4th edition, 2012.

Reference Books

1. Turban, Efraim, King, David, Lang, Judy, Introduction to Electronic Commerce, 2nd edition and prentice hall.
2. Tiny ERP, Open ERP – Pour une gestion d'entreprise efficace et intégrée, 1re éd., Fabien et Geoff Gardiner, fEyrolles Publications, 2008, f ISBN-2-212-12261-9.
3. Internet Marketing & e-Commerce, Kalyanam, Kirthi, Hanson, Ward A., 2nd edition and Thomson Learning.

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BUSINESS ETHICS AND CORPORATE GOVERNANCE

III - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To make the students aware of ethical and moral issues concerning business both in Indian and international context.
- To develop sensitivity of students for right ethical practices in conduct of business.

Learning Outcomes

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

- apply ethical concepts to business practice.
- understand the importance of maintaining a positive reputation as it relates to branding and other marketing elements.
- evaluate current business issues in the context of their ethical dimensions.
- analyse how corporate governance systems influence performance, including both the performance of individual firms and the allocation of capital within a country.

UNIT - I: Importance of Business Ethics

values and ethics, nature and goals of business ethics, ethics in work place – ethical decision making. concepts and theories of business ethics- normative theories – ethical theories in relation to business, major indian scams – reasons for unethical practices-case Study.

UNIT - II: Marketing Ethics

consumer rights, exploitation of consumers, guidelines for consumer protection, product safety and pricing, ethical responsibility in product, advertising and target marketing, ethics of sales, advertising and product placement, consumer autonomy-case study.

UNIT - III: Ethical Issues in Human Resource Management

genesis and growth of HRM – HR related ethical issues – institutional culture – financial management and ethical issues, frauds in banks, measures against financial Frauds, constraints to ethical practices indian nationalized banks – frauds in insurance sector- cases.

UNIT - IV: Corporate Governance

an overview, theory and practice of governance- indian model of governance, good corporate governance, land marks in emergence of governance OECD principles-sarbanes-oxley act2002 – SEBI's initiatives – various committee reports on corporate governance-case study.

UNIT - V: Agents and Institutions in Corporate Governance

rights and privileges of shareholders-investors' problems – other stakeholders-board of directors- role of auditors- duties and responsibilities of auditors-case study.

Text Books

1. A.C.Fernando: Business Ethics, Pearson Education, New Delhi, 2009
2. Manuel G. Velasquez: Business Ethics, PHI Learning, New Delhi, 2010
3. Daniel Albuquerque: Business Ethics, Oxford University Press, New Delhi 2010.
4. S.Prabhakaran: Business Ethics and Corporate Governance, Excel Books, New Delhi 2010.

Reference Books

1. R.C.Shekhar: Ethical Choices in Business, Sage Publishers, New Delhi,2009
2. Bob Tricker: Corporate Governance, Oxford University, New Delhi,2010
3. Subash Chandra Das: Corporate Governance in India, PHI Learning, New Delhi 2009
4. David Martin: Corporate Governance, Viva Books, New Delhi, 2010
5. Jayasree Suresh,B.S.Ragavan: Human Values in Professional Ethics, Sultan Chand, New Delhi,2009
6. S.K Mandal: Ethics in Business and Corporate Governance, TMH, New Delhi, 2010.

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ENTREPRENEURSHIP AND PROJECT MANAGEMENT

IV - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To acquaint the students with challenges of starting new ventures and enable them to investigate, understand and internalize the process of setting up a Business.
- Explore the main factors for successful project management: project planning, project implementation & project evaluation and documentation.

Learning Outcomes

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

- understand the importance of women entrepreneurship and problems of women entrepreneur.
- analyse entrepreneurship development programme, government policies, schemes and incentives for promotion of entrepreneurship and social responsibility of business
- evaluate of projects and make project report preparation

UNIT - I: Entrepreneurship

importance, characteristics and qualities of entrepreneurship, role of entrepreneurship, ethics and social responsibilities, entrepreneur scenario in india and abroad-case study.

UNIT - II: Role of Government

role of IDBI, NIESBUD, SISI, DIC financial institutions commercial banks, entrepreneurial development institutes, universities and other educational institutions offering entrepreneurial development programme-case study.

UNIT - III: Training

designing appropriate training programme to inculcate entrepreneurial spirit, training for new and existing entrepreneurs, feedback and performance of trainees. women entrepreneurship, role & importance, profile women entrepreneur, challenges & problems of women entrepreneurs, achievements - case study.

UNIT - IV: Creativity

entrepreneurship sources and methods of ideas planning and development of programmes e-business ventures; new venture management , emerging trends-case study.

UNIT - V: Planning and Evaluation of Projects

growth if firm - factors inducing growth, strategic investment, growth rate decision, project feasibility study, cash flow projections, role of study group, rate of return from projects, project quality management techniques, quality assurance. problems & risks contingencies in managing international projects-case study.

Text Books

1. Hisrich: Entrepreneurship, TMH ,New Delhi, 2009.
2. Narayana Reddy: Entrepreneurship. Cengage learning, New Delhi, 2010.
3. Rajeev Roy: Entrepreneurship, Oxford University Press, New Delhi, 2010.
4. V.Gangadhar, Narsimha Chary: Entrepreneurship Development, Kalyani Publishers, New Delhi 2007.

Reference Books

1. H.Nandan: Fundamentals of Entrepreneurship, PHI Learning, New Delhi, 2009
2. Prasanna Chandra: Projects, TMH, New Delhi, 2009.
3. Kathrin Koster: International Project Management, Sage Publication, New Delhi, 2010.
4. Shivathanu Pillay: Project Management, University Press, New Delhi, 2009.
5. K.Nagarajan: Project Management, New Age International , New Delhi,2010.
6. Jack R Meredith: Project Management, Wiley India Publishers, New Delhi,2010.

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Specialisation - Marketing

ADVERTISING AND BRAND MANAGEMENT

III - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To enlighten the students with the Concepts and Practical applications of advertising.
- To enlighten the students with the Concepts and Practical applications of Brand Management.

Learning Outcomes

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

- understand the analytical skills useful in planning and evaluating advertising campaigns.
- analyze critically the task of advertising under contemporary conditions and to examine the role of advertising as it relates to other marketing functions.
- evaluate the various types of policies that can be employed in guiding the advertising and Branding activity.

UNIT - I: Role of Advertising in Promotional Mix

introduction to advertising, advertising and communication, integrated marketing (IMC), challenges and opportunities in advertising, economic, social and ethical aspects of advertising. direct response advertising- direct mail, catalogs, internet Advertising.

UNIT - II: Audience Analysis in Advertising

media planning, media mix decisions, developing media strategy, creative strategy and copy writing, different types of appeals, layout design. advertising and consumer behaviour, setting advertising objectives, DAGMAR approach. advertising budgets—methods of formulating advertising budgets.

UNIT - III: Brand-concept

nature and importance of brand, brand evolution, brand life cycle, brand name and brand management, brand identity, conceiving, planning and executing (aaker Model), brand loyalty, measures of loyalty.

UNIT - IV: Brand Equity

concepts and measures of brand equity-cost, price and consumer based methods; sustaining brand equity, brand personality, definition of brand personality, measures

of personality, formulation of brand personality, brand image Vs brand personality. brand identity.

UNIT - V: Brand Positioning

concepts and definitions, repositioning, brand rejuvenation, celebrity endorsement, brand extension, differential advantage, strategies for competitive advantage, brand pyramid, branding in different sectors.

** Relevant cases have to be discussed in each unit.*

Text Books

1. George E Belch, Michael A Belch and Keyoor Purani, Advertising and Promotion, Tata McGraw Hill, 7th edition, 2009.
2. S.A. Chunawalla and K.C. Sethia, Foundations of Advertising - Theory & Practice, 8th revised edition, Himalaya Publishing House Pvt. Ltd. , 2015.
3. Aaker, David (2002), Managing Brand Equity, Prentice Hall of India.
4. Kevin Lane Keller, Jacob Isaac and Ambi M. G. Parmeswaran, Strategic Brand Management, 3rd edition, Pearson Education India, 2010.

Reference Books

1. John. S. Wright Wills. L.Winter, Jr. and Sherliyer K. Zeigler, Advertising – Tata McGrawHill, 1982.
2. William Wills, John Burnett and Sandra Mriarty – Advertising Principles and Practice –Pearson,ND, 7th edition.
3. Percy & Elliot – Strategic Advertising Management, Oxford University Press, 5th edition 2016.
4. Harsh V. Varma, Brand Management, Excel Books.
5. Kumar, Ramesh. Managing Indian Brands, Vikas Publishing House, New Delhi, 2004.
6. Keller K. L., Strategic Brand Management, 2nd Edition, Pearson Education, 2003.

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Specialisation - Marketing

CONSUMER BEHAVIOUR

III - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To enable the students in making marketing decisions keeping in mind the consumer behavior.
- To design primary market research studies for the mutual benefit of consumers and organizations.

Learning Outcomes

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

- understand consumer perception and attitude.
- analyze and determine the behavior of consumer
- identify the roots of consumerism.

UNIT - I: Understanding Consumer Behaviour

defining consumer behaviour, need for the study of consumer behaviour. consumer behavior in a world of economic instability, rural consumer behaviour, diversity of indian market. changing indian consumer behaviour. understanding consumer through research process, consumer segmentation and targeting.

UNIT - II: Consumer as an Individual

consumer personality and self-concept, consumer motivation, consumer perception, consumer beliefs, consumer attitude- formation and change, consumer learning and information processing.

UNIT - III: Socio-Cultural Influences on Consumer Behavior

influence of culture, sub culture, social class, reference groups, family and personality. cross-cultural consumer behaviour.

UNIT - IV: Consumer Decision Making Processes

problem recognition, search and evaluation, purchasing processes, post purchase behaviour. models of consumer decision making, consumers and the diffusion of innovations.

UNIT - V: Consumerism and Ethics

consumerism and its roots, consumer safety, consumer information, consumer responsibilities, marketer responses to consumer issues, marketing ethics towards consumers.

* Relevant cases have to be discussed in each unit.

Text Books

1. Leon G. Schiffman, Leslie Lazer Kanuk, S.Ramesh Kumar, Consumer Behaviour Pearson, Tenth edition, 2011.
2. David L. Loudon and Albert J.Della Bitta, Consumer Behaviour, TMH, Fourth Edition.
3. Ramanuj Majumdar, Consumer Behaviour, PHI, 2011.
4. Suja R Nair, Consumer Behaviour in Indian perspective, 2nd edition, HPH, 2013.

Reference Books

1. Michael R.Solomon Consumer Behaviour, Tenth Edition, PHI, 330-331.
2. Satish Batra, SHH kazmi, Consumer Behaviour-Text and Cases, Excel Books, Second Edition, 2011.
3. Kardes, Cline, Cronley, Consumer Behaviour-Science and Practice, Cengage Learning, 2012.
4. S. Ramesh kumar, Consumer Behaviour and Branding, Pearson, 2013.
5. Dr.Shri Prakaash, Consumer Behaviour, Vikas 2010.
6. S.A.Chunawalla, Commentary on Consumer Behaviour, 3rd edition, HPH 2012
7. S.H.H.Kazmi, Consumer Behaviour and Marketing Communication, Excel 2011.
8. Ramneek Kapoor, N.Namdi O Madichie, Consumer Behaviour, TMH 2012
9. J.Paul Peter, Jerry.C.Olsan, Consumer Behaviour and Marketing Strategy 7th Edition, TMH 2011.

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Specialisation - Finance

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

III - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the basic concepts of different kinds of markets & various investment alternatives available.
- To acquaint the students about investment decisions related to financial assets, the risks and the returns involved, alongside the theories and concepts involved in portfolio management.

Learning Outcomes

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

- familiarise in calculating the risk & return of the various combinations of the funds invested in the portfolio.
- selecting the optimum securities on the basis of technical & fundamental analysis.
- knowledge in calculation of bond duration, volatility & buy, hold or sell decision.

UNIT - I: Investments

The investment environment, classification and functions of financial markets and financial instruments. Securities trading – types of orders, margin trading, clearing and settlement procedures. regulatory systems for equity markets - case study.

UNIT - II: Portfolio Management

concept of risk, measuring risk and returns, portfolio risk – measurement and analysis, mean, variance approach, business risk and financial risk and treatment in portfolio management, the capital asset pricing model, single-index model, arbitrage pricing theory, market efficiency.

UNIT - III: Bond Valuation

bond analysis - bond pricing theorems, convexity, duration, bond immunization, active bond management and passive bond management - case study.

UNIT - IV: Fundamental Analysis & Technical Analysis

economic analysis, factors in domestic and international economy, economic forecasting and stock investment decisions, types of economic forecasts, forecasting techniques, industry analysis, classification, key characteristics in

industry analysis, sources of information for industry analysis. company analysis: sources of information for company analysis (internal, external), factors in company analysis, operating analysis, management analysis, financial analysis, technical analysis.

UNIT - V: Security Analysis

dividend discount models, intrinsic value and market price, earnings multiplier approach, p/e ratio, price/ book value, price/sales ratio. mutual funds, growth of mutual funds in India, structure. performance evaluation of mutual funds, conventional theory, performance measurement with changing portfolio composition-case study.

Text Books

1. Punithavathy Pandian: Security Analysis and Portfolio Management, Vikas Publishing House, New Delhi, 2009.
2. Prasanna Chandra, Investment Analysis and Portfolio Management, 3/e Tata McGraw-Hill Publishing Co. Ltd. New Delhi, 2003

Reference Books

1. Thomas S Y Ho: Security valuation, Oxford University Press, New Delhi, 2009.
2. S.Kevin: Security Analysis and Portfolio Management, PHI Learning, New Delhi, 2009.
3. Edwin J. Elton, Martin J. Gruber: Modern Portfolio Theory and Investment Analysis, 5/e, John Wiley & Sons, 2001.
4. Ranganatham : Investment Analysis and Portfolio Management Pearson Education.

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Specialisation - Finance

INTERNATIONAL FINANCIAL MANAGEMENT

III - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To determine trading through the exchange of foreign currency and international dealings with overseas business partners.
- To provide knowledge on Forex markets, major participants, types of transactions and settlements dates, Foreign exchange quotations
- To forecast and evaluate future cash flows and to determine EXIM policy guidelines, reforms.
- To evaluate transactions and settlement dates in financial markets.

Learning Outcomes

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

- management of capital account & current account can be done effectively
- conversion of currency & their cross quotations is understood.
- player's trade in the exchange markets such as central banks, speculators, corporations and individuals make up speculation techniques is known
- the arrangement of netting systems bilateral and multilateral with cross border countries can be elevated to students.
- relationship between inflation, interest rates and exchange rates is understood

UNIT - I: International Financial Management

an overview, importance, nature and scope, theories of international business, international business methods, recent changes and challenges in IFM - Case study.

UNIT - II: International Flow of Funds

balance of payments (BoP), fundamentals of BoP, accounting components of BOP, factors affecting international trade flows, agencies that facilitate international flows. Indian BoP trends and payment methods - case study.

UNIT - III: International Monetary System

evolution, gold standard, Bretton Woods system, the flexible exchange rate regime, evaluation of floating rates, the current exchange rate arrangements, the economic and monetary union (EMU), foreign direct investment, international capital

budgeting, international cash management, accounts receivable management, inventory management - Case study.

UNIT - IV: Foreign Exchange Market

function and structure of the forex markets, major participants, types of transactions and settlements dates, foreign exchange quotations, process of arbitrage, speculation in the forward market, overview of the other markets, euro currency market, euro credit market, euro bond market, international stock market - case study.

UNIT- V: Exchange Rates

measuring exchange rate movements, factors influencing exchange rates. government influence on exchange rates, exchange rate systems. managing foreign exchange risk, international arbitrage and interest rate parity, Purchasing Power Parity – international fisher effect – fisher effect- case study.

Text Books

1. Alan C.Shapiro, “Multinational Financial Management”, 7/e, John Wiley, 2006.
2. Jeff Madura, “International Corporate Management”, 8th edition, Thomson Publications, 2007.
3. S.Eun Choel and Risnick Bruce,”International Financial Management”, 3/e Tata McGraw Hill, 2006

Reference Books

1. P.K Jain, Josette Peyrard and Surendra S. Yadav, “International Financial Management”, Macmillan Publishers, 2006.
2. P.G.Apte, “International Financial Management”, 4/eTata McGraw-Hill, New Delhi, 2007.
3. Madhu Vij, “International Financial Management”, second edition, Excel Books, 2005.
4. Maurice D.Levi,”International Finance”, 3rd edition, Tata Mc Graw-Hill, New Delhi, 2006.

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TRAINING AND DEVELOPMENT

III - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To enable the student understand the concepts, principles and process of training and development.
- To familiarize with learning styles and theories in relation to the knowledge management.
- To develop an understanding of how to assess training needs and design training programs in an Organisational setting.
- To familiarize with the levels, tools and techniques involved in evaluation of training effectiveness.
- To develop an understanding on management and career development solutions to improve employee performance.

Learning Outcomes

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

- assess training needs and design training programs in an Organisational setting.
- design the different evaluation criteria of training programs.
- it provides knowledge about various types of training programs and management development methods
- create the feasible environment for management development and career development of employee.

UNIT - I: Introduction to Training

concept, role, need and importance of training, principles of training, training administration, components. difference between training, learning and development

UNIT - II: Learning

tearining and its styles- David Kolb's learning style model, VAK Model, principles of Learning, andragogy and pedagogy, synergogy for team learning, theories of learning, learning and knowledge kanagerment.

UNIT - III: Training Needs Assessment (TNA)

concepts, determination of training needs, approaches to TNA, methods for identifying training needs, resistance to training, trainee motivation to learn, challenges to become learning organization.

UNIT - IV: Training Design and Evaluation

designing training programs - process, methods and techniques of training, designing a training unit (cross cultural, leadership, training the trainer, change), Kirkpatrick's four level frame work of evaluation criteria, models of evaluation (COMA, decision based), return on investment on training.

UNIT - V: Human Resource Development

management development- objectives of management development- methods of management development, management development process, leader centered techniques of management development. HRD at micro and macro levels, sub-systems of HRD, role of HRD function, steps in career planning, methods of career planning and development - career development actions and programs- guidelines for career management.

Text Books

1. Goldstein Irwin L, "Training In Organizations - Needs Assessment, Development & Evaluation", Wordsworth Publication
2. Lynton & Parekh, "Training for Development", Sage Publications, 2nd edition 2011.
3. Robert L. Craig, "ASTD Training and Development", McGraw Hill Publications
4. Dugan laird, "Approaches to Training and Development", Perseus Publishing, 2003
5. Rao TV, "Readings in HRD", Oxford & IBH, 2006
6. NM Agrawal, Transfer of Learning - ISTD Article
7. Noe, A Raymond & Kodwani, Deo Amitabh, "Employee Training and Development", 5e, McGraw Hill Publications, 2012

Reference Books

1. Elaine Biech, ASTD Handbook, 2nd Edition: The Definitive Reference for Training & Development, American Society for Training and Development.
2. Ronald R. Sims, Reinventing Training and Development, Greenwood Publishing Group.

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Specialisation - HR

INDUSTRIAL RELATIONS AND LABOUR LAWS

III - Semester

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

Course Objectives

- To acquainting the students with the essentials of Industrial Relations in India.
- To familiarizing them with the use of preventive measures in IR
- To helping them to know about trade unions and their working
- To familiarizing them with collective bargaining and WPM
- To helping them to know specific provisions under various laws

Learning Outcomes

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

- understand the evolution, concept and scope of Industrial Relations and Labour laws relating to it.
- apply the knowledge related to various Labour Laws related to wages as applicable in India.
- recall acts related to employment insurance and retiring benefits.
- designing Grievance Redressal Procedure for settling employee grievances.

UNIT - I: Introduction to Industrial Relations

Industrial Relations Perspective: concept, importance, scope and aspects of industrial relations, causes and effects of poor industrial relations in india. approaches to industrial relations, Trade Unions- trade union act, 1926; historical evolution of trade unions in India, role and functions of trade unions, essentials for success of trade unions-case Study.

UNIT - II: Grievance Management and Industrial Disputes

Employee Discipline-Causes of Discipline, Kinds of Punishment, grievance Procedure- settlement of grievance,model grievance procedure,collective bargaining. industrial disputes- industrial disputes act, 1947, causes and methods for settlement of industrial disputes-case study.

UNIT - III: Labour Welfare, Social Security and Workers' Participation in Management (WPM)

Introduction- history of labour welfare, theories of labour welfare; labour welfare officer – role, functions and duties. Employees' Safety and Social Security-health and occupational safety programs; workers' participation in management in India – shop floor, plant and corporate level- case study.

UNIT - IV: Legal Framework for Social Security

Employees Compensation act, 1923, employees state insurance act, 1948, employees provident fund and miscellaneous provisions act, 1952, payment of gratuity act, 1972, maternity benefit Act, 1961- case Study.

UNIT - V: Laws related to Employee Welfare and Wages

Industrial employment (standing orders) act, 1946, factories act, 1948, contract labour act, 1970, payment of wages Act, 1936, minimum wages act, 1948, payment of bonus act, 1965- case study.

Text Books

1. C. Mamoria, S. Mamoria, S. Gankar: "Dynamics of Industrial Relations", HPH, N. Delhi, 16th edition, 2012.
2. A.M Sarma, "Industrial Relations, Conceptual and Legal Framework", HPH, N. Delhi, 2012.
3. A. Monappa: "Industrial Relations". TMH, N. Delhi, 2nd edition 2017.
4. S C Srivastava, "Industrial Relations and Labour Laws", 6/e, Vikas Publishing, 2012.

Reference Books

1. R. Sivarethinamohan, "Industrial Relations and Labour Welfare": Text And Cases, PHI Learning Pvt. Ltd., New Delhi.
2. R.j.reddy, "Labour Legislation", APH Publishing Corporation, New Delhi.
3. B D Singh, A K Sinha, "Labour Laws in Brief", Excel Books, New Delhi.

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Specialisation - Marketing

MARKETING OF SERVICES

IV - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To develop insights into emerging trends in the service sector in a developing economy.
- To explain the unique challenges involved in marketing and managing services.
- To introduce the need to develop an appropriate marketing mix
- To understand the role of recovery and relationship marketing in services marketing.

Learning Outcomes

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

- appraise, modify, and/or extend new concepts and strategies pertaining to explaining the characteristics of customers' purchasing and consumption behavior of services and service firms' marketing behavior
- assess the difference between marketing physical products and intangible services, including dealing with the extended services promotion mix
- develop the strategies for relationship and recovery in services marketing

UNIT - I: Introduction to Services Marketing

Services - nature and characteristics, classification of services, marketing of services Vs. goods, product service continuum, services marketing challenges, service marketing mix. services in the modern economy- role of services in Indian Economy. services and technology, services as a system.

UNIT - II: Consumer Behaviour and Relationship Marketing

Consumer Behaviour in services- understanding customer needs and expectations, service perceptions, encounters. Relationship Marketing- the nature of service consumption, relationship development strategies and challenges.

UNIT - III: Service Development and Physical Evidence

Service Development- planning, creating and branding service products, new service development; service blueprinting, service process redesign; service physical evidence, servicescape, physical evidence strategy; services marketing triangle; role of employees and customers in service delivery and performance.

UNIT - IV: Service Quality and Recovery

Service Quality - service quality dimensions, gaps model of service quality, service recovery – customer responses to service failures, customer recovery expectations, complaint handling, recovery management, recovery strategies, service recovery effects, service guarantees.

UNIT - V: Services Pricing, Promotion and Distribution

Pricing of Service - establishing pricing objectives, pricing related to four value definitions, service communication- challenges, communication mix. Service Delivery Process-delivering services through intermediaries and electronic channels, balancing demand and capacity.

* Relevant cases have to be discussed in each unit.

Text books

1. Valarie A Zeithaml, "D D Gremler et. al., Services Marketing", 4th edition, TMH, New Delhi.
2. Rajendra Nargundkar: Services Marketing, 3rd edition, TMH, New Delhi.
3. R Srinivasan, Services Marketing, Indian Context, 4th edition, Prentice Hall of India, New Delhi.
4. Harsh V.Verma: Services Marketing, 2nd edition, Pearson Education, New Delhi.

Reference Books

1. Christopher Lovelock, Jayanta Chatterjee and Jochen Wirtz, Services Marketing: People, Technology, Strategy, Pearson Education, 7th edition.
2. Govind Apte: Services Marketing, Oxford University Press, New Delhi, 2009
3. Ravi Shanker: Services Marketing, Excel Books, New Delhi, 2010
4. Christian Gronroos: Service Management and Marketing, Wiley India, New Delhi, 2010
5. Vasanthi Venugopal: Services Marketing, Himalaya Publishing House, 2010
6. Nimith Chowdhary: Marketing of Services, MacMillan Publishers, New Delhi, 2009.
7. Douglas Hoffman K: Marketing of Services, Cengage learning, New Delhi 2010.

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Specialisation - Marketing

SALES AND DISTRIBUTION MANAGEMENT

IV - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To develop understanding and appreciation of the Sales & Distribution processes in organizations.
- To familiarize the concepts, approaches and the practical aspects of the key decision making variables in sales force and distribution channel management.

Learning Outcomes

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

- apply the knowledge of various concepts which are helpful in developing a sound sales and distribution policy and in organizing and managing sales force and marketing channels.
- evaluate the tools and strategies necessary for designing, motivating and evaluating sales & distribution management systems.
- execute the decision making skills of future sales and distribution process.

UNIT - I: Sales Management

objectives and functions of sales management, selling as a career, sales organisation, purpose of setting up a sales organisation, types of sales organizations, organisation of the sales department, inter department relations, ethics in Sales management. process of personal selling.

UNIT - II: Sales Potential Analysis and Territory Management

sales potential, sales volume, sales quotas. sales forecasting, different methods of sales forecasting, sales budgets. Sales territory - reasons for establishing sales territories, time and territory management, routing and scheduling sales personnel.

UNIT - III: Sales Force Management

recruitment, selection and training of sales personnel, selecting training methods , evaluating sales training programmes, motivation and compensation plans of sales force, evaluation of salesmen's performance, sales control research.

UNIT - IV: Channels of Distribution

channel structure and functions, channel design process and channel management decisions, selecting channel members motivating channel members, customer service and physical distribution.

UNIT - V: Channel Management

role and types of channel intermediaries, channel conflicts – reasons, managing channel conflicts evaluating channel member performance – retail management , e-enabled distribution, emerging trends in distribution management.

** Relevant cases have to be discussed in each unit.*

Text Books

1. Richard R.Stire, Edward W.Candiff and Norman, A.P.Gavani, “Sales Management Decisions”, Policies and Cases – Prentice Hall.
2. Krishna K Havaladar Vasant M Cavale, “Sales and Distribution Management”, TMH, New Delhi, 2009
3. S.L.Gupta, “Sales and Distribution Management”: Text and Cases, Excel Publishers.
4. Pingali Venugopal, “Sales and Distribution Management”: An Indian Perspective, Response Books, New Delhi.

Reference Books

1. Tapan K Panda: Sales and Distribution Management, Oxford University Press, New Delhi, 2009.
2. Tony Carter: Sales Force Management, Jaico Publishing House, New Delhi, 2008.
3. S.A.Chunawala: Sales and Distribution Management,Himalaya Publishing House, New Delhi, 2009.
4. Aftab Alam Sales and Distribution Management, Wisdom Publication.
5. Eugene. M.Johnson, David L.Kurty and Enirhard. E.Scheuing – Sales Management, Concepts, Practices and Cases by McGraw Hill International.
6. Berg Rosenbloom – Marketing Channels – a Management View – by the Dryden Press, Hinsdale, Illinois.
7. Aune T.Coughlan, Stern E.Ansary – Marketing Channels, Prentice Hall of India.
8. Matin Khan: Sales and Distribution Management, Excel Publish.
9. Hair, Anderson: Sales Management, Cengage Learning, New Delhi, 2010.
- 10.Mark W Johnston: Sales Force Management, TMH, New Delhi, 2009.

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Specialisation - Finance

FINANCIAL DERIVATIVES

IV - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To aim at providing an in-depth understanding of financial derivatives in terms of concepts, structure, instruments and trading strategies for profit and risk management
- To understand the fundamental concepts and to develop the necessary skills used in valuing derivative contracts

Learning Outcomes

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

- analyse and evaluate the characteristics of financial derivative instruments.
- understand the asset price dynamics in deriving both the binomial and Black-Scholes option pricing models and pricing other more complex derivative instruments.
- establish the ability to price derivative instruments and hedge market risk based on numerical data and current market conventions.

UNIT - I: Introduction

forwards and futures contracts, other derivatives - trading - regulation, index futures, futures on currencies - interest rate futures, derivatives market in India - case study.

UNIT - II: Options Market

properties of stock options - mechanics of option markets, underlying assets, stock options - warrants, executive stock options, and convertibles - case study.

UNIT - III: Trading Strategies

strategies involving options - spread, combinations, other payoffs, options on indices - hedging strategies using derivatives - case study.

UNIT - IV: Options Valuation

binomial model - one-step and two step binomial trees. Black-Scholes Model - lognormal property of stock prices - volatility, causes of volatility- Case study.

UNIT - V: Swaps

currency swaps - interest rate swaps, equity swaps, credit derivatives, credit default swaps, caps and floors- Case study.

Text Books

1. John Hull, Options, “Futures and other Derivatives”, Pearson Education, 9th edition, 2016.
2. S.L.Gupta, “Financial Derivatives”, Prentice Hall, 1st edition 2005.
3. S. K. Parameshwaran, “Financial Derivatives”, McGraw Hill, 1st edition, 2010.

Reference Books

1. D. C. Patwari, Options and Futures- An Indian Perspective, Jaico Publishing House, 3rd revised edition, 2006.
2. Punithavati Pandian, Security Analysis and Portfolio Management, Vikas Publishing House, 2nd edition, 2012.
3. Prasanna Chandra, Security Analysis and Portfolio Management, Tata McGrawHill, 2010.

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Specialisation - Finance

FINANCIAL INSTITUTIONS AND SERVICES

IV - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the aspects of economics those are most relevant for a career in banking and finance.
- To provide knowledge and understanding of different types of banking and financial systems in emerging countries and countries in transition.
- To provide an understanding of the theory, methodology and techniques of research in banking and finance, and also of the potential limitations of this research.

Learning Outcomes

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

- evaluate the role of technology in Federal Reserve, commercial banks, insurance companies, mutual funds, investment banks, pension funds, federal regulatory agencies, and federal and state guaranty institutions.
- understand the nature of financial intermediation and regulations carried out by the main non-bank financial sub-sectors.
- analyze differentiated markets and generalize the importance of major and minor markets in Indian industry with SEBI regulations.

UNIT - I: The Basic Theoretical Framework

the financial system and its technology, the factors, financial intermediaries and financial Innovation, RBI-central banking.

UNIT - II: Financial Institutions & Instruments

an update on the performance of IDBI, ICICI, IFCI and SFCs. role and structure of money market and capital market, call money market, treasury bill market, and commercial bill market including commercial paper and certificate of deposits, discount market, government securities market, primary and secondary market for securities, book building mechanism.

UNIT - III: Banking & Non- Banking Institutions

commercial banks – the public and the private sectors, structure and comparative performance. The problems of competition, interest rates, spreads, and NPAs. Bank capital – adequacy norms and capital market support.

Non-Banking Institutions - evolution, control by RBI and SEBI. A perspective on future role. Unit Trust of India and Mutual Funds.

UNIT - IV: Insurance

concept of insurance, need for insurance, insurance industry in India, role of IRDA, insurable risk, principles and benefits of insurance, reinsurance, LIC & GIC, General insurance and its types, Life insurance and its types.

UNIT - V: Financial Services

Asset/fund based financial services – lease finance, consumer credit and hire purchase finance, factoring definition, functions, simple problems on factoring and forfeiting, bills discounting, housing finance, venture capital financing. Fee-based / Advisory services - stock broking, credit rating, bankers to an issue, debenture trustees, portfolio managers.

Text Books

1. R.Shanmugham: “Financial Services”, Wiley India, New Delhi, 2010.
2. M.Y.Khan , “Financial Services”, Tata McGraw-Hill, New Delhi, 2004.
3. Harsh V.Verma, “Marketing of Services”, Global Business Press, 2002
4. Bhole : “Financial Institutions and Markets”, TMH, New Delhi, 2009.
5. P.K. Gupta: “Insurance & Risk Management”, Himalaya Publishing House: Mumbai.

Reference Books

1. Meir Kohn: Financial Institutions and Markets, Oxford University Press, New Delhi, 2009.
2. Sames L .Heskett, Managing In the Service Economy, Harvard Business School Press, Boston, 2001.
3. Bharti V Pathak: The Indian Financial System, Pearson Education, New Delhi, 2010.
4. H.R Machiraju, Indian Financial Systems, Vikas Publishing House Pvt. Ltd.2002.
5. Clifford Gomez: Financial Markets, Institutions and Financial Services, PHI Learning, New Delhi 2009
6. Erich A Helfert: Financial Analysis, Jaico Publication House, New Delhi2006.
7. George E. Rejda: Principles of Risk Management & Insurance, Pearson: New Delhi.

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Specialisation - HR

COMPENSATION MANAGEMENT

IV - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To understand the various dimensions of Compensation Management.
- To know how the compensation options are determined.
- To gain awareness of the role of various bodies involved in Compensation Management.

Learning Outcomes

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

- calculate compensation of an employee using various methods .
- develop an understanding of various types of wage methods.
- analyze theories of wage calculation.

UNIT - I: Compensation Management

conceptual framework of compensation management - concept and components of wages, theories of wages, subsistence theory, wage fund theory, marginal productivity theory, residual claimant theory, bargaining theory, criteria of wage fixation. methods of payment, broad banding, executive compensation, emerging trends of compensation management in IT industries.

UNIT - II: Wage Determination

principles of wage and salary administration, job evaluation - concept, scope, methods and techniques, performance based pay systems, knowledge based pay system, market based pay system, incentive based pay system, types of incentive plans, wage differentials.

UNIT - III: Payroll

salary calculation and reporting, income tax calculations and reporting, loan accounting, PF and Gratuity, Bonus, Ex-Gratia, Incentive, Superannuation 103 - arrears calculation.

UNIT - IV: Wage Administration in India

wage policy in india, methods of wage determination in India, The Pay Commission and Wage Boards - structure, scope and functions, role of collective bargaining in wage determination, the rate of minimum wages act.

UNIT - V: Benefit Programs

wage boards – pay commissions – compensation management in multi-national organizations.

Text Books

1. Richard.I. Henderson: “Compensation Management” In A Knowledge Based World – Prentice-Hall, 5th edition 1988.
2. Richard Thrope & Gill Homen: “Strategic Reward Systems” - PrenticeHall.

Reference Books

1. Thomas.P. Plannery, David.A. Hofrichter & Paul.E.Platten: People Performance & Pay – Free Press, 1st edition, 2002.
2. Michael Armstrong & Helen Murlis: Hand Book Of Reward Management – Crust Publishing House, 12th edition, 2012.
3. Joseph.J. Martocchio: Strategic Compensation – A Human Resource Management Approach – Prentice-Hall, 8th edition, 2014.
4. Edward.E.Lawler III: Rewarding Excellence (Pay Strategies for the New Economy) – Jossey-Bass.

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Specialisation - HR

MANAGEMENT OF CHANGE AND DEVELOPMENT

IV - Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

- To develop insight and competence in diagnostic and intervention processes and skills for initiating and facilitating change in organizations.
- To Gain necessary self-insight, skills and techniques to become effective change agents and internal OD consultants.

Learning Outcomes

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

- develop strategies to build a learning organization.
- analyse the principles of change and manage and sales force compensation and training.
- develop an understanding of the principles of ethical and legal issues faced by contemporary sales force.

UNIT - I: Basics of Change Management

introduction to change, stimulating forces, planned change, change agents, unplanned change, model of organisational change – Lewin's three step model.

UNIT - II: Resistance to Change

change management process, phases of the change management process, concept of resistance to change, forms of resistance, reactions to change, resistance to organizational change Initiatives, overcoming the resistance to change, techniques to overcome resistance.

UNIT - III: Concept of Organizational Culture

dimensions of culture, type of culture, assessing organizational culture, role of culture in managing change, approaches to individual change, and implications of change in individuals.

UNIT - IV: Organization Development (OD)

meaning, nature and scope of OD, dynamics of planned change, person-focused and role-focused OD interventions, planning OD Strategy – OD interventions in Indian organizations, challenges to OD.

UNIT - V: Team Building

nature and importance of teams, team Vs groups, types of teams, characteristics of virtual teams, team building life cycle, role of managers as linking pins, team building skills, virtual teams, high performance teams, self managing teams building team relationships, empowered teams.

Text books

1. Mark Hughes: "Change Management in Organizations", Jaico Publishing House, New Delhi, 1st edition, 2008.
2. Robert A Paton: "Change Management", Sage Publications, New Delhi, 3rd edition, 2008.

Reference Books

1. Cummings: "Theory of Organisation Development and Change", Cengage Learning, New Delhi, 1st edition, 2013.
2. Robert A Paton: Change Management, Sage Publications, New Delhi, 2011.
3. Nilanjan Sengupta: Managing Changing Organisations, PHI Learning, New Delhi, 2016.

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