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 intership / practical training course if he secures a minimum of 50% aggregate marks (internal & semester end examination marks put together), subject to securing a minimum of 40% marks in the semester end examination.

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

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

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

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

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

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

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

where CR = Credits of a course

GP = Grade Points awarded for a course

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

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

7.4 Eligibility for Award of B.Tech Degree:

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

i) 4 Year B.Tech Course:

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

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

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

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

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

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

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

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

The CGPA is calculated as given below:

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

where CR = Credits of a course

GP = Grade points awarded for a course

7.6 Award of Division:

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

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

7.7 Consolidated Grade Card

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

8. Supplementary Examinations

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

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

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

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

9. Conditions for Promotion

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

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

a) 4 Year B.Tech Program:

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

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

irrespective of whether the candidate takes the examination or not.

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

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

irrespective of whether the candidate takes the examination or not.

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

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

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

irrespective of whether the candidate takes the examination or not.

10. Revaluation

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

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

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

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

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

11. Re-admission Criteria

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

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

12. Break in Study

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

13. Transitory Regulations

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

Transfer candidates (from an autonomous college affiliated to JNTUK)

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

14. Withholding of Results

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

15. Malpractices

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

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

DISCIPLINARY ACTION FOR MALPRACTICES/IMPROPER CONDUCT IN EXAMINATIONS

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

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

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

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

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

16. Other Matters

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

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

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

17. General

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

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

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

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

VII. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits	% of Credits as per UGC
1	Baisc Sciences (BS)	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

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SYLLABUS

VIII. COURSE STRUCTURE

I Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	EG2501	Functional English	4	-	-	3
2	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	 EC2507 CT2512 EE2518	**Optional Elective - I** i) Biomedical Engineering ii) Computer Organisation and Architecture iii) Introduction to Quantum Mechanics for Engineers	-	-	-	3
11	EE2519	**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	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	 ME2549 CT2507 EE2528	**Optional Elective - III** i) Mechatronics ii) Object Oriented Programming Through Java iii) Control System Design	-	-	-	3
10	EE2529	**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	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	 CT2513 EC2516 EE2535	**Optional Elective - V** i) Data Base Management Systems ii) Nano Electronics iii) Solar and Wind Energy Systems	-	-	-	3
10	**EE2536**	**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 L	T	P	No.of Credits
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 L	T	P	No.of Credits
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 L	T	P	No.of Credits
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 L	T	P	No.of Credits
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 onversation **Marks: 1 x 5 = 5**

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

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

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

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

V.

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

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

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

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

Marks: 1 x 6 = 6

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

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

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

VII. Correction of grammatical errors:

- Either a conversation with twelve grammatical errors of the types dealt with in Textbook 1 (listed under F. TEXTBOOKS in Section 2), or isolated sentences with twelve grammatical errors will be given.
- The errors will include at least six typical instances of Indianism widely believed to be inappropriate in standard English.

- If isolated sentences with errors are given, they are not to be given in isolation from their contexts; a conversation with errors of the kind specified above will serve the purpose better.
- The examinees are expected to rewrite the sentences in the answer book, correcting them. **Marks: 12 x 1 = 12**

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LINEAR ALGEBRA & 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 **e**ngineering problems.
- apply 1^{st} & 2^{nd} 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 inconsistence, 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, 42^{nd} 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, 2^{nd} Edition, Excel Books, New Delhi, 2011.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 8^{th} 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 CHEMISTY

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.Kurisascose 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 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 form 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 , 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 CHEMISTY 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	: *if*-clause and Indianism
Writing	: Email writing

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

The following portions only:

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

3. From Great Stories in Easy English

"Pride and Prejudice" by Jane Austen

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

1. **From the textbook "Innovate with English": Unit VIII**

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

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

   The following portions only:

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

3. ***From Great Stories in Easy English***

   "Gulliver's Travels" by Jonathan Swift

Textbooks

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

Testing Pattern

First Mid-Term Examination

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

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

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

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

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

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

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

III.

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

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

IV.

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

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

Second Mid-Term Examination

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

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

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

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

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

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

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

III.

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

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

IV. Reading an expository text and doing two tasks:

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

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

Semester End Examination

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

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

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

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

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

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

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

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

a. Ten comprehension questions:

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

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

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

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

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

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

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

VI. Correction of grammatical errors:

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

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

VII. Reading an expository text and doing two tasks:

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

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

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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 inproper 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 Enginering -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, Mc Graw 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 - CO_2 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 dielectics - 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) – Hystyresis - 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-Ai rprevention and control of pollution) Act, 1981-Environmental(protection) Act,1986.

UNIT–VI: Waste Management

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

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

Text Books

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

Reference Books

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

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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 AndhraPradesh.

Testing Pattern

1. Internal	**40 marks**
a. Regular performance in the Communications Lab	15 marks
b. Completing the tasks in the lab manual	10 marks
c. Making a PowerPoint presentation (Pair/Group)	15 marks
(Note: A hard copy of the presentation is to be submitted)	
2. External	**60 marks**

a. Test of writing
A telephone conversation — 08 marks
The minimum number of exchanges to be specified

- Writing a resume — 10 marks

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

- Answering 3 job-interview questions — 12 marks

Questions at an elementary level. In other words, questions that require candidates to talk about themselves, their ambitions, their personality, their hobbies and interests, and their key skills.
Sample questions:
Can you tell us something about yourself?
What kinds of things do you worry about?
What are your key skills?
What skills do you need to improve?
What do you see as your strengths?
What do you like doing in your spare time?
How would you describe the way you work?
Tell us about a time when you showed strong leadership skills.
Tell us about a time when you had to make a difficult decision.
How do you see yourself in five years' time?

b. Test of speaking
Group discussion — 15 marks
Time: 10-15 minutes (approx.) per group

c. Viva voce with an external examiner — 15 marks

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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 thermsitor
- observe self timer and tuning nature of passive components like RC,LCR
- verify magnetic field along the axis of a circular coil.
- determine frequency of AC and unknown tuning fork
- calculate light gathering power of optical fiber
- estimate wavelength of unknown source

List of Experiments

S.No.	Name of the experiment- Aim
1	Determination of 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(1^{st} 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, it's 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 roads, 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 MATAB.
- 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 diagnal of a given Cuboid.
2. Determination of 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, Willey 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 & MaheswariSultan 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. Bhimbra, 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, Div (D) = ñ, work done in moving a point charge in an Electrostatic field

UNIT III: Conductors – Dielectrics

Electric Dipole - Dipole moment, Potential and EFI 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, div(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, Curl(H)=Jc, 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, Curl (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

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

Course Content

UNIT - I: Introduction.

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

UNIT - II: Surveying

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

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

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

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

UNIT - III: Building Materials and Construction

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

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

UNIT - IV: Water Resources

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

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

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

UNIT - VI: Transportation Engineering

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

Text Books

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

Reference Books

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

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Open Elective - I

BUILDING SERVICES

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Water Quality, Treatments and Distribution

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

UNIT - II: Waste Water, Treatments and Disposal

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

UNIT - III: Room Acoustics

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

UNIT - IV: Electrical Services

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

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

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

General Methods of Thermal Insulation: Thermal insulation of roofs, exposed walls. **Ventilation:** Definition and necessity,system of ventilation. Principles of air conditioning, Air cooling, Different systems of ducting and distribution, Essentials of air-conditioning system.

UNIT - VI: Fire Fighting Services

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

Text Books

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

Reference Books

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

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Open Elective - I

ELECTRICAL MATERIALS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Dielectic Materials

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

UNIT - II: Ferromagnetic Materials

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

UNIT - III: Magnetic Materials

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

UNIT - IV: Semiconductor Materials

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

UNIT - V: Materials for Electrical Applications

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

UNIT - VI: Special Purpose Materials

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

Text Books

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

Reference Books

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

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Open Elective - I

CONTROL SYSTEMS ENGINEERING

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Introduction

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

UNIT - II: Control Systems Components

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

UNIT - III: Time Response Analysis

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

UNIT - IV: Stability Analysis in S-Domain

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

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

UNIT - V: Frequency Response Analysis

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

UNIT - VI: State Space Analysis of Continuous Systems

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

Text Books

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

Reference Books

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

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Open Elective - I

ELEMENTS OF MANUFACTURING PROCESSES

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I

Introduction: Classification of manufacturing processes

Sand Casting: steps involved in making casting

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

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

UNIT - II

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

Casting defects – Cause and Remedies.

UNIT - III

Metal Joining Processes:- Classification of Metal joining processes

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

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

Types of Arc Welding Processes: SMAW, TIG, MIG

UNIT - IV

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

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

Welding Allied Processes: Soldering, Brazing and Braze welding

UNIT - V

Metal Forming: Classification of metal working processes.

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

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

Extrusion – Classification of Extrusion process, Impact Extrusion

UNIT – VI

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

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

Text Books

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

Reference Books

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

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Open Elective - I

AUTOMOTIVE ENGINEERING

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I

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

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

UNIT - II

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

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

UNIT - III

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

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

UNIT - IV

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

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

UNIT - V

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

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

UNIT - VI

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

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

Text Books

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

Reference Books

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

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Open Elective - I

INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: 8086 Microprocessor

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

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

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

UNIT - III: Interfacing with 8086

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

UNIT - IV: Interrupt Structure and Serial Communication

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

UNIT - V: Introduction to 8051 Microcontroller

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

UNIT - VI: Interfacing with 8051

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

Text Books

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

Reference Books

1. Barry B.Brey, "The Intel Microprocessors", PHI, 7^{th} Edition, 2006.
2. Liu and GA Gibson, "Micro Computer System 8086/8088 Family Architecture. Programming and Design", PHI, 2^{nd} Edition.
3. Kenneth. J. Ayala, "The 8051 Microcontroller", 3^{rd} 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", 4^{th} Edition. TMH.

Reference Books

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

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Open Elective - I

COMPUTER GRAPHICS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Introduction

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

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

UNIT - II: 2-D Geometrical Transforms

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

UNIT - III: 2D Viewing

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

UNIT - IV: 3D Geometric Transformations

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

UNIT - V: Visible Surface Detection Methods

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

UNIT - VI: Computer Animation

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

Text Books

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

Reference Books

1. Foley, VanDam, Feiner, Hughes, "Computer Graphics Principles and Practice", 2^{nd} 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", 7^{th} edition, TMH.
2. Sachin Malhotra, Saurabh Choudhary, "Programming in Java", 2^{nd} edition, Oxford.

Reference Books

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

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Open Elective - I

SYSTEMS SOFTWARE

II Year – II Semester

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

Course Objective

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

Learning Outcomes

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

- outline the relationship between system software and machine architecture.
- analyze working of assembler for a simplified Instructional computer.
- describe the important features of linkage Editors and Dynamic Linking .
- identify the mostly used macro processors algorithms and data structures.
- compare the functions of Absolute Loader , Bootstrap Loaders.

UNIT - I: Introduction

System software and machine architecture, The Simplified Instructional Computer (SIC), Machine architecture, Data and instruction formats, addressing modes, instruction sets, I/O and programming System.

UNIT - II: Assemblers

Basic assembler functions, SIC assembler, assembler algorithm and data structures, machine dependent assembler features.

UNIT - III: Implementation of Assemblers

Instruction formats and addressing modes, program relocation, machine independent assembler features, literals, symbol, defining statements, expressions, one pass assemblers, multi pass assemblers, implementation example, MASM assemble.

UNIT - IV: Loaders

Basic loader functions, design of an absolute loader, simple bootstrap loader, machine dependent loader features, relocation, loader options, loader design options, bootstrap loaders.

UNIT - V: Linkers

Program linking, algorithm and data structures for linking loader, machine independent loader features, automatic library search, linkage editors, dynamic linking, implementation example, MS DOS linkers.

UNIT - VI: Macro Processors

Basic macro processor functions, macro definition and expansion, macro processor algorithm and data structures, machine independent macro processor features, concatenation of macro parameters, generation of unique labels, conditional macro expansion.

Text Book

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd edition, Pearson Education Asia, 2000.

Reference Book

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", 2nd Revised edition, Tata McGraw-Hill, 1999.
2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 1972.

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Open Elective - I

WEB PROGRAMMING

II Year – II Semester

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

Course Objectives

- To develop real time web applications.
- To get acquainted with skills for creating websites and web applications by learning various technologies like HTML, CSS, JavaScript, XML, JSP and JDBC.

Learning Outcomes

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

- identify HTML tags with their purpose
- develop User Interface for web applications using HTML and CSS.
- design dynamic web pages using Java Script.
- use XML for storing data.
- design JSP applications
- apply the concept of sharing data between dynamic web pages
- create pure Dynamic web application using JDBC
- describe the usage of JDBC API

UNIT - I: HTML & CSS

HTML –HTML versions**,** Basic HTML Tags, working with Lists, Tables, Forms, Frames,div, Images, Navigation.

UNIT - II: Cascading Style sheets

CSS rules, Types of CSS, Selectors ,CSS Properties for Styling Backgrounds, Text, Fonts, Links, and Positioning.

UNIT - III: Java Script

Introduction to Java Script, Variables, Data types, Functions, Operators, Control flow statements, Objects in Java Script with examples.

UNIT – IV: XML

Basic building blocks, DTD and XML Schemas, XML Parsers- DOM and SAX, using CSS with XML and XML AJAX.

UNIT - V: JSP

Basic of a JSP Page, JSP Processing, Generating Dynamic Content-Using Scripting Elements, Implicit JSP Objects, Declaring Variables and Methods, Passing Control and Data between pages, creation of Session

UNIT - VI: Database Access

JDBC Drivers, Database Programming using JDBC, Accessing a database from a JSP Page.

Text Books

1. Web Technologies, "Black book", Kogent Learning Solutions, Dreamtech press.
2. Chris Bates, "Web Programming: building internet applications", WILEYDreamtech, 2nd edition.

Reference Books

1. Uttam K Roy, "Web Technologies", Oxford.
2. John Duckett, "Beginning Web Programming".
3. Wang Thomson, "An Introduction to web design and Programming".

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Open Elective - I

MATHEMATICAL CRYPTOGRAPHY

II Year – II Semester

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

Course Objectives

- To give a simple account of classical number theory, prepare students towards the concepts of Network Security and to demonstrate applications of number theory (such as public-key cryptography).
- To students will have a working knowledge of the fundamental definitions and theorems of elementary number theory, be able to work with congruences.
- To solve congruence equations and systems of equations with one and more variables.
- To students will also have an exposure to cryptography.

Learning Outcomes

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

- understand the properties of divisibility and prime numbers, compute the greatest common divisor and least common multiples and handle linear Diophantine equations.
- understand the operations with congruences, linear and non-linear congruence equations.
- understand and use the theorems: Chinese Remainder Theorem, Lagrange theorem, Fermat's theorem, Wilson's theorem.
- use arithmetic functions in areas of mathematics.
- understand continue fractions and will be able to approximate reals by rationals.
- understand the basics of RSA security and be able to break the simplest instances.

Course Content

UNIT - I: Divisibility

Greatest common divisor, Fundamental theorem of arithmetic, Congruence, Residue classes and reduced residue classes, Euler's theorem, Fermat's theorem, Wilson Theorem, Chinese remainder theorem with applications.

UNIT - II: Polynomial Congruences

Primitive roots, Indices and their applications, Quadratic residues, Legendre symbol, Euler's criterion, Gauss's Lemma, Quadratic reciprocity law, Jacobi symbol.

UNIT - III: Arithmetic Functions

ϕ(x), d (x), μ(x), σ (x) , Mobius inversion formula, LinearDiophantine equations

UNIT - IV: Farey Series

Continued fractions, Approximations of reals by rationals, Pell's equation.

UNIT - V: Introduction to Cryptography

Encryption schemes, Cryptanalysis, Block ciphers, Stream ciphers.

UNIT - VI: Public Key Encryption

RSA cryptosystem and Rabin encryption.

Text Books

1. Jeffrey Hoffstein, Jill Pipher, Joseph H. Silverman, **An Introduction to Mathematical Cryptography**, springer, second edition (2014).
2. Gilbert Baumslag, Benjamin Fine, Martin Kreuzer, A Course in Mathematical Cryptography, Walter de Gruyter GmbH & Co KG(2015).

Reference Books

1. Hardy and Wright W.H., **Theory of Numbers**, Oxford University Press (1979).
2. Niven I., Zuckerman S.H. and Montgomary L.H., **An Introduction to Theory of Numbers**, John Wiley and Sons (1991).

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Open Elective - I

SEMICONDUCTOR PHYSICS

II Year – II Semester

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

Course Objectives

- To know the physics and applications of semi conductor.
- To understand fundamental principles and applications of the electronic and optoelectronic.

Learning Outcomes

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

- classify semi conductors.
- discuss photonic devices.
- Interpret formation of band structure.

Course Content

UNIT - I: Electronic Materials (8)

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirecT bandgaps, Types of electronic materials: metals, semiconductors, and insulators.

UNIT - II: Semiconductors (10)

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentrationand temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift

UNIT - III: Light-Semiconductor Interaction (6)

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulateD Emission.

UNIT - IV: Engineered Semiconductor Materials (6)

Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Hetero junctions and associated band-diagrams

UNIT - V: Photo Detectors (6)

Types of semiconductor photo detectors -p-n junction, PIN, and Avalanche and their structure, materials, working principle, and characteristics, Noise limits on performance; Solar cells.

UNIT - VI: Semiconductor Light Emitting Diodes

Rate Equation for carrier density - Radiative and non-radiative recombination mechanisms in semiconductor - LED: device structure, material, characteristics and figures of merit.

Text Books

1. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).

Reference Books

1. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
2. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
3. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
4. Online course: “Semiconductor Optoelectronics” by M R Shenoy on NPTEL
5. Online course: “Optoelectronic Materials and Devices” by Monica Katiyar and Deepak Gupta on NPTEL.

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DIGITAL CIRCUIT DESIGN LAB

II Year – II Semester

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

Course Objectives

- To get acquaint 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 impartthe knowledge on the patient monitoring displays, diagnosis & techniques.

Learning Outcomes

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

- know the concept of bio-medical engineering, evolution, age, development, advancements and applications.
- get awareness on noval theory related to human body and various components.
- analyze the operation of measuring the cardio-vascular system by knowing its inner organization, sensor and transducer theory & plethysmographical concepts.
- learn the principles of respiration and respiratory therapy equipment.
- understand the fundamental principles & techniques of diagnosys and bio-telemetry, monitors, recorders

Course Content

UNIT - I: Introduction to Bio-Medical Instrumentation

Man instrumentation system-introduction & components, physiological system of the body, sources of bio-electric potentials, resting & action potentials,Electro-Cardiogram(ECG),Electro-Encephalogram(EEG), Electro Myogram (EMG),envoked responses.

UNIT - II: Electrodes & Transducers

Bio-potential electrodes, basic transducers-transduction principles, biochemical transducers, active & passive transducers, transducers of bio-medical applications, pulse sensors, respiration sensors.

UNIT - III: Cardio-Vascular System & Respiratory System Measurements

The heart & cardiovascular system, Electro-Cardiography, blood pressure measurement, measurement of blood flow & cardiac output, the physiology of the respiratory system, tests & instrumentation for the mechanics of breathing, respiratory therapy equipment.

UNIT - IV: Patient Care & Monitoring

Elements of intensive care monitoring, patient monitoring displays, diagnosis, calibration & repair ability of patient monitoring equipment, organization of the hospital for patient care monitoring, pace-makers, defibrillators.

UNIT - V: Diagnostic Techniques & Bio-Telemetry

Principles of ultrasonic measurement, Ultrasonic Imaging, Ultrasonic Diagnosis X-Ray & Radio-Isotope Instrumentations CAT Scan, Emission Computerized Tomography, MRI, Introduction & components of bio-telemetry system.

UNIT - VI: Monitors, Recorders & Shocking Hazards

Monitors, recorders, shock hazards & prevention, physiological effects & electrical equipment, methods of accident prevention, isolated power distribution system.

Text Books

1. Onkar N. Pandey, Rakesh kumar, "Bio-Medical Electronics and Instrumentation", S. K. Kataria & Sons, 2007.
2. Cromewell, Wiebell, P.feiffer, "Biomedical instrumentation and measurements", Prentice-Hall, 1973.

Reference Books

1. Joseph J.Carr, John M.Brown, "Introduction to Bio-Medical Equipment Technology", Pearson Publications, 4th Edition.
2. Khandapur, "Handbook of Bio-Medical Instrumentation", TMH, 2nd Edition.

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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.
- demonistrate various operations on fixed and floating point numbers.
- summarize different data transfer techniques.
- demonistrate 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 Engnieering 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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Professional Elective - I

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, 3rd editon.
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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Professional Elective - I

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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Professional Elective - I

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

1^{st} order low-pass Butterworth filter, 1^{st} 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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Professional Elective - I

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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Open Elective - II

GEOINFORMATICS

III Year – I Semester

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

Course objectives

- To introduce the basic concepts and principles of remote sensing.
- To familiarize with structure and function of Geographic Information Systems.
- To illustrate the multidisciplinary nature of Geospatial applications.

Learning Outcomes

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

- relate the scientific theories to the behaviour of electromagnetic spectrum.
- distinguish between different types of satellites and identify appropriate remote sensing data products for mapping, monitoring and management applications.
- interpret Satellite images and processed outputs for extracting relevant information.
- structure the concept of a spatial decision support system in its analog and digital forms.
- perform tasks related to building a GIS database with location, attribute and meta-data.
- list and elaborate applications of Geoinformatics in various fields.

Course Content

UNIT - I: Electro-Magnetic Radiation (EMR), its interaction with Atmosphere & Earth

Definition of remote sensing and its components – Electromagnetic spectrum, wavelength regions important to remote sensing, wave theory, particle theory, Stefan-Boltzmann and Wien's Displacement Law – Atmospheric scattering, absorption, atmospheric windows, spectral signature concepts, typical spectral reflective characteristics of water, vegetation and soil.

UNIT - II: Platforms and Sensors

Types of platforms, orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors, resolution concept, payload description of important Earth Resources and Meteorological satellites – Airborne and Space-borne TIR (Thermal Infrared Radiation) and microwave sensors

UNIT - III: Image Interpretation and Analysis

Types of Data Products – types of image interpretation, basic elements of image interpretation, visual interpretation keys – Digital Image Processing, pre-processing, image enhancement techniques – multispectral image classification, supervised and unsupervised

UNIT - IV: Geographic Information System

Introduction to Maps, definitions, map projections, types of map projections, map analysis – GIS definition, basic components of GIS, standard GIS software's – Data types, spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems(DBMS).

UNIT - V: Data Entry, Storage and Analysis

Data models, vector and raster data – data compression – data input by digitisation and scanning – attribute data analysis – integrated data analysis – modelling in GIS for scenario analysis and planning.

UNIT - VI: RS and GIS Applications

Land cover and land use, agriculture, forestry, urban applications, hydrology, flood zone delineation & mapping, groundwater prospects & recharge, reservoir storage estimation.

Text Books

1. Remote Sensing and Geographical Information Systems, M.Anji Reddy, 4^{th} Edition, B.S.Publications.
2. Remote Sensing and GIS, Basudeb Bhatta, 2^{nd} Edition, Oxford University Press.

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman , 7^{th} Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5^{th} Edition (2014), Springer.

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Open Elective - II

ENVIRONMENTAL SANITATION

III Year – I Semester

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

Course Objectives

- To communicate the importance of institutional sanitation in maintaining public health.
- To introduce the strategies for maintaining healthy living and working environment.
- To delineate the role of environmental engineer in industrial environments.

Learning Outcomes

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

- identify the common communicable diseases and the solutions for controlling them.
- suggest appropriate sanitation measures for water supply and sanitation in un-sewered areas.
- describe the process of refuse disposal in rural areas.
- draw out the procedures adopted for maintaining hygiene in institutional buildings.
- list out the occupational comfort parameters to be considered for designing built environment.
- introduce the notion of occupational health, safety and the related management approaches.

Course Content

UNIT - I: Epidemics, Epizootics

Origin and spread of Communicable diseases like Cholera, Smallpox, Tuberculosis, Malaria, Filaria, and Plague, common methods (nose, throat, intestinal discharges) – Role of Public Health Engineering in the preventive aspects of the above diseases – Role of vectors in transmitting diseases and Rodent control methods.

UNIT - II: Rural water supply and Sanitation

Sanitary protection of wells, springs, economic methods of treatment – Excreta disposal systems – Types of sanitary privies.

UNIT - III:Refuse Sanitation

Quality and quantity of garbage, rubbish, ashes, street sweepings, night soil; methods of conveyance and sanitary disposal methods, latest technologies adopted to dispose off the solid wastes.

UNIT - IV: Food Hygiene and Sanitation

Milk and milk products, sanitary maintenance of catering, establishment, measures– Sanitary requirements and maintenance of the public utility services like schools, hospitals, offices and in other public buildings.

UNIT - V:Ventilation, Air Conditioning And Light

Composition of ambient air, air pollutants, bacteria, odours – Effective Temperature – Comfort standards of ventilation, air interchange, natural ventilation, artificial ventilation, air conditioning – Measurement of light, illumination standards, natural lighting, artificial lighting.

UNIT - VI: Occupational Health and Safety

Occupational hazards in public buildings, schools, hospitals, eating establishments, swimming pools – Cleanliness and maintenance of comfort – Industrial plant sanitation – OHSAS 18001 and the WELL Building Standard and rating for built environment.

Text Books

1. Municipal and Rural Sanitation, Victor M.Ehlers, Ernest W. Steel, 6th Edition, McGraw Hill
2. Environmental Sanitation, Joseph A. Salvato, Nelson L. Nemerow, Franklin J. Agardy , 5th Edition, John Wiley and Sons
3. OHSAS 18001 Manual
4. WELL Rating System Manual

Reference Books

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen, Samuel A Vigil,McGraw Hill.
2. Not in my backyard – Solid Waste Management in Indian Cities, Sunita Narain, Jain Book Agency.
3. National Building Code of India, Bureau of Indian Standards.

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Open Elective - II

MODELING AND SIMULATION OF ENGINEERING SYSTEMS

III Year – I Semester

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

Course Objectives

- To familiarize with programming skills using basic MATLAB and its associated tool boxes.
- To impart knowledge on building SIMULINK and Graphical user interface.

Learning Outcomes

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

- develop MATLAB programme for the solution of engineering system.
- build a SIMULINK model and GUI to simulate engineering system and asses its performance.
- solve and visualize the dynamic performance of engineering systems through MATLAB tool boxes.
- compute and analyse the data of a physical system using advanced programming methods in MATLAB.

Course Content

UNIT - I: Variables, scripts, and operations

Getting Started, Scripts, Making Variables, Manipulating Variables, Basic Plotting

UNIT - II: Visualization and programming

Functions, Flow Control, Line Plots, Image/Surface Plots, Vectorization

UNIT - III: Solving equations and curve fitting

Linear Algebra, Polynomials, Optimization, Differentiation/Integration, Differential Equations

UNIT - IV: Advanced methods

Probability and Statistics, Data Structures, Images and Animation, Debugging, Online Resources

UNIT - V: Symbolics, Simulink®, file I/O, building GUIs

Symbolic Math, Simulink, File I/O, Graphical User Interfaces

UNIT - VI:

Examples on statistics, optimization, plots

Text Books

1. “Getting started with MATLAB” by Rudra pratap, Oxford University, 2002.
2. MATLAB and SIMULINK for Engineers by Agam Kumar Tyagi, OUP 2011

Reference Books

1. Spencer, R.L. and Ware, M (2008), Introduction to MATLAB, Brigham Young Unviersity, available online, accessed, 7, 2008.
2. David F.Griffiths, October (2012) “An introduction to MATLAB” the Unviersity of Dundee, available online, Acessed, October 2012.

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Open Elective - II

POWER SYSTEMS ENGINEERING

III Year – I Semester

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

Course Objectives

- To introduce the working of power plants in power generation and layout of substations.
- To familiarize with the concepts of corona, insulators and sag in overhead lines.

Learning Outcomes

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

- describe the operation of thermal power station.
- describe the operation of nuclear and hydel power plants.
- distinguish various bus bar arrangements in substation
- analyze the phenomenon of corona.
- determine the sag in over head lines

Course Content

UNIT - I: Thermal Power Stations

Single line diagram of Thermal Power Station showing paths of coal, steam, water, air, ash and flue gasses-Brief description of TPS components: Economizers, Boilers, super heaters, Turbines ,condensers, chimney and cooling towers.

UNIT - II: Nuclear Power Stations

Working principle, Nuclear fuels. Nuclear reactor Components: Moderators, Control roads, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR.

UNIT - III: Hydal power stations

Selection of site, block diagram approach of hydro electric power plant and classification of pumped storage power plants.

UNIT - IV: Air insulated substations

Equipments used in substations, Classification of substations: - Indoor & Outdoor substations: Single line diagram of substation. Bus bar arrangements and their classification.

UNIT - V : Overhead Line Insulators and Corona

Types of Insulators, String efficiency and methods for improving string efficiency, Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss.

UNIT - VI: Sag and Tension Calculations

Sag and Tension calculations with equal and unequal heights of towers, effect of Wind and Ice on weight of Conductor, Stringing chart and sag template and its applications.

Text Books

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd., 1999.

Reference Books

1. Principles of Power Systems by V.K Mehta and Rohit Mehta S.Chand& Company Ltd.New Delhi 2004.
2. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.
3. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.

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Open Elective - II

ELEMENTS OF MECHANICAL TRANSMISSION

III Year – I Semester

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

Course Objectives

- To familiarize with the principles of mechanical power transmission elements

Learning Outcomes

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

- Identify suitable shaft couplings for a given application.
- describe various transmission elements like belts, ropes and chain drives.
- Explain different thread profiles and applications of power screws
- explain the working of various gears, gear trains and gear box.

Course Content

UNIT - I: Shaft Couplings

Shaft couplings: Rigid couplings – Muff, split muff and flange couplings, Flexible coupling-Modified Flange coupling

UNIT - II: Belt Drives

Flat Belts: Introduction, Selection of a Belt Drive, Types of Belt Drives, Length of Belts, Materials, Belt Joints, Types of Flat Belt Drives, Power transmitted.

UNIT - III: V-Belt, Rope Drives & Chain Drives

V-belts: Introduction, Types of V-belts, Ratio of Driving Tensions for V-belt, Power transmitted.

Rope Drives: Introduction, Classification of rope drives, Power transmitted

Chain drives: Introduction, Chain drives, Polygonal effect, Selection of roller chains, length of chain.

UNIT - IV: Power Screws

Forms of Threads, Multi-start Threads, Right Hand and Left Hand Threads, nut, compound screw, differential screw

UNIT - V: Gears and Gear trains

Types, terminology, materials, law of gearing, velocity of sliding, forms of teeth, path of contact, arc of contact, interference, Gear Trains - Types, differential of an automobile.

UNIT - VI: Gearbox

Introduction, types, constant mesh gearbox, sliding type gear box, single and multi stage gear box

Text Books

1. Design of machine elements by Bhandari, Tata McGraw Hill book Co.3rd Edition,2010.
2. Machine Design by P.C. Sharma & D.K. Agarwal. 4th Edition-1996.S.K.Kataria & Sons

Reference Book

1. Design of Machine Elements by Sharma & Purohit ,PHI, 10th Edition,2011.
2. Design of Machine Elements by Kannaiah.5th Edition,1999.Scitech Publication.

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Open Elective - II

MATERIAL HANDLING EQUIPMENT

III Year – I Semester

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

Course Objectives

- To provide knowledge on materials handling equipment.

Learning Outcomes

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

- understand the basic concepts of material handling equipments.
- illustrate the working principle of conveyors, industrial trucks, hoppers, hoists and cranes.

UNIT - I: Introduction

Types of industrial transport – classification and characteristics of materials – classification and selection of materials handling.

UNIT - II: Conveyor Equipment

Classification of conveyors – description and uses of belt – conveyors – apron conveyors -Roller conveyors – water – screw conveyors – pneumatic and hydraulic conveyors, Computer controlled conveyor system.

UNIT - III: Industrial Trucks

Industrial trucks – main types – purpose of hand trucks – tractors and trailers – self propelled trucks – fork trucks , Automated guided vehicles.

UNIT - IV: Auxiliary Equipment

Hoppers and gates – uses, auxiliary equipment – feeders – chutes – uses.

UNIT - V: Hoisting Appliances

types, description and uses of chain – ropes – types and description and purpose of crane hooks – Grab buckets, lifts – excavators.

UNIT - VI: Cranes

Hand-propelled and electrically driven E.O.T overhead Traveling, cranes; Traveling mechanisms of cantilever and monorail cranes.

Text Books

1. Conveyor Equipment Manufacturer's Association, "*Belt conveyors for bulk materials*" 6th edition, The New CEMA Book.
2. Rudenko N., "*Materials handling equipment*", Elnvee Publishers, 1970
3. Ishwar G Mulani and Mrs. Madhu I Mulani, "*Engineering Science and application design for belt conveyor*", Madhu I. Mulani, 2002.

Reference Books

1. Spivakovsy A.O. and Dyachkov V.K., "*Conveying Machines, Volumes I and II*", MIR Publishers, 1985.
2. Alexandrov, M., "*Materials Handling Equipments*", MIR Publishers, 1981.
3. Boltzharol, A.,"*Materials Handling Handbook*", The Ronald press company 1958.

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Open Elective - II

AUTOMOTIVE ELECTRONICS

III Year – I Semester

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

Course Objectives

- To familiarize with the electronic systems inside an automotive vehicle.
- To introduce the concepts of advanced safety systems.

Learning Outcomes

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

- learn the fundamentals of automotive technology.
- describe the operation of microcomputer systems.
- acquire knowledge in automotive sensors and control systems.
- develop communications & navigation/routing in automotive vehicles.

Course Content

UNIT - I: Automotive Fundamentals

Use of electronics in the automobile, evolution of automotive electronics, the automobile physical configuration, evolution of electronics in the automobile, survey of major automotive systems, engine control or electronic control unit, ignition system.

UNIT - II: Automotive Micro-Computer System

Binary number system, binary counters, Microcomputer fundamentals-digital versus analog computers, basic computer block diagram, microcomputer operations, CPU registers, accumulator registers, condition code register-branching; microprocessor architecture, memory-ROM, RAM; I/O parallel interface, digital to analog converter and analog to digital converters with block diagram.

UNIT - III: Basics of Electronics Engine Control

Motivation for electronic engine control, exhaust emissions, fuel economy, concept of an electronic engine control system, engine functions and control, electronic fuel control configuration, electronic ignition with sensors.

UNIT - IV: Sensors and Actuators

Introduction; basic sensor arrangement; types of sensors such as oxygen sensors, crank angle position sensors, fuel metering/vehicle speed sensors and detonation sensors, altitude sensors, flow sensors, throttle position sensors, solenoids, stepper motors, actuators – fuel metering actuator, fuel injector, and ignition actuator.

UNIT - V: Electronic Vehicle Management System

Cruise control system, antilock braking system, electronic suspension system, electronic steering control, and transmission control, safety: air bags, collision avoidance radar warning system with block diagram, low tire pressure warning system, advanced cruise control system.

UNIT - VI: Automotive Instrumentation System

Speech synthesis, sensor multiplexing, control signal multiplexing with block diagram, fibre optics inside the car, automotive internal navigation system, GPS navigation system, voice recognition cell phone dialling.

Text Books

1. William B. Ribbens, "Understanding Automotive Electronics", SAMS/Elsevier Publishing, 6th Edition. (UNIT I to VI).
2. Robert Bosch Gambh, "Automotive Electrics Automotive Electronics Systems and Components", John Wiley& Sons Ltd., 5th edition, 2007.

Reference Books

1. Ronald K Jurgen, "Automotive Electronics Handbook", 2nd Edition, McGraw-Hill, 1999.
2. G. Meyer, J. Valldorf and W. Gessner, "Advanced Microsystems for Automotive Applications", Springer, 2009.
3. Robert Bosch, "Automotive Hand Book", SAE, 5th Edition, 2000.

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Open Elective - II

INTRODUCTION TO MEMS

III Year – I Semester

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

Course Objectives

- To introduce lithography principles, mechanical sensors and actuators.
- To make it known the thermal sensors and actuators, magnetic sensors and actuators.
- To present formally micro fluidic systems and chemical and bio medical micro systems.

Learning Outcomes

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

- define MEMS, lithography methods, sensors and actuators.
- describe the principles of MOEMS technology and its applications.
- elucidate different magnetic sensing and detection for MEMS.
- apply sensing principles and mechanisms the chemical and bio medical micro systems.

Course Content

UNIT - I: Introduction

Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

Mechanical Sensors and Actuators: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT - II: Thermal Sensors and Actuators

Thermal energy basics and heat transfer processes, thermistors, thermo devices, thermo couple, micro machined thermo couple probe, Peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

UNIT - III: Micro-Opto-Electro Mechanical Systems

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT - IV: Magnetic Sensors and Actuators

Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT - V: Micro Fluidic Systems

Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, optoelectro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps. RADIO FREQUENCY (RF) MEMS: RF based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

UNIT - VI: Chemical and Bio Medical Micro Systems

Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (E-nose), mass sensitive chemosensors, fluroscence detection, calorimetric spectroscopy.

Text Book

1. Nitaigour Premchand Mahalik “MEMS”, TMH Publishing co.

Reference Books

1. Chang Liu “Foundation of MEMS”, Prentice Hall Ltd.
2. Sergey Edwrd Lyshevski “MEMS and NEMS”, CRC Press, Indian Edition.
3. Tai-Ran Hsu “MEMS and Micro Systems: Design and Manufacture”, TMH Publishers.
4. Richard A Layton, Thomas M Adams “Introductory MEMS”, Springer International Publishers.

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Open Elective - II

DATA SCIENCE

III Year – I Semester

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

Course Objectives

- To familiarize with statistical methods to analyze data using classification, graphical and computational methods
- To introduce Data Wrangling approaches and descriptive analytics on large data sets.

Learning Outcomes

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

- apply statistical methods to data for inferences.
- analyze data using Classification, Graphical and computational methods.
- describe Data Wrangling approaches.
- perform descriptive analytics over massive data.

Course Content

UNIT - I: Introduction and Linear Regression

Overview of random variables and distributions, statistical learning, assessing model accuracy, descriptive statistics, dependent and independent events

Linear Regression: Simple and multiple linear regressions, comparison of linear regression with k-nearest neighbors.

UNIT - II: Hypothesis Testing

Simple Hypothesis testing, student's t-test, paired t and u test, correlation and covariance, tests for association.

UNIT - III: Graphical Analysis

Histograms and frequency polygons, box-plots, quartiles, scatter plots, heat maps.

UNIT - IV: Computational Methods

Programming for basic computational methods such as Eigen values and Eigen vectors, sparse matrices, QR and SVD.

UNIT - V: Data Wrangling

Data acquisition, data formats, imputation, the split-apply-combine paradigm.

UNIT - VI: Descriptive Analytics

Data warehousing and OLAP, data summarization, data de-duplication, data visualization using CUBEs.

Text Book

1. Gareth James, Trevor Hastie, Robert Tibshirani, Daniela Witten, "An Introduction to Statistical Learning with Applications in R".

Reference Book

1. Mark Gardener, "Beginning R The statistical Programming Language", Wiley.

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", WileyPublications,2003.
2. Steve Suchring, "MySQL Bible", John Wiley, 2002

Reference Books

1. RasmusLerdorf and Levin Tatroe, "Programming PHP", O'Reilly, 2002.
2. Steven Holzner, "PHP: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.
3. VikramVaswani, "MYSQL: The Complete Reference", 2nd Edition, TataMcGraw –Hill Publishing Company Limited, Indian Reprint 2009.

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Open Elective - II

CYBER LAWS

III Year – I Semester

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

Course Objectives

- To expose the need of cyber laws to prosecute cybercrimes in the society.
- To familiarize with Licensing Issues Authorities for Digital Signatures.

Learning Outcomes

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

- outline the pros and cons of Internet.
- operate on confidential data in a precautious manner.
- discuss Criminal Justice in India and its Implications.
- interpret the Cyber Consumers under the consumer Protection Act.
- devise the legal framework for Confidential Information.
- determine the e-commerce issues for copyright protection and defend personal data from being hacked.

Course Content

UNIT - I: The IT Act, 2000- A Critique

Crimes in this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce?,Forgetting the Line between Cognizable and Non - Cognizable Officers, Arrest for"About to Commit" an Offence Under the IT Act, A Tribute to Darco, Arrest But NoPunishment.

UNIT - II: Cyber Crime and Criminal Justice

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

UNIT - III: Cyber Criminality Strategies and Trends

Network Service Providers, Jurisdiction and CyberCrimes, Nature of Cyber Criminality Strategies to Tackle Cyber Crime and Trends,Criminal Justice in India and Implications.

UNIT - IV: Digital Signatures, Certifying Authorities and e-Governance

Introduction to Digital Signatures, Certifying Authorities and Liability in the Eventof Digital Signature compromise, E - Governance in the India. A Warming toBabudom, Are Cyber Consumers Covered under the Consumer Protection, Goodsand Services, Consumer Complaint Defect in Goods and Deficiency in ServicesRestrictive and Unfair Trade Practices

UNIT - V: Traditional Computer Crime

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

UNIT - VI: Web Based Criminal Activity

Interference with Lawful Use of Computers, Malware, DoS (Denial of Service) andDDoS (Distributed Denial of Service) Attacks, Spam ,Ransomware and Kidnappingof Information, Theft of Information, Data Manipulation, and Web EncroachmentOnline Gambling Online Fraud, Securities Fraud and stock Manipulation, Ancillarycrimes

Text Books

1. Vivek Sood, " Cyber Law Simplefied", Tata McGraw Hill.
2. Marjie T. Britz, "Computer Forensics and Cyber Crime", Pearson

Reference Book

1. Cyber Laws Texts and Cases, Ferrera, CENGAGE.

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Open Elective - II

QUALITY, RELIABILITY AND OPERATIONS RESEARCH

III Year – I Semester

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

Course Objectives

- To equip students with basic practical skills with sufficient theory.
- To understand the principles involved in the application area.
- To develop the power of systematic thinking and reasoning, practical approach and exposition in the students.

Learning Outcomes

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

- Construct the control charts to understand whether the process is under control.
- Solve various problems regarding quality and life testing of a given product(s).
- Form the real life situations/practical problems into LPP.
- Apply various algorithms like graphical method, simplex method, Charne's method, Hungarian method etc.
- Find the optimal Transportation cost and optimal assignment policy.
- Appreciate Travelling Salesman Problem.
- Identify the job sequence to the given situation and to find the total elapsed time.

Course Content

UNIT - I: Statistical Process Control

Importance of Statistical Quality Control (SQC) in industry, Statistical basis of Shewart Control Charts, Construction of control charts for variables and attributes (with fixed and varying sample sizes), Interdependence of control charts, Natural tolerance limits and specification limits, process capability index, concept of Six sigma and its importance.

UNIT - II: Accepting Sampling Plans

Producer's Risk and Consumer's Risk, Concept of AQL and LTPD. Single and Double Sampling plans for attributes and derivation of their OC and ASN functions, design of single and double sampling plans for attributes using Binomial distribution.

UNIT - III: Reliability

Introduction, Hazard function, Exponential distribution as life model, its memory less property, Reliability function and its estimation, concepts of censoring and truncation, system reliability - series, parallel and k out of N systems and their reliabilities.

UNIT - IV: Linear Programming

Meaning and scope of OR, Convex sets and their properties. Definition – general LPP, formulation of LPP, solution of LPP by Graphical method, Simplex algorithm, concept of degeneracy and resolving it, concept of duality , duality as LPP, Dual-Primal relationships.

UNIT - V: Transportation Problem

Definition of Transportation problem(TP) – TP as a special case of LPP, Feasible solutions by North-west corner rule, Matrix minima method, Vogel's Approximation method. Optimal solution through MODI tableau method for balanced and unbalanced TPs. Degenercy in TP and resolving it.

UNIT - VI: Assignment and Sequencing Promlems

Description of Assignment problem(AP) and its variations, AP as a special case of TP and LPP (both balanced and unbalanced cases), Optimum solution by Hungarian method. Travelling salesman problem.

Introduction to Sequencing problem, optimum sequence of N jobs on two an three machines (without passing).

Text Books

1. Kanti Swaroop, P. K. Gupta and Man Mohan: Operations Research, Sultan Chand Company.
2. L. S. Srinath: Reliability Engineering, Affiliated East-West Press.
3. Parimal Mukhopadhyay: Applied Statistics, New Central Book Agency.
4. Gass: Linear Programming, Mc Graw Hill.
5. R. C. Gupta: Statistical Quality Control.

Reference Books

1. V. K. Kapoor and S. C. Gupta: Fundamentals of Applied Statistics, Sultan Chand.
2. S. K. Sinha: Reliabilty and Life Testing
3. S. M. Ross: Probability Models, Harcourt India Pvt. Ltd.
4. D. C. Montgomory: Introduction to Statistical Quality Control, Wiley.
5. Hadly: Linear Programming, Addison – Wiley.
6. Taha: Operation Research: An Introduction, Mac Millan.
7. Wayne L. Wiston: Operations Research, Thomson, India edition, 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. Histand 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 - 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 Eidtion, 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, Willey 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 –120^0 and 180^0 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, 4^{th} 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 GillispieMazidi 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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Professional Elective - II

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 Mc-Graw Hill, 2007.

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Professional Elective - II

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 (RTlevel), 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, 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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Professional Elective - II

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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Professional Elective - Ii

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-SengGan, 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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Open Elective - III

HYDROLOGY

III Year – II Semester

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

Course Objectives

- To impart the knowledge of essential components of the hydrologic cycle
- To provide an overview and understanding of Unit Hydrograph theory and its analysis.
- To familiarize with different methods of flood frequency analysis and flood routing.
- To impart knowledge on groundwater movement and well hydraulics
- To familiarize with the relationships between soil, water and plant and their significance in planning an irrigation system

Learning Outcomes

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

- measure and analyze the rainfall in any given area and develop intensity-duration-frequency curves.
- quantify the abstractions from precipitation and the factors affecting
- determine runoff in a catchment and prepare the unit hydrograph which in-turn determines the runoff for any given rainfall
- estimate flood magnitude and carry out flood routing
- determine hydraulic properties of an aquifer and specific capacity, efficiency and yield of a well
- choose appropriate method of irrigation for different crops and cropping patterns and determine the quality and quantity of water required for a crop

Course Content

UNIT - I: Hydrologic Cycle

Introduction: Engineering hydrology and its applications, Hydrologic cycle. Precipitation: Types and forms of precipitation, rainfall measurement, types of rain gauges, rain gauge network, average rainfall over a basin, consistency of rainfall data, frequency of rainfall, intensity-duration-frequency curves, probable maximum precipitation.

UNIT - II: Abstractions

Abstractions: Evaporation, factors affecting evaporation, measurement of evaporation, evaporation reduction, evapotranspiration, factors affecting evapotranspiration, measurement of evapotranspiration - Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

UNIT - III: Runoff

Runoff :Factors affecting runoff ,components of runoff, computation of runoff-rational and SCS methods, separation of base flow ,Unit Hydrograph, assumptions, derivation of Unit Hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of UH

UNIT - IV: Floods

Floods-Causes and effects, flood frequency analysis-Gumbel's method, flood control methods, flood routing-hydrologic routing, hydraulic routing, channel and reservoir routing- Muskingum method of routing

UNIT - V Ground Water

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT - VI: Irrigation

Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, water logging and drainage, standards of quality for Irrigation water, principal crops and crop seasons, crop rotation.

Text Books

1. Engineering Hydrology, P. Jayaram Reddy, third edition, Laxmi publications
2. Irrigation and water power engineering, B.C. Punmia, Pande B.B Lal, Ashok Kumar Jain & Arun Kumar Jain sixteenth edition, Laxmi publications.

Reference Books

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

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Open Elective - III

PLANNING FOR SUSTAINABLE DEVELOPMENT

III Year – II Semester

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

Course Objective

- To familiarize the concept of sustainable development
- To introduce various components of sustainable development

Learning Outcomes

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

- explain the importance of sustainable development
- use various strategies for promoting sustainable development
- analyze important current issues and areas of debate in relation to sustainable development.
- implement policy responses in environmental degradation.

Course Content

UNIT - I: Introduction

Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability,

UNIT - II: Key Components in Sustainable Development

Strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.

UNIT - III: Innovation for Sustainable Development

Innovation for sustainable development- Environmental management and innovation strategies.

UNIT - IV: Theories of Sustainable Development

Societal transformations.Institutional theory.

UNIT - V: Governance and Policy Response

Governance for sustainable development.Policy responses to environmental degradation.

UNIT - VI: Research in Sustainable Development

Capacity development for innovation.Research methods.

Text Books

1. Basic Principles for Sustainable Development,Harris, J.M, 2004.
2. Some thoughts on the idea of sustainable development Ecological Economics, Robinson, J. (2004), 48(4): 369-384.

Reference Books

1. Navigating towards Sustainable Development: A System Dynamics Approach, Hjorth, P. and A. Bagheri (2006), Futures 38: 74-92.
2. Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs ,Mog, J.M. (2004), World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure
3. Global Development and Environment Institute, working paper 00-04. Available at:http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF.

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Open Elective - III

ELECTRICAL AND HYBRID VEHICLES

III Year – II Semester

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

Course Objectives

- To introduce the concepts on working principles of electric drives used for different hybrid electric vehicles.
- To familiarize with the different energy storage systems and their management strategies.

Learning Outcomes

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

- describe hybrid vehicles and their performance
- analyze various power converter configurations of hybrid electric drives.
- analyze and suggest possible energy storage systems for different applications.
- apply the appropriate energy management strategies for various applications.

Course Content

UNIT - I: Introduction to Hybrid Electric Vehicles

History of hybrid and electric vehicles, electric vehicles, impact of modern drive-trains on energy supplies.

UNIT - II: Hybrid Electric Drive-trains

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies

UNIT - III: Electric Drive-trains

Basic concept of electric traction Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC and AC Motor drives

UNIT - IV: Energy Storage

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis.

UNIT - V: Hybridization of different energy storage devices

Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine, sizing the power electronics, selecting the energy storage technology.

UNIT - VI: Energy Management Strategies

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Text Books

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015

Reference Books

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

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Open Elective - III

POWER PLANT INSTRUMENTATION

III Year – II Semester

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

Course Objectives

- To provide an overview of different methods of power generation with a particular stress on thermal power generation.
- To impart knowledge on the different types of control loops.

Learning Outcomes

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

- describe the constructional details, working principles of various generating stations.
- analyze the working of different types of controls and control loops.
- choose various measurements involved in power generation plants.
- understand the knowledge about the different types of devices used for analysis.

Course Content

UNIT - I: Overview Of Power Generation

Brief survey of methods of power generation – hydro, thermal, nuclear, solar and wind power – importance of instrumentation in power generation – thermal power plants – building blocks – details of boiler processes UP&I diagram of boiler – cogeneration.

UNIT - II: Measurements In Power Plants

Electrical measurements – current, voltage, power, frequency, power – factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor.

UNIT - III: Analyzers In Power Plants

Flue gas oxygen analyser – analysis of impurities in feed water and steam – dissolved oxygen analyser – chromatography – PH meter – fuel analyser – pollution monitoring instruments.

UNIT - IV: Control Loops In Boiler

Combustion control – air/fuel ratio control – furnace draft control – drum level control – main stem and reheat steam temperature control – super heater control – attemperator –deaerator control – distributed control system in power plants – interlocks in boiler operation.

UNIT - V: Turbine – Monitoring And Control

Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control – cooling system

UNIT - VI: Analysis in Power Plant

Thermal conductive type, paramagnetic type-Oxygen analyzer, hydrogen purity meter-chromatography – PH meter,fuel analyzer, pollution monitoring and control

Text Books

1. Sam G. Dukelow, 'The control of Boilers', Instrument Society of America,1991.
2. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.
3. E.L Wakil, M.M./Power Plant technology/Mc Graw Hill 1984.
4. J.Balasubramaniam & R.K Jain/Modern Power Plant Engineering/Khanna

Reference Books

1. Elonka,S.M.and Kohal A.L.Standard Boiler Operations, McGraw-Hill, New Delhi,1994.
2. R.K.Jain, Mechanical and industrial Measurements, Khanna Publishers, New Delhi, 1995.

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Open Elective - III

MATERIAL SCIENCE

III Year – II Semester

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

Course Objectives

- to understand the properties of engineering materials, so as to manipulate them for the desired engineering applications.

Learning Outcomes

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

- compare the different types of conductors and semi conductors and their applications
- classify magnetic materials based on their parameters
- understand the applications of dielectric principles in engineering devices.
- propose a corrosion prevention technique for a particular application
- summarize the different optical properties of metallic materials
- apply different characterization techniques for validation of metals.

Course Content

UNIT - I: Conductors, Semi Conductors and Resisters

Resistivity, Range of Resistivity- free electron theory - classical theory & quantam theory. Semiconducting materials: Energy gap in solids - intrinsic semi conductors - extrinsic semi conductors - element & compund semi conductors - crystal structure - growth & purification of semi conductor crystals.

UNIT - II: Magnetic Materials

Magnetic Materials: Classification of magnetic materials based on spin - Hard and soft magnetic materials - Dia, Para & Ferro types, atomic magnetic moment - anti ferro magnetism.

UNIT - III: DIELECTRIC MATERIALS

Dielectric Materials: Dielectric susceptability - complex die electric constant - Polarization mechanisms in dielectrics - Frequency and temperature dependence of polarization mechanism - Dielectric loss - Dielectric waveguide and dielectric resonator antenna - Piezoelectric, pyroelectric and ferroelectric materials and their applications.

UNIT - IV: Optical Properties of Materials

Introduction - electromagnetic radiation - light interactions with solids - Refraction, Reflction, Absorption, Transmission, Opacity & Translucency in insulators - Luminescence - Photo conductivity.

UNIT - V: Corrosion & Oxidation

Corrosion: Principles of corrosion - electrode potential - galvanic series - galvanic cell - polarization - passivation - electro chemical considerations - corrosion rate - forms of corrosion - corrosion prevention.

Oxidation: Mechanisms of oxidation - oxidation resistant materials.

UNIT - VI: Materials Characterization

X-ray diffraction, Neutron diffraction and Electron diffraction - X-ray fluorescence spectroscopy - Thermogravimetric Analysis (TGA) - Differential Thermal Analysis (DTA) - Differential Scanning Calorimetry (DSC).

Text Books

1. V. Raghavan, "Materials Science and Engineering", PHI Learning Publication, 5th edition.
2. Rajendran, V. "Materials Science",Tata McGraw- Hill,New Delhi,2011.

Reference Books

1. William D. Callister, "Materials Science and Engineering" 9th ed., John Wiley and sons, Incorporated.
2. Sam Zhang, "Materials Characterization Techniques", CRC Press.
3. J. M. D. Coey, "Magnetism and Magnetic Materials", Cambridge University Press.

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Open Elective - III

RENEWABLE ENERGY SOURCES

III Year – II Semester

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

Course Objectives

- To study various types of non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

Learning Outcomes

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

- analyze the significance of renewable energy.
- describe the principles of solar radiation and design the solar collectors.
- know the functioning of basic components of wind energy and understand the utilization of biomass in power generation.
- discuss the working principles of geothermal, ocean, tidal and wave energy techniques.
- know the functioning of direct energy conversion techniques.

Course Content

UNIT - I: Introduction

Energy Sources and their availability, Role and potential of renewable source.

Principles of Solar Radiation: Solar constant, Solar Radiation outside the Earth's atmosphere, Solar Radiation at the Earth's surface, instruments for measuring solar radiation, solar radiation geometry, solar radiation on titled surfaces with numerical problems.

UNIT - II: Solar Energy Storage and Applications

Different methods, sensible, latent heat and stratified storage, solar ponds. Solar Applications-solar heating/cooling technique, solar distillation, drying, photovoltaic energy conversion, solar central power tower concept and solar chimney. solar collectors- flat plate, concentric collectors.

UNIT - III: Wind Energy

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

Bio-Mass: Biomass Energy Sources, methods for obtaining energy from biomass, Biomass gasification.

UNIT - IV:

Geothermal Energy: Resources, types of wells, methods of harnessing the energy.

Ocean Energy: OTEC, Principles, utilization, setting of OTEC plants, thermodynamic cycles.

Tidal and wave energy: Potential and conversion techniques, Mini-hydel power plants

UNIT - V:

Direct Energy Conversion (DEC): Need for DEC, limitations, principles of DEC. Thermoelectric Power – See-beck, Peltier, Joule -Thomson effects, Thermo-electric Power generators.

UNIT - VI: MHD Power Generation

Principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion.

Fuel cells: Principles, Faraday's laws, thermodynamic aspects, selection of fuels and operating conditions, applications.

Text Books

1. Tiwari and Ghosal, "Renewable energy resources", Narosa.
2. B.H.Khan "Non – conventional Energy Resources" Tata McGraw Hill education Pvt Ltd.

Reference Books

1. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons
2. Twidell & Weir, "Renewable Energy Sources " Sukhatme, "Solar Energy", Tata McGraw-Hill Education.

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Open Elective - III

ASSISTIVE TECHNOLOGIES

III Year – II Semester

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

Course Objectives

- To introduce different assistive technology devices
- To familiarize with the concepts of enhance speech communication and independent living.

Learning Outcomes

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

- identify the legislative policies connected with assistive Technologies
- know the universal design principles in the context of general education environments and curriculum materials.
- explore the process for finding the right technology and the right applications and determine how to pay for it.

Course Content

UNIT - I: Introduction to Assistive Technology (AT) Devices and Services

Assistive technology defined, historical overview of assistive technology, multidisciplinary nature of service provision.

UNIT - II: Adaptations Framework for Considering Assistive Technology

Introduction to the adaptations framework, setting-specific demands, person-specific characteristics, adaptations, evaluation of effectiveness of adaptations.

UNIT - III: Assistive Technology Assessments

Overview of assessment issues, overview of general assessments, assistive technology assessments, assessment components.

UNIT - IV: Enhance Speech Communication

Nature of spoken language, introduction to augmentative and alternative communication systems, selection techniques for aided communication systems, overview of non-electronic systems and electronic devices.

UNIT - V: Mobility and Access to Information

Introduction to mobility adaptations, basic design considerations, seating and positioning issues, introduction to information access, computer access, telecommunication, listening and print access.

UNIT - VI: Enhance Independent Living

Introduction to independent living, devices for daily life, switches and scanning, environmental control units, access to management devices.

Text Books:

1. Diane P edrotty Bryant, Brian R. Bryant, Allyn and Bacon "Assistive Technology for People with Disabilities", 2^{nd} 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, 2^{nd} 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 imparte the knowledge on the patient monitoring displays, diagnosis & techniques.

Learning Outcomes

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

- know the concept of bio-medical engineering, evolution, age, development, advancements and applications.
- get awareness on noval theory related to human body and various components.
- analyze the operation of measuring the cardio-vascular system by knowing its inner organization, sensor and transducer theory & plethysmographical concepts.
- learn the principles of respiration and respiratory therapy equipment.
- understand the fundamental principles & techniques of diagnosys and bio-telemetry, monitors, recorders.

Course Content

UNIT - I: Introduction to Bio-Medical Instrumentation

Man instrumentation system-introduction & components, physiological system of the body, sources of bio-electric potentials, resting & action potentials,Electro-Cardiogram(ECG),Electro-Encephalogram(EEG), Electro Myogram (EMG),envoked responses.

UNIT - II: Electrodes & Transducers

Bio-potential electrodes, basic transducers-transduction principles, biochemical transducers, active & passive transducers, transducers of bio-medical applications, pulse sensors, respiration sensors.

UNIT - III: Cardio-Vascular System & Respiratory System Measurements

The heart & cardiovascular system, Electro-Cardiography, blood pressure measurement, measurement of blood flow & cardiac output, the physiology of the respiratory system, tests & instrumentation for the mechanics of breathing, respiratory therapy equipment.

UNIT - IV: Patient Care & Monitoring

Elements of intensive care monitoring, patient monitoring displays, diagnosis, calibration & repair ability of patient monitoring equipment, organization of the hospital for patient care monitoring, pace-makers, defibrillators.

UNIT - V: Diagnostic Techniques & Bio-Telemetry

Principles of ultrasonic measurement, Ultrasonic Imaging, Ultrasonic Diagnosis X-Ray & Radio-Isotope Instrumentations CAT Scan, Emission Computerized Tomography, MRI, Introduction & components of bio-telemetry system.

UNIT - VI: Monitors, Recorders & Shocking Hazards

Monitors, recorders, shock hazards & prevention, physiological effects & electrical equipment, methods of accident prevention, isolated power distribution system.

Text Books

1. Onkar N. Pandey, Rakesh kumar, "Bio-Medical Electronics and Instrumentation", S. K. Kataria & Sons, 2007.
2. Cromewell, Wiebell, P.feiffer, "Biomedical instrumentation and measurements", Prentice-Hall, 1973.

Reference Books

1. Joseph J.Carr, John M.Brown, "Introduction to Bio-Medical Equipment Technology", Pearson Publications, 4th Edition.
2. Khandapur, "Handbook of Bio-Medical Instrumentation", TMH, 2nd Edition.

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Open Elective - III

NODE AND ANGULAR JS

III Year – II Semester

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

Course Objectives

- To familiarize with defining own custom AngularJS directives that extend the HTML language
- To introduce the concepts of client-side services that can interact with the Node.js web server
- To understand the best practices for server -side JavaScript

Learning Outcomes

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

- develop single page applications that reduces app's time to market without plugins.
- identify the services, modules and directives to subdivide application logic into modules and share code across apps
- explain the routing process in angular for managing URL's.
- interpret command line applications in Node.js that allows developers a more maintainable code
- develop code with use of Node.js and JSON services for web applications.
- examine how error events affect piped streams and handling events in Node.js

UNIT - I: Introduction to Node.js and JSON

Introduction, operators, decision and iterative statements, Node.js collections: create array object, insert, access, update and remove data. JSON:Create JSON object, display, access and edit data. JSON Array: Creation, display, access and edit data. Check JSON attribute.

UNIT - II: Node.js Files, Functions and Strings

File modules, reading text, creating file. Functions: creating function, types of functions, callback function. Strings: operations, string to numeric and vice-versa, string parser.

UNIT - III: Node.js Modules, Error Handling & Logging and Events

Create simple module, module class. Error handling and logging. Events: Events module, once event listener, remove events.

UNIT - IV: Introduction to Angular

Introduction to TypeScript (TS), node package manager, introduction to Angular 4, create angular application using TS and angular CLI, webpack, gulp introduction.

UNIT - V: Elements in Angular

Angular components, controllers, modules, dependency injection, angular service, providers and directives, pipes and filters, Angular forms-Reactive, lifecycle hooks.

UNIT - VI: Routing in Angular

Routing-module, component, lazy loading of components, apply route guards-security, Angular material design.

Text Books

1. Andrew Grant, “Beginning AngularJS”, Apress Publishers.
2. Agus Kurniawan, “Nodejs Programming By Example”, PE Press.

Reference Books

1. Ken Williamson,”Learning AngularJS: A Guide to AngularJS Development”, O’Relly Media.
2. Matt Frisbie, “AngularJS Web Application Development Cookbook”, Packt Publishing Ltd.
3. David Herron, “Node.js Web Development”, 4th edition, Packt Publishing Ltd.
4. Marc Wandschneider, “Learning Node.js: A Hands-On Guide to Building Web Applications in JavaScript”, Addison Wesley.

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Open Elective - III

CYBER SECURITY

III Year – II Semester

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

Course Objectives

- To understand security concepts, Ethics in Network Security.
- To familiarize with new algorithms (mathematical formulas) and statistical measures that assesses relationships among members of large data sets.
- To identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks, and apply those to design and evaluate counter measure tools.
- To gain knowledge on security threats, and the security services and mechanisms to counter them.

Learning Outcomes

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

- outline management framework.
- describe various tools that can be used in cyber security management.
- write a secure access client for access to a server.
- determine firewall requirements, and configure a firewall.
- employ policies and standards to solve security problems.
- use security techniques in an organisational context.

UNIT - I: Systems Vulnerability Scanning

Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks vulnerability scanning - Netcat, understanding port and Services tools-Datapipe, Fpipe, Network reconnaissance –Nmap, THC-Amap. Network sniffers and injection tools–Tcpdump and Windump.

UNIT - II: Network Defence Tools

Firewalls and packet filters: Firewall basics, packet filter vs firewall, how a firewall protects a network, packet characteristic to filter, stateless vs stateful firewalls, network address translation (NAT) and port forwarding, the basic of virtual private networks, Snort: Intrusion detection system.

UNIT - III: Web Application Tools

Scanning for web vulnerabilities tools: Nikto, HTTP utilities-Curl, OpenSSL and stunnel, password cracking and Brute-Force tools–John the Ripper,L0phtCrack, pwdump, HTC-Hydra.

UNIT - IV: Introduction to Cyber Crime and Law

Cyber crimes, types of cyber crime, hacking, attack vectors, cyberspace and criminal behavior, clarification of terms, traditional problems associated with computer crime.

UNIT - V: Introduction to Incident Response

Digital forensics, computer language, network language, realms of the cyber world, a brief history of the Internet, recognizing and defining computer crime, contemporary crimes, computers as targets, contaminants and destruction of data, Indian IT ACT 2000.

UNIT - VI: Introduction to Cyber Crime Investigation

Firewalls and packet filters, password cracking, keyloggers and spyware, virus and worms, Trojan and backdoors, steganography, attack on wireless networks.

Text Books

1. Mike Shema, “Anti-Hacker Tool Kit (Indian Edition)”, Publication Mc Graw Hill.
2. Computer forensics and cyber crime : an introduction by Marjie T. Britz.

Reference Books

1. James Graham, Ryan Olson, Rick Howard, “Cyber Security essentials”, 1st edition.
2. Chwan-Hwa (John) Wu, J. David Irwin, “Introduction to Computer Networks and Cybersecurity”.
3. Nina Godbole and Sunit Belpure, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Publication Wiley.

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Open Elective - III

SCRIPTING LANGUAGES

III Year – II Semester

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

Course Objectives

- To familiarize with JQuery, JSON, PERL, Ruby, AJAX to develop client-side and server-side web applications.

Learning Outcomes

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

- use jQuery with DOM to manipulate HTML elements, attributes and CSS.
- store and exchange data between server and browser using JSON.
- develop PERL scripts using arrays, hashes, control structures and subroutines.
- write Ruby scripts usingdata types, arrays, hashes, control structures and classes.
- retrieve data from a database using PHP and AJAX.

Course Content

UNIT - I : jQuery

Introduction, Selectors, Events, Effects, Manipulating HTML and CSS using jQuery

UNIT - II: JSON

Introduction, Syntax rules, JSON Vs XML, Data types, Objects, Arrays, Parsing JSON and using stringify() function

UNIT - II: Introduction to PERL

Basic syntax, Perl language elements: variables, operators, control flow statements, Arrays, Hashes and File handling; Regular expressions, Subroutines

UNIT - IV: Working with PERL

Packages and modules, Working with files, Retrieving documents from the web with Perl.

UNIT - V: Ruby

Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, classes, Iterators, Pattern Matching. Overview of Rails.

UNIT - VI: AJAX A New Approach

Introduction, Creating XMLHttpRequest object, Integrating AJAX with PHP, Retrieving data from a database using PHP and AJAX, Handling XML data using PHP and AJAX.

Textbooks

- Kogent , HTML 5 Black Book, 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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Open Elective - III

SOFTWARE PROJECT MANAGEMENT

III Year – II Semester

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

Course Objectives

- To introduce plan and manage projects at each stage of the software development life cycle (SDLC).
- To impart effective software projects that support organization's strategic goals.

Learning Outcomes

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

- analyze the different software projects.
- prepare project plans that address real time management challenges.
- relate important risks facing a new project.
- design effective software development model to meet organizational needs.
- recognize appropriate methodology to develop a project schedule.
- apply appropriate techniques to assess ongoing project performance.

Course Content

UNIT - I: Conventional Software Management

The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness.

UNIT - II: Principles of Modern Software Management

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT - III: Checkpoints and Process Planning

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating.

UNIT - IV: Project Organizations

Project Organizations And Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Process Automation: Automation Building blocks.

UNIT - V: Project Control and Process Instrumentation

The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation, T**ailoring the Process**- Process discriminants.

UNIT - VI: Future Software Project Management

Modern Project Profiles, Next generation Software economics, modern process transitions.

Text Books

1. Walker Royce,Software Project Management, Pearson Education, 2005.

Reference Books

1. Bob Hughes and Mike Cotterell, Software Project Management, Tata McGraw-Hill Edition.
2. Joel Henry, Software Project Management, Pearson Education.
3. PankajJalote, Software Project Management in practice, Pearson Education, 2005.

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Open Elective - III

ELEMENTS OF STOCHASTIC PROCESSES

III Year – II Semester

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

Course Outcomes

- To study and understand the systems which evolve randomly over time, especially in long run.
- To survey the important tools of stochastic processes.
- To model and solve engineering problems arising in real life situations.

Learning Outcomes

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

- formulate and solve probabilistic problems using random variables.
- distinguish between Poisson process and the exponential random variable and apply this knowledge to solve problems involving memory less processes.
- use renewal theory to solve problems where Poisson is not a realistic processes.
- ise Markov chain is discrete and continuous time to solve queuing problems.

Course Content

UNIT - I: Generating Functions

Introduction, Definitions and elementary results, Convolutions, Compound distributions, Partial fraction expansions, Moment and cumulant generating functions.

UNIT - II: Recurrent Events

Definitions, Basic theorems, Delayed recurrent events.

Random Walk Models: Introduction, Gambler's Ruin, Probability distribution of ruin at nth trial and extensions.

UNIT - III: Markov Chains

Introduction, Notation and definition, classification of states, classification of chains, Evaluation of P^n (transition probability matrix)

UNIT - IV: Markov Process

Discrete and continuous – The Poisson process, Use of generating functions, Random variable technique, Solution of linear partial deferential equations.

UNIT - V: Homogeneous and Non-Homogeneous Birth and Death Processes

Introduction, simple birth process, general birth process, divergent birth processes. Simple death process, simple birth and death processes, the effect of immigration, the general birth and death process, multiplication processes. Polya process, a simple non-homogeneous birth and death process. The effect of immigration.

UNIT – VI: Queuing process

Introduction, Equilibrium theory, Queues with many servers, Monte carlo methods in appointment systems, Non-equilibrium treatment of a sample queue, First passage times, Diffusion process.

Text Book

1. The Elements of Stochastic Processes, Norman T.J. Bailey.

Reference Book

1. Stochastic Processes, J. Mehdi

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Open Elective - III

ACADEMIC COMMUNICATION

III Year – II Semester

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

Course Objectives

- To acquaint the students with the process and elements of academic writing.
- To help them gain accuracy in the academic writing tasks they will be called upon to perform as part of their graduate and postgraduate studies.
- To empower them to carry out academic writing tasks such as project report writing with success.

Learning Outcomes

Upon successful completion of the course, the student will be able to produce successful academic writing tasks (such as designing and reporting a survey/project, writing discussion essays, and composing formal letters) with attention to:

- the writing process involving a good understanding of the purpose and the register as well as organizational strategies such as introduction, main body, conclusion, paragraphing;
- the elements of academic writing such as argument, cause and effect, cohesion and coherence, generalizations, references, style, and visual information; and
- the kind of accuracy, technical as well as grammatical, that writing in academic contexts demands

Course Content

I. The Writing Process

a. Background to writing

i. The purpose of academic writing

ii. Common types of academic writing

iii. The features of academic writing

iv. Writing in paragraphs

b. From understanding to planning

i. The planning process

ii. Analyzing essay titles

iii. Brainstorming

c. Organizing paragraphs

i. Paragraph structure | ii. Development of ideas

iii. Linking paragraphs together

d. Introductions and conclusions

i. Introduction contents | ii. Introduction structure

iii. Opening sentences | iv. Conclusions

e. Re-writing and proof-reading

i. Re-writing | ii. Proof-reading

II. Elements of Writing

a. Cohesion

i. Reference words | ii. Preventing confusion

b. Comparisons

i. Comparison structures | ii. Forms of comparison

iii. Using superlatives

c. Style

i. Components of academic style | ii. Guidelines

d. Visual information

i. The language of change | ii. Types of visuals

iii. Describing visuals | iv. Labelling

III. Accuracy in Writing

a. Academic vocabulary | b. Remedial grammar

c. Punctuation

IV. Writing Models

a. Formal/Professional emails | b. CVs

c. Reports | d. Scholarly essays

Suggesting Reading

1. Bailey, Stephen. (2011). *Academic Writing A Handbook for International Students*. Routledge: London.

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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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Optional Elective - V

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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Optional Elective - V

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 elementfrom a new bus to reference– Addition of element from a new bus to an oldbus– 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-Guass-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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Professional Elective - III

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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Professional Elective - III

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 andsequential 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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Professional Elective - III

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 semiand 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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Professional Elective - III

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 Warms, 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”, 2ndedition, Pearson Eduction, 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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Professional Elective - IV

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-Distructive 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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Open Elective - IV

DISASTER MANAGEMENT

IV Year – I Semester

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

Course Objectives

- To familiarize with disaster occurrence, strategies and remedial measures.

Learning Outcomes

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

- explain the aspects of disaster management and various types of disasters.
- assess and evaluate the impact of hazards on structures.
- identify the vulnerability conditions against disasters.
- adopt the rehabilitation procedures.

Course Content

UNIT - I: Introduction

Concept of Disaster Management.Types of Disasters.Disaster mitigating agenciesand their organizational structure at different levels.

UNIT - II: Overview of Disaster Situations in India

Vulnerability of profile of India and Vulnerability mapping including disaster – prone areas, communities, places. Disaster preparedness – ways and means; skillsand strategies; rescue, relief reconstruction. Case Studies: Lessons andExperiences from Various Important Disasters in India

UNIT - III: Flood and Drought Disaster

Raising flood damage, assessing flood risk, flood hazard assessment, flood impactassessment, flood risk reduction options. Drought and development, reliefmanagement and prevention, drought mitigation and management-integratingtechnology and people.

UNIT - IV: Landslide and Earthquake Disaster

Land slide hazards zonation mapping and geo environmental problems associatedwith the occurrence of landslides. The use of electrical resistivity method in thestudy of landslide.Causes and effects of earth quakes. Secondary effects. Criteria for earthquake resistant design.

UNIT - V: Cyclone and Fire Disaster

Cyclone occurrence and hazards.Cyclone resistant house for coastal areas.Disaster resistant construction role of insurance sector.Types of fire. Fire safetyand fire fighting method, fire detectors , fire extinguishers.

UNIT - VI: Rehabilitation

Rehabilitation programmes, Management of Relief Camp, information systems &decision making tools

Text Books

1. Disaster Management – Future Challenges and Opportunities, Jagbir Singh, 2007, I K International Publishing House Pvt. Ltd.
2. Disaster Management – Global Challenges and Local Solutions, Rajib shah & R R Krishnamurthy, 2009, Universities press.

Reference Books

1. Disaster Science & Management, Tushar Bhattacharya, 2012, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. Disaster Management, H K Gupta, 2003, Universities press.
3. Natural Disaster management, Jon Ingleton, Leigh Trowbridge,1999, Tudor Rose Holdings Ltd.

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Open Elective - IV

REPAIR AND RETROFITTING TECHNIQUES

IV Year – I Semester

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

Course Objectives

- To familiarize with durability aspects, quality of concrete causes of deterioration.
- To impart the knowledge on inspection and assessment of distressed structures, strengthen measures and demolition procedures.
- To familiarize with various concrete materials for repairs, and various precautions during retrofitting.

Learning Outcomes

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

- identify and evaluate the degree of damage in structures.
- explain the cause of deterioration of concrete structures.
- point out the causes of distress in concrete
- explain the concept of Serviceability and Durability.
- assess damage to structures and select suitable retrofitting and repair techniques
- apply different materials for repairing

Course Content

UNIT - I: Assessment, Maintenance and Repair Strategies

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT - II: Serviceability and Durability of Concrete

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness and cracking.

UNIT - III: Materials for Repair

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete.

UNIT - IV: Techniques for Repair and Protection Methods

Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Expoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and catholic protection. Engineered demolition techniques for dilapidated structures.

UNIT - V: Repair, Rehabilitation and Retrofitting of Structures

Repairs to overcome low member strength.Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

UNIT - VI: Work Site Safety

General safety-vehicles, eye and ear protection, clothing; Tool safety-drills and bits, power saws, power mixers, ladders, screwdrivers and chisels; co-worker safety.

Text Books

1. Concrete Structures, Materials, Maintenance and Repair, Denison Campbell, Allen and Harold Roper, edition-1991, Longman Scientific and Technical UK.
2. Repair of Concrete Structures, Allen R.T. & Edwards S.C, edition-1991 Blakie and Sons, UK.

Reference Books

1. Concrete Technology-Theory and Practice, M.S.Shetty, Edition-2006 S.Chand and Company.
2. Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures, Ravishankar.K, Krishnamoorthy.T.S, Edition-2004, Allied Publishers.
3. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers Edition-2004.
4. Hand book on Repair and Rehabilitation of RCC buildings, Published by CPWD, Delhi, Edition-2002.
5. Repair and protection of concrete structures, Noel P.Mailvaganam, Edition-1991 CRC Press London.

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Open Elective - IV

MODERN OPTIMIZATION TECHNIQUES

IV Year – I Semester

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

Course Objectives

- To familiarize with the concepts of evolutionary optimization
- To introduce the principles of soft computing optimization algorithes such as Genetic Algorithm, Particle Swarm Optimization, Differential Evolution and Ant Colony Optimization.

Learning Outcomes

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

- distinguish the various optimization techniques.
- describe the concepts of various optimization techniques.
- develop suitable algorithms for the implementation of optimization techniques.
- apply suitable optimization technique to solve various engineering optimization problems

Course Content

UNIT - I: Definition-Classification Of Optimization Problems

Unconstrained and Constrained optimization-Optimality conditions, Evolution in nature-Fundamentals of Evolutionary algorithms- Evolutionary Strategy and Evolutionary Programming.

UNIT - II: Genetic Algorithm

Basic concepts- search space- working principle -encoding-fitness function -Genetic Operators-Selection: Roulette-wheel, Boltzmann, Tournament, Rank and Steadystate-Elitism- Crossover: single-pint, two-point, multi-point, uniform, matrix and cross over rate, mutation, mutation rate.

UNIT - III: Variations of GA & PSO

Variations of GA: Adaptive GA and Real coded GA - Issues in GA implementation-Particle Swarm Optimization: Introduction- Fundamental principles of Particle Swarm Optimization-Velocity Updating-Advanced operators-Parameter selection.

UNIT - IV: Variations of PSO

Implementation issues-Convergence issues, Multi-objective PSO (Dynamic neighbourhood PSO-Vector evaluated PSO)-Variations of PSO: weighted, repulsive, stretched, comprehensive learning, combined effect PSO and clonal PSO.

UNIT - V: Differential Evolution

Introduction-Fundamental principles of Differential Evolution- different strategies of differential evolution-function optimization formulation-mutation and crossover operators-estimation and selection-Discrete Differential Evolution.

UNIT - VI: Ant Colony Optimization

Introduction-Fundamental principles of Ant colony optimization-Ant foraging behaviour-initialization-transition strategy-pheromone update rule- applications.

Text Books

1. Kalyanmoy Deb, "Multi objective optimization using Evolutionary Algorithms",John Wiley and Sons, 2008.
2. E. Goldberg, Genetic Algorithms in search, Optimization and machine learning,1989
3. Particle Swarm Optimization, An overview by Riccardo Poli, James Kennedy,Tim Blackwell, pringer
4. Differential Evolution, A Practical Approach to Global Optimization, Authors:Price, Kenneth, Storn, Rainer M., Lampinen, Jouni A. , Springer
5. Ant Colony Optimization by Marco Dorigo, Thomas Stutzle, MIT Press.

Reference Books

1. "Modern optimization techniques with applications in Electric Power Systems", Soliman Abdel Hady, Abdel Aal Hassan Mantawy, Springer,2012.
2. 'Introduction to Genetic Algorithms", M. Mitchell, Indian reprint, MIT press Cambridge, 2nd edition, 2002.
3. R.C. Eberhart, Y.Sai and J. Kennedy, Swarm Intelligence , The Morgan Kaufmann Series in Artificial Intelligence, 2001.
4. "Biomimicry for optimization, Control and Automation, K.M. Passino, Springer-Verlag, London, UK, 2005.
5. "New Optimization Techniques in Engineering, G. C. Onwubolu, & B. V. Babu,Springer- Verlag Publication, Germany, 2003.

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Open Elective - IV

ELECTRICAL POWER UTILIZATION

IV Year – I Semester

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

Course Objectives

- To familiarize with the mechanics of train movement.
- To impart knowledge on various heating methods and laws of illumination.
- To familiarize with the concepts of refrigeration and air-conditioning.

Learning Outcomes

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

- analyze the appropriate type of traction system.
- select a suitable method of heating for a given application.
- design an illumination system.
- calculate the required tonnage capacity for a given air-conditioning system.
- select a suitable charging method.
- evaluate domestic wiring connection and debug any faults occured.

Course Content

UNIT - I: Electrical Traction

Features of an Ideal Traction System, Systems of Electrical Traction, Traction Supply System, Mechanism of Train Movement, Speed- Time Curve, Traction Motors, Tractive Effort and Horse Power, Speed Control Schemes, Electric Braking,Recent Trends in Traction.

UNIT - II: Electric Heating

Classification, Heating Element, Losses in Oven and Efficiency, Resistance Furnace, Radiant Heating, Induction Heating, High Frequency Eddy Current Heating, Dielectric Heating, Arc Furnace, Heating of Furnace, Electric Welding, Methods and Equipments.

UNIT - III: Illumination

Radiant Energy, Terms and Definitions, Laws of Illumination, Polar Curves, Photometry, MSCP, Integrating Sphere, Luminous Efficacy, Electrical Lamps, Design of Interior and Exterior Lighting Systems, Illumination Levels for Various Purposes, Light Fittings, Factory Lighting, Flood Lighting, Street Lighting, Energy Conservation in Lighting.

UNIT - IV: Air Conditioning and Refrigeration

Control of Temperature, Protection of Motors, Simple Heat-Load and Motor Calculations, Various Types of Air Conditioning, Functioning of Complete Air Conditioning System, Type of Compressor Motor, Cool Storage, Estimation of Tonnage Capacity and Motor Power.

UNIT - V: Electro-Chemical Processes

Electrolysis – Electroplating – Electro deposition – Extraction of metals current, Efficiency - Batteries – types – Charging Methods.

UNIT - VI: Basics of Domestic Electrical Wiring

Types of Cables, Flexible Wires Sizes and Current Capacity, Use of Fuse, MCB and MCCB (Working and Construction), Idea about Megger, Earthling – Domestic and Industrial.

Text Books

1. "Utilisation of Electric Energy" Garg and Girdhar, 1982, Khanna Publisher.
2. "Art and Science of Utilization of Electrical Energy", Pratab H., Second Edition, Dhanpat Rai and Sons, New Delhi.

Reference Books

1. "Generation, Distribution and Utilization of Electrical Energy",Wadhwa C.L., 1993, Wiley Eastern Limited,
2. "Electric Energy Utilization and Conservation", S.C.Tripathy, 1993, Tata McGraw Hill.
3. "Utilization of Electric Power", R.K. Rajaput,Laxmi Publications, 1st Edition, 2007.
4. "Utilization of Electric Power", N.V.Suryanarayana, New Age International, 2005.
5. "Generation, Distribution and Utilization of Electrical Energy, C.L.Wadhwa, New Age International, 4th Edition, 2011.
6. Refrigiration and Air-conditioning, M. Prasad, Wiley Eastern Ltd., 1995 .
7. "Utilization of Electrical Energy", Taylor E. Openshaw, 1968, Orient Longman.
8. "Utilization of Electric Power and Electric Traction", Gupta J. B., 2002, S. K. Kataria and Sons.

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Open Elective - IV

GREEN ENGINEERING

IV Year – I Semester

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

Course Objectives

- To impart the knowledge needed to minimize impacts of products, processes on environment for sustainable development.

Learning Outcomes

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

- evaluate the impact of technology on environment
- compare biological ecology to industrial ecology
- design eco friendly product.
- create sustainable products, facilities, processes and infrastructure
- asses the life cycle of a product to evaluate its impact on energy and materials use
- determine the effects of air and water quality

Course Content

UNIT - I: Introduction

Humanity and technology, the concept of sustainability, quantifying sustainability, industrial ecology

UNIT - II: Frame work for green engineering

The relevance of biological ecology to industrial ecology, metabolic analysis, technology and risk, the social dimensions of industrial ecology.

UNIT - III: Implementation

Technological product development,design for environment and sustainability- customer products- buildings and infrastructure.

UNIT - IV: Life Cycle Assessment

An introduction to life cycle assessment, the LCA impact and interpretation stages, streamlining the LCA process.

UNIT - V: Analysis of Technological Systems-material flow and energy

Systems Analysis, industrial ecosystems, material flow analysis, energy and industrial ecology,

UNIT - VI: Analysis of Technological Systems-air-water

Air quality impacts, carbon cycles and energy balance, water quality impacts, urban industrial ecology, modelling in industrial ecology.

Text Books

1. T E Graedel, Braden R Allenby "Industrial ecology and sustainable engineering" Prentice Hall.
2. David T. Allen, David R Shonnard "Sustainable Engineering Concepts, Design and Case Studies" Prentice Hall.

References Books

1. Bradley A. Striebig, Adebayo A. Ogundipe, Maria Papadakis "Engineering applications in sustainable design and development" Cengage Learning.
2. Anastas, Paul T, Zimmerman, Julie B, "Innovations in Green Chemistry and Green Engineering", Springer, First Edition.
3. Daniel A. Vallero, Chris Brasier, "Sustainable Design: The Science of Sustainability and Green Engineering", Wiley, First Edition.

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Open Elective - IV

NON DESTRUCTIVE EVALUATION

IV Year – I Semester

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

Course Objectives

- To familiarize with the concepts of various NDE techniques to identify the defect in a mechanical elements.

Course Outcomes

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

- choose a suitable non destructive method to find the defect in the given mechanical components using radiography, ultrasonic test, magnetic particle test etc.,

UNIT - I: Introduction to Non-Destructive Testing

Radiographic test, Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography

UNIT - II: Ultrasonics Test

Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect, Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

UNIT - III: Liquid Penetrant Test

Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing

UNIT - IV: Magnetic Particle Test

Magnetic Materials, Magnetization of Materials, Demagnetization of Materials,Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test.

UNIT - V: Eddy Current Test

Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current Testing Effectiveness of Eddy Current Testing

UNIT - VI: Industrial Applications of NDE

Span of NDE Activities Railways, Chemical Industries, Automotive Industries, NDE of pressure vessels, castings, welded constructions.

Text Books

1. Non-Destructive Test and Evaluation of Materials, J Prasad, GCK Nair, TMH Publishers.
2. Ultrasonic Testing by Krautkramer and Krautkramer.
3. Non-Destructive Testing, Warress, JMc Gonmade.

References Books

1. Ultrasonic inspection training for NDT: E. A. Gingel, Prometheus Press.
2. ASTM Standards, Vol 3.01, Metals and alloys.
3. Non-Destructive, Hand Book – R. Hamchand.

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Open Elective - IV

CYBER PHYSICAL SYSTEMS

IV Year – I Semester

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

Course Objectives

- To prototype the Smart objects and provides a holistic understanding of development Platforms, connected products of Internet of things (IoTs).
- To famializrize with real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes

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

- develop prototypes using appropriate Platforms of internet-connected products.
- assess and improve the reliability & security of a simple Cyber-Physical System.
- differentiate various methodologies and tools of automatic synthesis of controls and software

Course Content

UNIT - I: Introduction to Cyber physical System

Cyber-Physical Systems (CPS); history; key features; CPs design challenges; model-based design and design methodologies; simulation, validation, verification, and synthesis; platform-based design and contract-based design.

UNIT - II: Modeling

Introduction to models of computation; languages and tools for system design; mathematical background; notions of complexity and computability, finite state machines; synchronous/reactive model.

UNIT - III: Analysis

Cyber-Physical System requirements (functional, extra-functional, safety, liveness, reliability, real-time); specification languages; temporal logic; overview of requirement analysis and validation techniques, core engines for algorithmic system verification;

UNIT - IV: Introduction to Internet of Things

Definition and evolution of IoT, architecture of IoT, resource management, data management and analytics, security issues, identity management and authentication, privacy, standardization and regulatory limitations, opportunities for IoT.

UNIT - V: IoT Enabling Technologies

Wireless Sensor Networks: Overview, history, the node, connecting nodes, networking nodes. securing communication- standards. cloud computing, Big data analysis, communication protocols, wireless communication protocols, wireless communication protocols and application protocols.

UNIT - VI: Use cases and IoT applications

Home automation, smart building, smart health, location tracking, environment, energy, agriculture, smart cities and other IoT electronic industries.

Text Books

1. E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems, A Cyber-Physical Systems Approach," 2nd Edition, http://LeeSeshia.org, 2015.
2. R. Alur, "Principles of Cyber-Physical Systems," MIT Press, 2015.

Reference Books

1. Arshdeep Bahga, Vijay Madisetti "Internet of Things - A Hands-on Approach", Published by Arshdeep Bahga & Vijay Madisetti, 1st Edition.
2. Dieter Uckelmann, Mark Harrison Florian, Michahelles "Architecting the Internet of things", Springer-Verlag Berlin Heidelberg, 1st Edition.

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Open Elective - IV

SIGNALS AND SYSTEMS

IV Year – I Semester

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

Course Objectives

- To familiarize with the basic concepts of signals and systems.
- To introduce various transform techniques on signals.
- To develop an understanding of sampling and correlation techniques on signals.

Course Outcomes

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

- classify the signals and various operations on signals.
- perform Fourier analysis on the signals.
- analyze the various systems.
- perform correlation operational on signals.
- apply the various sampling techniques on continuous time signals.
- analyze the various continuous time signals through transformation (Fourier and Laplace) techniques.

Course Content

UNIT - I: Signal Analysis

Classification of signals, basic operations on signals-amplitude and time scaling, time shifting, addition and multiplication, introduction to elementary signals-unit step, impulse, ramp, parabolic, rectangular, triangular, sinusoidal, exponential, signum, sinc and gaussian functions.

UNIT - II: Fourier Series Representation of Continuous Time Signals

Trigonometric and exponential Fourier series, relationship between trigonometric and exponential Fourier series, representation of a periodic function by the Fourier series over the entire interval, convergence of Fourier series, alternate form of trigonometric series, symmetry conditions-even and odd, complex Fourier spectrum.

UNIT - III: Fourier Transform

Representation of an arbitrary function over the entire interval: Fourier transform, Fourier transform of some useful functions and periodic function, properties of Fourier transform, energy density spectrum, Parseval's theorem.

Sampling: Sampling theorem for band limited signals- explanation, reconstruction of signal from samples, aliasing, sampling techniques- impulse, natural and flat top sampling.

UNIT - IV:LTI Systems

Properties of systems, Linear Time Invariant (LTI) system, response of LTI system-convolution integral, properties of LTI system, transfer function and frequency response of LTI system.

Signal Transmission Through LTI Systems: Filter characteristics of LTI systems, distortion less transmission through LTI system, signal bandwidth, System bandwidth, ideal LPF, HPF and BPF characteristics, causality and physical realizability- Paley-Wiener criterion, relationship between bandwidth and rise-time.

UNIT - V: Correlation of Continuous Time Signals

Cross correlation and auto correlation of continuous time signals (finite and nonfinite energy signals), relation between convolution and correlation, properties of cross correlation and autocorrelation, power density spectrum, relation between auto correlation function and energy/power spectral density function.

UNIT - VI: Laplace Transform

Laplace transform of signals, properties of Region of Convergence (ROC), unilateral Laplace transform, properties of unilateral Laplace transform, inversion of unilateral and bilateral Laplace transform, relationship between Laplace and Fourier Transforms.

Text Books

1. B.P.Lathi, "Signals, Systems &Communications", BS Publications, 2003 (Units I-VI).
2. A.V. Oppenheim, A.S. Willsky and S.H.Nawab, "Signals and Systems",PHI, 2nd Edition (Units I, III, VI)

Reference Books

1. Simon Haykin and Van Veen, "Signals &Systems", Wiley, 2nd edition
2. Michel J. Robert , "Fundamentals of Signals and Systems", TMGH Int. Edition, 2008
3. C.L.Philips, J.M. Parr and Eve A. Riskin, "Signals, Systems and Transforms", Pearson Education, 3rd Edition, 2004.

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Open Elective - IV

DIGITAL FORENSICS

IV Year – I Semester

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

Course Objectives

- To provide a comprehensive overview of digital forensic process.
- To familiarize with the different roles a computer in crime investigation.

Learning Outcomes

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

- formulate a Digital Forensic Process
- employ fundamental computer theory in the context of computer forensics practices
- apply the principles of effective digital forensics investigation techniques
- explain the role of digital forensics in the field of information assurance and information security
- evaluate the effectiveness of available digital forensic tools
- outline the file storage mechanisms of DOS systems
- examine computer incidents in crime scene

Course Content

UNIT - I: Introduction to Digital Forensics

What is Computer Forensics?, Differences between Computer Forensics and Digital Forensics, History of Digital Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists, Types of Computer Forensics Technology.

UNIT - II: Computer Forensics Evidence and Capture

Data Recovery, Data Back-up and Recovery, The Role of Back-up in Data Recovery, The Data-Recovery Solution, Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options, Obstacles, Types of Evidence, the Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody.

UNIT - III: Duplication and Preservation of Digital Evidence, Computer Image Verification and Authentication, Processing Crime and Incident Scenes: Identifying Digital Evidence, Collecting Evidence in Private-Sector Incident Scenes, Securing a Computer Incident or Crime Scene, Seizing Digital Evidence at the Scene, Storing Digital Evidence, Obtaining a Digital Hash, Reviewing a Case.

UNIT - IV: Digital Forensics Analysis and Validation

Determining what data to collect and analyze, Validating Forensic data, Data-Hiding Techniques, Examining Encrypted Files, Recovering Passwords, Performing Remote Acquisitions, Virtual Machines, Network Forensics and performing Live Acquisitions, Email Investigations, Mobile Device Forensics.

UNIT - V: Current Digital Forensics Tools

Types of Forensics Tools, Tasks performed by Forensic Tools, Tool Comparisons, Software Tools – Command-line Forensics Tools, UNIX/Linux Forensics Tools, other GUID Forensics Tools, Hardware Tools – Forensic Workstations, Using a Write-Blocker, Validating and Testing Forensic Software - Using National Institute of Standards and Technology (NIST) Tools, Using Validation Protocols.

UNIT - VI: Working with Windows and DOS Systems

File Systems, exploring Microsoft File Structures, examining NTFS disks, whole Disk Encryption, Windows Registry, Microsoft Start-up Tasks, MS-DOS Start-up Tasks, and Virtual Machines.

Text Books

1. John R.Vacca, "Computer Forensics: Computer Crime Scene Investigation", 2nd edition, Charles River Media.
2. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", 3rd edition, CENGAGE Learning.

Reference Books

1. Tony Sammes and Brian Jenkinson, "Forensic Computing, A Practitioners Guide", 1st edition. Springer
2. Christopher L. T. Brown, "Computer Evidence: Collection and Preservation", 2nd edition, Firewall Media.
3. Jesus Mena, "Homeland Security, Techniques and Technologies", 1st edition Firewall Media.

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Open Elective - IV

BUSINESS INTELLIGENCE AND DECISION SUPPORT SYSTEMS

IV Year – I Semester

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

Course Objectives

- To identify the process of decision making and use of model for decision making.
- To use various visualization tools for delivery of knowledge.

Learning Outcomes

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

- identify the need of Business Intelligence
- explain the process of decision making
- use mathematical model for decision making
- compare simple linear regression model with multiple linear regression model for prediction.
- choose a marketing model to design sales territory
- construct charts, graphs and widgets to deliver the knowledge for decision makers

Course Content

UNIT - I: Introduction to Business Intelligence

Effective and timely decisions, Data, information and knowledge, Role of mathematical models, Business intelligence architectures, Ethics and business intelligence.

UNIT - II: Decision support systems

Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system.

UNIT - III: Mathematical models for decision making

Structure of mathematical models, Development of a model, Classes of models.

Regression: Structure of regression models, Simple linear regression, Multiple linear regression.

UNIT - IV: BI Applications

Marketing Models: Relational Marketing, Sales force Management, Business case studies.

UNIT - V: Data envelopment analysis

Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices.

UNIT - VI: Knowledge Delivery

Visualization, Scorecards and Dashboards, Geographic Visualization, Integrated analytics, Considerations: Optimizing the presentation for the Right message.

Text Books

1. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications.
2. David Loshin, "Business Intelligence: The Savvy Manager's Guide", 2nd edition, Morgan Kaufman Publications.

Reference Books

1. Efraim Turban, Jay E Aronson, Teng-Peng Liang, Ramesh Sharda, "Decision Support and Business Intelligence Systems", 8th Edition, Pearson.
2. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", 2nd edition, Morgan Kaufmann Publishers.
3. Larissa T. Moss and Shaku Atre, "Business Intelligence Roadmap: The complete Project Life Cycle of Decision Making", 1st edition, Addison Wesley.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw- Hill.

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Open Elective - IV

ADHOC AND SENSOR NETWORKS

IV Year – I Semester

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

Course Objectives

- To acquire fundamental concepts of ad hoc networks.
- To learn design considerations of wireless sensor networks.

Learning Outcomes

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

- evaluate architecture and protocols in adhoc and wireless sensor networks.
- identify applications of adhoc and WSN's.
- illustrate wireless sensor networks design aspects.
- synthesize routing protocols for adhoc wireless networks.
- outline Transport layer and security protocols for Ad hoc wireless networks.
- summarize layer wise functionalities of wireless sensor networks.
- describe MAC protocols in adhoc and WSN's.

Course Content

UNIT - I: Introduction

Fundamentals of wireless communication technology, the electromagnetic spectrum, radio propagation mechanisms, characteristics of the wireless channel.Ad hoc wireless networks: introduction, cellular and Ad hoc wireless networks, applications of ad-hoc networks, issues in ad hoc wireless networks.

UNIT - II: MAC Protocols for Adhoc Wireless Networks

Issues in designing a MAC protocol for ad hoc wireless networks, classifications of MAC protocols, Contention based protocols.

UNIT - III: Routing protocols for Adhoc Wireless Networks

Issues in designing a routing protocol for ad hoc wireless networks, classifications of routing protocols, table-driven routing protocols, on-demand routing protocols.

UNIT - IV: Transport layer and Security Protocols for Adhoc Wireless Networks

Introduction, Issues, design goals, classification of transport layer solutions, TCP over ad hoc wireless networks: TCP-F, TCP-ELFN, TCP-BUS, ATCP, split-TCP. Network security attacks.

UNIT - V: Sensor Networks Design Considerations-I

Introduction, energy consumption, sensing and communication range, design issues, localization scheme, clustering of SN's, MAC layer, Applications of wireless sensor networks.

UNIT - VI: Sensor Networks Design Considerations-II

Routing layer, flat versus hierarchical, operation-based protocols, location-based protocols, high level application layer support.

Text Books

1. Carlos de Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", 2nd Edition, World Scientific Publications, 2011.
2. C. Siva Ram Murthy, B.S. Manoj "Ad Hoc wireless networks: Architectures and protocols ", Pearson, 2017.

Reference Books

1. Prasant Mohapatra and Srihanamurthy, "Ad Hoc Networks Technologies and Protocols", Springer, Springer International Edition, 2009.
2. Subir kumar sarkar, C. Puttamadappa, T.G.Basavaraju, "Ad hoc mobile wireless networks:principles, protocols and applications", Taylor & Francis India Pvt Ltd - New Delhi, 2007.
3. Jagannathan, sarangapani, "wireless ad hoc and sensor networks protocols, performance, and control", CRC press, 2007.

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Open Elective - IV

INFORMATION RETRIEVAL SYSTEMS

IV Year – I Semester

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

Course Objectives

- To provide the foundation knowledge in information retrieval.
- To familiarize about different applications of information retrieval techniques in the Internet or Web environment.

Learning Outcomes

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

- identify basic theories in information retrieval systems.
- identify the analysis tools as they apply to information retrieval systems.
- understand the problems solved in current IR systems.
- describes the advantages of current IR systems.
- understand the difficulty of representing and retrieving documents.
- understand the latest technologies for linking, describing and searching the web.

Course Content

UNIT - I: Introduction to Information Storage and Retrieval System

Introduction, Domain Analysis of IR systems and other types of Information Systems, IR System Evaluation. Introduction to Data Structures and Algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

UNIT - II: Inverted files

Introduction, Structures used in Inverted Files, Building Inverted file using a sorted array, Modifications to Basic Techniques.

UNIT - III: Signature Files

Introduction, Concepts of Signature Files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT - IV: New Indices for Text

PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT trees as PATRICA Trees, PAT representation as arrays.

UNIT - V: Stemming Algorithms

Introduction, Types of Stemming Algorithms, Experimental Evaluations of Stemming to Compress Inverted Files.

UNIT - VI: Thesaurus Construction

Introduction, Features of Thesauri, Thesaurus Construction,Thesaurus construction from Texts, Merging existing Thesauri.

Text Books

1. William B. Frakes, Ricardo Baeza-Yates, "Information Retrieval: Data Structures and Algorithms", Prentice Hall.
2. Ricardo Baeza-Yates, Bertheir Ribeiro-Neto, "Modern Information Retrieval", Pearson Education.
3. Robert R. Korfhage, "Information Storage and Retrieval", John Wiley & Sons.

Reference Books

1. Gerald Kowalski, Mark T Maybury, "Information Storage and Retrieval Systems-Theory and Implementation", 2nd edition, Kluwer Academic Press, 1997.
2. David A. Grossman, Ophir Frieder, "Information Retrieval:Algorithms and Heuristics", 2nd edition, Springer.

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Open Elective - IV

FUZZY LOGIC

IV Year – I Semester

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

Course Objectives

- To impart the knowledge of fuzzy set theory and its applications in Engineering.

Learning Outcomes

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

- distinguish between crisp set and fuzzy set.
- compose the operations on fuzzy sets to characterize the belongingness of elements in the sets
- construct fuzzy relations to draw inferences
- illustrate the methods of defuzzification to drive the control mechanism.
- apply fuzzy logic to control automatic engineering systems.

Course Content

UNIT - I: Crisp Sets Vs Fuzzy Sets

Crisp sets an overview, Concept of fuzziness, the notion of Fuzzy sets, basic concepts of fuzzy sets.

UNIT - II: Operations of Fuzzy Sets

Fuzzy set operations-fuzzy complement, fuzzy union, fuzzy intersection, combinations of operations.

UNIT - III: Fuzzy Relations

Fuzzy Cartesian product ,Fuzzy relations, operations on fuzzy relations, properties of fuzzy relations, lamda cut for fuzzy relations and composition, Fuzzy tolerance and equivalence relations.

UNIT - IV: Fuzzification and Defuzzification

Features of membership function, fuzzification, defuzzification to crisp set, Defuzzification to scalars (centroid method, centre of sums method, mean of maxima method).

UNIT - V: Fuzzy Logic

Introduction to fuzzy logic, Crisp connectives vs Fuzzy logical connectives, Approximate reasoning.

UNIT - VI: Applications of Fuzzy Systems

Fuzzy Control System, Control System Design Problem, Simple Fuzzy Logic Controller, general applications of fuzzy logic (washing machine, air conditioner controller).

Text Books

1. Timothy J.Ross., Fuzzy Logic with Engineering Applications - Second Edition, Wiley Publications, 2007, New Delhi.
2. S.Rajasekaran, G.A.Vijayalakshmi Pai, Neural networks, Fuzzy logic, and genetic algorithms synthesis and applications- – Prentice-Hall of India private limited, 2008, New Delhi.

Reference Books

1. H.J. ZIMMERMAN, Fuzzy set theory and its applications, 4th edition — SPRINGER, 2006. New Delhi.
2. Recommended Text S.Nanda and N.R.Das "Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi.

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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, Shanon-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 Phython 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 IntegrationChallenges and SolutionsSeries: Green Energy and TechnologyHossain, Jahangir, Mahmud, Apel (Eds.)

References Book

1. Integration of Alternative Sources of EnergyFelix A. Farret, M. Godoy Simões December 2005, Wiley-IEEE Press.

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Professional Elective - V

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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Professional Elective - V

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-basisn 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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Professional Elective - V

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 Lypanov's stability and Lypanov's instability theorems. Direct method of Lypunov'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 edtion, 1998.
3. Control system Engineering – I.J. Nagarath, 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 Stainslaw 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 andpractice, 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- booklet12-EEO.

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Professional Elective - VI

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.

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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.

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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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