ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

CIVIL ENGINEERING

B.Tech Four Year Degree Course

(Applicable for the batches admitted from 2017-18)

GUDLAVALLERU ENGINEERING COLLEGE

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

Seshadri Rao Knowledge Village

GUDLAVALLERU - 521 356, Krishna District, Andhra Pradesh

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VISION & MISSION OF THE COLLEGE

Vision

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

Mission

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

VISION & MISSION OF THE DEPARTMENT

Vision

To provide quality education embedded with knowledge, ethics and advanced skills and preparing students globally competitive to enrich the civil engineering research and practice.

Mission

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

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

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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

IV. PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

V. PROGRAM SPECIFIC OUTCOMES (PSOs)

Students will be able to

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

VI. ACADEMIC REGULATIONS

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

1. UG – B.Tech Programs

The following B.Tech Programs are offered at present

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

2. Duration of the Program

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

3. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

4. Program Credits

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

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

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

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

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

5. Attendance Regulations

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

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

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

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

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

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

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

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

6. Examinations and Scheme of Evaluation

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

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

Internal Assessment:

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

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

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

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

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

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

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

from all the three units of syllabus. Sum of the 75% marks of better scored mid-term examination and 25% marks of less scored mid-term examination are scaled down for 20 marks. Of 20 marks for laboratory, 10 marks for day-to-day performance and 10 marks for semester end internal examination.

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

External Assessment:

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

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

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

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

6.2 Laboratory Courses (1 or 2 credits) :

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

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

6.3 Mandatory Non-Credit Courses:

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

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

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

6.4 Internship / Industrial Training / Practical Training:

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

6.5 Mini Project / Field Work :

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

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

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

6.6 Project work:

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

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

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

iv) The project evaluation and semester end Viva–Voce shall be conducted by the committee consisting of an External Examiner, Head of the Department

and the supervisor of the project. The evaluation of project work shall be conducted at the end of the fourth year second semester.

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

7.1 Criteria for Passing a Course:

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 = $\frac{\sum(CR \times GP)}{\sum CR}$ 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:

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

where CR = Credits of a course

GP = Grade points awarded for a course

7.6 Award of Division:

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

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

7.7 Consolidated Grade Card

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

8. Supplementary Examinations

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

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

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

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

9. Conditions for Promotion

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

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

a) 4 Year B.Tech Program:

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

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

irrespective of whether the candidate takes the examination or not.

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

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

irrespective of whether the candidate takes the examination or not.

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

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

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

irrespective of whether the candidate takes the examination or not.

10. Revaluation

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

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

iii) An examiner, other than the first examiner, shall 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 examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of performance in that subject.

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

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

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

16. Other Matters

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

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

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

17. General

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

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

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

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

VII. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits	% of Credits as per UGC
1	Baisc Sciences (BS)	21	13.13	15 - 20
2	Humanities and Social Sciences (HSS)	15	9.38	10 - 15
3	Engineering Sciences (ES)	26	16.25	10 - 20
4	Professional Core (PC)	54	33.74	25 - 35
5	Professional Electives (PE)	18	11.25	8 - 12
6	Open Electives (OE) & Self Study Course	12	7.50	5 - 10
7	Others (Project, Survey Camp, Internship, etc.)	14	8.75	8 - 10
8	Mandatory Non-Credit Courses	-	-	-

COURSE STRUCTURE

&

SYLLABUS

VIII. COURSE STRUCTURE

I Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	EG2501	Functional English	4	-	-	3
2	MA2501	Linear Algebra & Differential Equations	4	1	-	4
3	EN2502	Engineer and Society	3	-	-	2
4	CH2501	Engineering Chemistry	3	-	-	2
5	CT2501	Problem Solving Using C *	4	-	2	4
6	ME2501	Engineering Drawing	1	-	4	3
7	EG2502	Functional English Lab	-	-	2	1
8	CH2502	Engineering Chemistry Lab	-	-	2	1
		Total	**19**	**1**	**10**	**20**

* **Integrated Course with Theory and Laboratory**

I Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	EG2503	Professional Communication	3	-	-	2
2	MA2503	Integral Transforms and Multiple Integrals	3	1	-	3
3	EN2501	Environmental Studies	3	-	-	2
4	PH2501	Engineering Physics	3	1	-	3
5	CE2501	Engineering Mechanics	4	1	-	4
6	EG2504	Professional Communication Lab	-	-	4	2
7	CE2502	Computer Aided Drafting Lab	-	-	4	2
8	PH2503	Engineering Physics Lab	-	-	2	1
9	CE2503	Applied Mechanics Lab and Building Trade Practice	-	-	2	1
		Total	**16**	**3**	**12**	**20**

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

II Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	CE2504	Mechanics of Solids	3	1	-	3
2	CE2505	Mechanics of Fluids	3	1	-	3
3	CE2506	Building Materials and Construction	2	1	-	2
4	CE2507	Surveying	3	1	-	3
5	ME2502	Elements of Mechancial and Electrical Engineering	4	-	-	3
6	CE2508	Building Planning and Drawing	2	-	3	3
7	CE2509	Mechanics of Solids Lab	-	-	4	2
8	CE2510	Survey Field Work	-	-	4	2
		Total	**17**	**4**	**11**	**21**
9	SG2501	Sports and Games / Cultural (Mandatory Non-Credit Course)	-	-	2	-

II Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	MA2509	Numerical and Statistical Methods	3	1	-	3
2	CE2511	Structural Analysis	2	1	-	2
3	CE2512	Hydraulics and Hydraulic Machines	2	1	-	2
4	CE2513	Concrete Technology	4	-	-	3
5	CE2514	Engineering Geology and Geomatics *	3	-	2	3
6		**Open Elective-I** (see list of Open Electives)	4	-	-	3
7	CE2517	Fluid Mechanics and Hydraulic Machines Lab	-	-	4	2
8	CE2518	Concrete Technology Lab	-	-	4	2
		Total	**18**	**3**	**10**	**20**
9	NS2501	NSS / Fine Arts / Yoga / Self Defense (Mandatory Non-Credit Course)	-	-	2	-
10	CE2519 CE2520 CT2505	**Optional Elective - I** i) Interior Design ii) Building Bye Laws and Scientific Planning iii) Data Structures	-	-	-	3
11	CE2521	**Optional Elective - II (MOOCs)** Student shall opt from the list of MOOCs given by the Department)	-	-	-	2

*** Integrated Course with Theory and Laboratory**

III Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	CE2522	Theory of Structures	3	1	-	3
2	CE2523	Geotechnical Engineering	2	1	-	2
3	CE2524	Hydrology and Water Resources Engineering	4	-	-	3
4	CE2525	Water and Waste Water Engineering	3	1	-	3
5		**Professional Elective - I**	4	-	-	3
6		**Open Elective-II** (see list of Open Electives)	4	-	-	3
7	CE2532	Geotechnical Engineering Lab	-	-	4	2
8	CE2533	Water and Waste Water Engineering Lab	-	-	4	2
		Total	**20**	**3**	**8**	**21**
9	CE2534 ME2509 CT2507	**Optional Elective - III** i) Infrastructure Development ii) Basics of Power Plant Engineering iii) Object Oriented Programming through JAVA	-	-	-	3
10	CE2535	**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	CE2536	Foundation Engineering	3	-	-	2
2	CE2537	Highway Engineering	4	-	-	3
3	CE2538	Design of RC Structures	3	1	-	3
4		**Professional Elective - II**	4	-	-	3
5		**Open Elective-III**(see list of Open Electives)	4	-	-	3
6	CE2545	Structural Engineering Lab	-	-	4	2
7	CE2546	Highway Engineering Lab	-	-	4	2
8	CE2547	Mini Project / Survey Camp	-	-	4	2
		Total	**18**	**1**	**12**	**20**
9	CE2548 CE2549 CT2513	**Optional Elective - V** i) Smart Buildings and Automation ii) Building Information Modeling iii) Database Management Systems	-	-	-	3
10	CE2550	**Optional Elective - VI (MOOCs)** Students shall opt from the list of MOOCs given by the Department)	-	-	-	2

*** Integrated Course with Theory and Laboratory**

L : Lecture T : Tutorial P : Practical

IV Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	CE2551	Project Management and Finance	4	-	-	3
2	CE2552	Estimation, Costing and Valuation	3	1	-	3
3	CE2553	Design of Steel Structures	3	1	-	3
4		**Professional Elective - III**	4	-	-	3
5		**Professional Elective - IV**	4	-	-	3
6		**Open Elective-IV**(see list of Open Electives)	4	-	-	3
7	CE2564	Computer Applications in Civil Engineering Lab	-	-	4	2
8	CE2565	Internship / Industrial Training / Practical Training	-	-	-	2
		Total	**22**	**2**	**4**	**22**
9		**Optional Elective - VII**	-	-	-	3
	CE2566	i) Project Scheduling and Contracts				
	MA2515	ii) Optimization Techniques				
	BA2504	iii) Entrepreneurship				
10	CE2567	**Optional Elective - VIII (MOOCs)**	-	-	-	2
		Students shall opt from the list of MOOCs given by the Department)				

IV Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1		**Professional Elective - V**	4	-	-	3
2		**Professional Elective - VI**	4	-	-	3
3	CE2576	**Project**	-	-	20	10
		Total	**8**	**-**	**20**	**16**

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

Open Elective - I

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

Open Elective - II

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

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

Open Elective - III

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

Open Elective - IV

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

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

Professional Electives

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

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

IX. SYLLABUS

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

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

Course Objectives

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

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

Learning Outcomes

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

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

Course Content

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

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

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

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

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

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

The following portions only:

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

3. From Great Stories in Easy English

"The Adventures of Huckleberry Finn" by Mark Twain

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

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

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

2. From Department-produced materials

Technical report writing

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

The following portions only:

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

4. From Great Stories in Easy English

"More Tales from Shakespeare" by Charles and Mary Lamb

Text books

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

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

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

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

e) Department-produced material on technical report writing

Testing Pattern

First Mid-Term Examination

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

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

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

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

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

III.

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

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

IV.

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

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

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

ii. Re-writing paragraph (b), which is poorly organized, into a coherent paragraph choosing appropriate sequence signals or connectives.

Marks: 5 x ½ = 2½

Second Mid-Term Examination

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

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

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

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

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

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

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

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

III.

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

follow the conventions of technical report writing

use language and style appropriate to technical report writing

Marks: 5 x 1 = 5

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

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

a topic sentence; and

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

IV.

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

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

Semester End Examination

Answer any five questions. Question one is compulsory.

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

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

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

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

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

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

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

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

a. identifying the reasons for the failure or breakdown of communication in the 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 1st & 2nd order differential equations to solve various engineering problems.
- apply the techniques of partial differentiation to find maxima and minima of two/three variables.
- solve first order linear & non-linear partial differential equations.

Course Content

UNIT- I: System of Linear Equations

Rank of a matrix - Echelon form, Normal form, System of equations - consistence and 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, 42nd edition, Khanna Publishers, New Delhi, 2012.
2. B. V. Ramana, Higher Engineering Mathematics, Tata-Mc Graw Hill Company Limited.

Reference Books

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

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

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT- I: Human Values

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

UNIT- II: Engineer's Responsibilities and Rights

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

UNIT- III: Global Climatic issues and Mitigation Strategies

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

UNIT- IV: Future Challenges to Society

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

UNIT- V: Patent law, Trade Marks and Copyrights

Introduction, Types of IPR – Patent requirements - Application process

– Ownership – Transfer – Infringement – Litigation.

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

UNIT- VI: Entrepreneurship

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

Text Books

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

Reference Books

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

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ENGINEERING CHEMISTY

I Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT–I: Corrosion and Its Prevention

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

UNIT–II: Polymers and Refractory Materials

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

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

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

UNIT–III: Nano Materials

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

UNIT–IV: Green Chemistry

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

UNIT–V: Water and its Treatment

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

UNIT–VI: Instrumental Methods of Analysis

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

Text Books

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

Reference Books

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

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PROBLEM SOLVING USING C
(Common to CE, EEE & ME)
I Year – I Semester

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

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

Learning Outcomes

Upon successful completion of the course, the students will be able to
- design flowcharts and pseudo code for solving problems.
- understand C tokens and control statements.
- gain knowledge on arrays, strings, pointers, functions, structures and files.
- use C language for solving problems
- self-learn advanced features of C.
- prepare applications using MS-Office.

Course Content

UNIT–I

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

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

Sample Problems such as evaluating formulae.

Programs :
1. Creating a document using MS Word.
2. Familiarizing with the usage and applications of MS Excel.
3. Creating a presentation using MS PowerPoint.
4. Write a C program to calculate the area of triangle using the formula 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 , Charotar Publications.
2. K.VenuGopal (2016), Engineering Drawing and Graphics, 5th edition , New Age International (p) Ltd Publishers.

Reference Books

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

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

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

Course Objectives

Functional English (Lab) seeks to develop in the students

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

Learning Outcomes

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

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

Course Content

UNIT–I

a. Greeting, introducing and taking leave b. Pure vowels

UNIT–II

a. Giving information and asking for information b. Diphthongs

UNIT–III

a. Inviting, accepting and declining invitations b. Consonants

UNIT–IV

a. Commands, instructions and requests b. Accent and rhythm

UNIT–V

a. Suggestions and opinions b. Intonation

Text Books

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

Testing Pattern

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

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ENGINEERING CHEMISTY LAB

I Year – I Semester

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

Course Objectives

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

Learning outcomes

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

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

List of Experiments

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

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

   (b) Determination of conductivity of different water samples by using conductivity meter.

7. Determination of concentration of the given acid by using standard base conductometrically.
8. (a) Determination of turbidity of different water samples by using turbidity meter.

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

Lab Manual

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

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

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

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

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

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

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

The following portions only:

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

3. From Great Stories in Easy English

"Pride and Prejudice" by Jane Austen

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

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

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

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

The following portions only:

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

3. From Great Stories in Easy English

"Gulliver's Travels" by Jonathan Swift

Textbooks

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 MULTIPLE INTEGRALS
(Common to CE & ME)

I Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT–I: Laplace Transforms (Without Proofs)

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

UNIT–II: Inverse Laplace Transforms

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

UNIT–III: Fourier Transforms

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

UNIT–IV: Multiple Integrals (only Cartesian form)

Double integrals - areas, triple integrals – volume.

UNIT–V: Vector Differentiation

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

UNIT–VI: Vector Integration

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

Text Books

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

Reference Books

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

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ENVIRONMENTAL STUDIES
(Common to CE, EEE & ECE)
I Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Multidisciplinary Nature of Environmental Studies

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

UNIT - II: Ecosystem

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

UNIT - III: Biodiversity &Its Conservation

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

UNIT - IV: Environmental Pollution

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

UNIT - V: Environmental Management

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

UNIT - VI: Waste Management

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

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

Text Books

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

I Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT- I: Simple Harmonic Oscillations

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

UNIT- II: Acoustics

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

UNIT- III: Crystal Structures

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

UNIT- IV: Non-Destructive Testing using Ultrasonics

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

UNIT- V: Physical Optics

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

UNIT- VI: LASER

Spontaneous and stimulated emission **-** Einstein's coefficient and their relations **-** basic characteristics - Basic requirements **-** Ruby laser **-** Helium-Neon Laser **-** CO_2 Laser - application of LASER.

Text Books

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

Reference Books

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

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ENGINEERING MECHANICS
(Common to CE & ME)
I Year – II Semester

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

Pre-Requisites
- Linear Algebra and Differential equations.

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

Learning Outcomes

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

Course Content

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

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

UNIT- II: Friction, Virtual work Principle

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

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

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

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

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

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

UNIT - V: Kinematics and Kinetics

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

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

UNIT - VI: Work – Energy Method

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

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

Text Books

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

Reference Books

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

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PROFESSIONAL COMMUNICATION LAB
(Common to All Branches)

I Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT–VI : Body Language

UNIT–VII : Dialogues

UNIT–VIII : Presentation Skills

UNIT–IX : Group Discussion

UNIT–X : Interviews and Telephonic Interviews

UNIT–XI : Debates

Text Books

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

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

I Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

List of Experiments

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

Text Books

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

Reference Books

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

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ENGINEERING PHYSICS LAB

I Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

List of Experiments

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

Reference Books

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

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APPLIED MECHANICS LAB & BUILDING TRADE PRACTICE

I Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

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

PART A (Applied Mechanics Laboratory)

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

PART B (Building Trade Practice)

Practice any two Experiments from each trade

1) Carpentry : a. T-Lap Joint b. Cross Lap Joint c. Dovetail Joint.

2) House Wiring : a. Parallel / Series Connection b. Stair Case wiring
c. Fluoroscent Lamp connection.

3) Plumbing : a. Screwed pipe joint – For GI Pipes, Steel Pipes
b. Glued or cemented pipe joint – for PVC pipes

Demo on : Fitting, Black Smithy, Tin Smithy, Welding, Foundry and Handling of Power Tools

Reference Books

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

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MECHANICS OF SOLIDS

II Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Simple Stresses and Strains, Elastic Constants

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

UNIT - II: Shear Force and Bending Moment

Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and over hang beams subjected to point loads, u.d.l s and combination of these loads –Point of contraflexure. Relation between, B.M, S.F and rate of loading at a section.

UNIT - III: Flexure and Direct & Bending Stresses

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

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

UNIT - IV: Shear and Torsion

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

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

UNIT - V: Principal Stresses & Strains and Energy Methods

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

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

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

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

Text Books

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

Reference Books

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

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MECHANCIS OF FLUIDS

II Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Introduction

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

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

UNTI - II: Fluid Kinematics

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

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

UNIT - III: Fluid Dynamics

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

UNIT - IV: Hydraulic Similitude

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

UNIT - V: Closed Conduit Flow

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

UNIT - VI: Measurement of Flow

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

Text Books

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

Reference Books

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

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BUILDING MATERIALS AND CONSTRUCTION

II Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Stones, Bricks and Masonry

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

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

UNIT - II: Wood, Lime and Cement

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

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

UNIT - III: Aggregates

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

UNIT - IV: Building Components

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

UNIT - V: Finishings

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

UNIT - VI: Alternative materials

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

Text books

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

Reference Books

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

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SURVEYING

II Year – I Semester

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

Course Objectives

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

LearningOutcomes

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

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

Course Content

UNIT- I: Introduction and Chain Surveying

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

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

UNIT - II: Compass Survey

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

UNIT - III: Levelling and Contouring

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

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

UNIT - IV: Theodeolite Survey &Trignometrical Levelling:

Theodeolite Survey:

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

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

UNIT -V: Tacheometry, Total Station and Minor Instruments

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

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

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

UNIT -VI: Curves

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

Text Books

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

Reference Books

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

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ELEMENTS OF MECHANICAL AND ELECTRICAL ENGINEERING

II Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Transmission Systems

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

UNIT - II: Machine Tools

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

UNIT - III: Thermodynamics

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

UNIT - IV: Electrical Circuits

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

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

UNIT - V: DC Machines

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

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

UNIT - VI: AC Machines

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

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

Text Books

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

Reference Books

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

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BUILDING PLANNING AND DRAWING

II Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

Section - A

UNIT - I: Fundamentals of Buildings

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

UNIT - II:Climate and its influence on building planning

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

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

UNIT - III: Planning of Residential and Public Buildings

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

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

UNIT - IV: Sign Conventions

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

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

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

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

Section - B

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

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

UNIT - VI: Planning of Building

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

Semester End Examination Pattern:

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

Text Books

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

Reference Books

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

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MECHANICS OF SOLIDS LAB

II Year – I Semester

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

Course Objectives

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

Course Outcomes

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

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

List of Experiments

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

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

Text Books

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

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SURVEY FIELD WORK

II Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

List of Field Works

Chain & Compass survey

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

Levelling

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

Theodolite Survey

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

Total Station

10. Introduction, leveling and centering

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

Text Books

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

ReferenceBooks

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

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NUMERICAL AND STATISTICAL METHODS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: AlgebraicandTranscendental Equations

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

UNIT - II: Interpolation

Interpolation-Introduction– Finitedifferences-Forward,Backward and Central difference operators –Relation between operators, Newton's formulae for interpolation – Lagrange's interpolation.

UNIT - III: Numerical Solutions ofFirst Order Ordinary Differential Equations

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

UNIT - IV Probability and Expectation of Random Variable

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

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

UNIT - V: Probability distributions and Correlation & Regression

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

UNIT - VI: Sampling and Statistical Inference

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

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

Text Books

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

Reference Books

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

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STRUCTURAL ANALYSIS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Deflection of Determinate Beams

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

UNIT - II: Columns and Struts

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

UNIT - III: Indeterminacy-Propped Cantilevers

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

UNIT - IV: Fixed Beams

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

UNIT - V: Continuous Beams: Theorem of three moments

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

UNIT - VI: Continuous Beams: Slope-Deflection Method

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

Text Books

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

Reference Books

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

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HYDRAULICS AND HYDRAULIC MACHINES

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Open Channel Flow-I

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

UNIT - II: Open Channel Flow-II

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

UNIT - III: Basics of Turbo Machines

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

UNIT - IV: Hydraulic Turbines – I

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

UNIT - V: Hydraulic Turbines – II

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

UNIT - VI: Pumps

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

Text Books

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

Reference Books

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

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CONCRETE TECHNOLOGY

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Cements& Admixtures

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

UNIT - II: Aggregates and water

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

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

UNIT - III: Fresh Concrete & Special Concretes

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

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

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

UNIT - IV: Hardened Concrete & Testing

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

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

UNIT - V: Elasticity, Creep & Shrinkage

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

UNIT - VI: Concrete Mix Design

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

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

Text Books

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

Reference Books

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

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ENGINEERING GEOLOGY AND GEOMATICS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Rocks and Minerals

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

UNIT - II: Geomorphology and Structural Geology

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

UNIT - III: Geographic Information System (GIS)

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

UNIT - IV: Global Positioning System (GPS)

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

UNIT - V: Introduction to Remote Sensing

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

UNIT - VI: Introduction to Photogrammetry

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

Text Books

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

Reference Books

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

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

UNIT-I

i) Identification of Minerals ii) Identification of Rocks

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

UNIT-VI

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

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Open Elective - I

ELEMENTS OF CIVIL ENGINEERING

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Introduction.

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

UNIT - II: Surveying

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

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

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

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

UNIT - III: Building Materials and Construction

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

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

UNIT - IV: Water Resources

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

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

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

UNIT - VI: Transportation Engineering

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

Text Books

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

Reference Books

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

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Open Elective - I

BUILDING SERVICES

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Water Quality, Treatments and Distribution

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

UNIT - II: Waste Water, Treatments and Disposal

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

UNIT - III: Room Acoustics

Key terms & Concepts, Introduction, Acoustic principles, Sound power and pressure levels, Sound pressure level, absorption of sound, Reverberation time,

Transmission of sound. Sound pressure level in a plant room, outdoor sound pressure level, Sound pressure level in intermediate space, noise rating, Data requirement, output data.

UNIT - IV: Electrical Services

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

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

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

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

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

UNIT - VI: Fire Fighting Services

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

Text Books

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

Reference Books

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

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Open Elective - I

ELECTRICAL MATERIALS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Dielectic Materials

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

UNIT - II: Ferromagnetic Materials

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

UNIT - III: Magnetic Materials

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

UNIT - IV: Semiconductor Materials

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

UNIT - V: Materials for Electrical Applications

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

UNIT - VI: Special Purpose Materials

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

Text Books

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

Reference Books

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

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Open Elective - I

CONTROL SYSTEMS ENGINEERING

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Introduction

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

UNIT - II: Control Systems Components

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

UNIT - III: Time Response Analysis

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

UNIT - IV: Stability Analysis in S-Domain

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

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

UNIT - V: Frequency Response Analysis

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

UNIT - VI: State Space Analysis of Continuous Systems

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

Text Books

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

Reference Books

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

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Open Elective - I

ELEMENTS OF MANUFACTURING PROCESSES

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I

Introduction: Classification of manufacturing processes

Sand Casting: steps involved in making casting

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

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

UNIT - II

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

Casting defects – Cause and Remedies.

UNIT - III

Metal Joining Processes:- Classification of Metal joining processes

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

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

Types of Arc Welding Processes: SMAW, TIG, MIG

UNIT - IV

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

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

Welding Allied Processes: Soldering, Brazing and Braze welding

UNIT - V

Metal Forming: Classification of metal working processes.

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

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

Extrusion – Classification of Extrusion process, Impact Extrusion

UNIT – VI

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

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

Text Books

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

Reference Books

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

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Open Elective - I

AUTOMOTIVE ENGINEERING

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I

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

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

UNIT - II

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

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

UNIT - III

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

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

UNIT - IV

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

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

UNIT - V

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

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

UNIT - VI

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

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

Text Books

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

Reference Books

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

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Open Elective - I

INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: 8086 Microprocessor

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

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

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

UNIT - III: Interfacing with 8086

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

UNIT - IV: Interrupt Structure and Serial Communication

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

UNIT - V: Introduction to 8051 Microcontroller

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

UNIT - VI: Interfacing with 8051

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

Text Books

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

Reference Books

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

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Open Elective - I

FUNDAMENTALS OF COMMUNICATIONS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Signals, Noise, Modulation and Demodulation

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

UNIT - II: Metallic Cable Transmission Media

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

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

UNIT - III: Digital Transmission

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

UNIT - IV: Wireless Communications Systems

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

UNIT - V: Telephone Instruments and Signals

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

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

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

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

Text Books

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

Reference Books

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

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Open Elective - I

COMPUTER GRAPHICS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Introduction

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

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

UNIT - II: 2-D Geometrical Transforms

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

UNIT - III: 2D Viewing

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

UNIT - IV: 3D Geometric Transformations

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

UNIT - V: Visible Surface Detection Methods

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

UNIT - VI: Computer Animation

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

Text Books

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

Reference Books

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

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Open Elective - I

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Fundamentals of OOP and JAVA

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

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

UNIT - II: Class Fundamentals and Inheritance

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

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

UNIT - III: Interfaces and Packages

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

Packages: Defining, creating and accessing a package.

UNIT - IV: Exception Handling and Multithreading

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

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

UNIT - V: Applets and Event Handling

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

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

UNIT - VI: AWT

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

Text Books

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

Reference Books

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

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Open Elective - I

SYSTEMS SOFTWARE

II Year – II Semester

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

Course Objective

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

Learning Outcomes

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

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

Course Content

UNIT - I: Introduction

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

UNIT - II: Assemblers

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

UNIT - III: Implementation of Assemblers

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

UNIT - IV: Loaders

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

UNIT - V: Linkers

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

UNIT - VI: Macro Processors

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

Text Book

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

Reference Book

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

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Open Elective - I

WEB PROGRAMMING

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: HTML & CSS

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

UNIT - II: Cascading Style sheets

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

UNIT - III: Java Script

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

UNIT – IV: XML

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

UNIT - V: JSP

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

UNIT - VI: Database Access

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

Text Books

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

Reference Books

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

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Open Elective - I

MATHEMATICAL CRYPTOGRAPHY

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Divisibility

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

UNIT - II: Polynomial Congruences

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

UNIT - III: Arithmetic Functions

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

UNIT - IV: Farey Series

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

UNIT - V: Introduction to Cryptography

Encryption schemes, Cryptanalysis, Block ciphers, Stream ciphers.

UNIT - VI: Public Key Encryption

RSA cryptosystem and Rabin encryption.

Text Books

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

Reference Books

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

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Open Elective - I

SEMICONDUCTOR PHYSICS

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Electronic Materials (8)

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

UNIT - II: Semiconductors (10)

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

UNIT - III: Light-Semiconductor Interaction (6)

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

UNIT - IV: Engineered Semiconductor Materials (6)

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

UNIT - V: Photo Detectors (6)

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

UNIT - VI: Semiconductor Light Emitting Diodes

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

Text Books

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

Reference Books

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

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FLUID MECHANICS AND HYDRAULIC MACHINES LAB

II Year – II Semester

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

Course Objectives

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

Course Out comes

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

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

List of Experiments

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

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

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

Reference Book

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

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CONCRETE TECHNOLOGY LAB

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

List of Experiments

I. Tests on Cemenet

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

II. Tests on Fine Aggregate

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

III. Tests on Coarse Aggregate

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

IV. Tests on Fresh and Hardended Concrete

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

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

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

Reference Books

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

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Optional Elective - I

INTERIOR DESIGN

II Year – II Semester

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

Course Objectives

- To introduce with civilisations of Greece, Romes, traditions of islamic and asian.
- To impart knowledge on design process, organising space in a building and sustainable design.

Learning Outcomes

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

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

Course Content

UNIT - I: Classical Civilizations: Greece & Rome

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

UNIT - II: Islamic and Asian Traditions:

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

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

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

UNIT - IV: Design process

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

UNIT - V: Understanding Building & organising the space

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

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

UNIT - VI: Human interface & Sustainable design

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

Text Books

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

Reference Books

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

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Optional Elective - I

BUILDING BYE LAWS AND SCIENTIFIC PLANNING

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Building Bye–Laws

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

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

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

UNIT - III: General building requirements and services

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

UNIT - IV: Economy Measures in Building Construction

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

UNIT - V: Anthropometric Studies

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

UNIT - VI:

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

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

Text Books

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

Reference Books

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

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Optional Elective - I

DATA STRUCTURES

II Year – II Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Sorting and Searching

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

Searching: Linear search, Binary search.

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

UNIT - II: Linked Lists

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

UNIT - III: Stacks and Queues

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

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

UNIT - IV: Trees

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

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

UNIT - V: Heap Trees and Graphs

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

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

UNIT - VI: Hashing

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

Text Books

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

Reference Books

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

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THEORY OF STRUCTURES

III Year – I Semester

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

Course Objectives

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

Learning Outcomes

Upon completion of the course, Students will be able to

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

Course Content

UNIT - I: Arches

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

UNIT - II: Influence Lines and Moving Loads

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

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

UNIT - III: Lateral Load Analysis Using Approximate Methods

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

UNIT - IV: Moment Distribution Method

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

UNIT - V: Kani's Method

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

UNIT - VI: Matrix Methods

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

Text Books

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

Reference Books

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

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GEOTECHNICAL ENGINEERING

III Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Soil formation and mass volume relationship

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

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

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

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

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

UNIT - III: Effective stress and Stress distribution in soils

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

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

UNIT - IV: Compaction

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

UNIT - V: Consolidation

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

UNIT - VI: Shear strength of soils

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

Text Books

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

Reference Books

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

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HYDROLOGY AND WATER RESOURCES ENGINEERING

III Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Hydrologic Cycle

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

UNIT - II: Abstractions

Abstractions: Evaporation, factors affecting evaporation, measurement of evaporation, evaporation reduction, evapotranspiration, factors affecting

evapotranspiration, measurement of evapotranspiration - Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

UNIT - III: Runoff

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

UNIT - IV: Floods

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

UNIT - V: Ground Water

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

UNIT - VI: Irrigation

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

Text Books

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

Reference Books

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

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WATER AND WASTEWATER ENGINEERING

III Year – I Semester

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

Course Objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Sourcing Raw Water

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

UNIT - II: Treating Raw Water

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

UNIT - III: Supplying Potable Water

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

UNIT - IV: Collection of Sewage

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

UNIT - V: Treating Sewage

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

UNIT - VI: Disposing off Treated Sewage and Sludge

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

Text Books

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

Reference Books

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

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Professional Elective - I

ADVANCED STRENGTH OF MATERIALS

III Year – I Semester

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

Course Objectives

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

Course Outcomes

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

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

Course Content

UNIT - I: Thin and Thick Cylinders

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

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

UNIT - II: Theories of Failures

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

UNIT - III: Unsymmetrical Bending

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

UNIT - IV: Cables and Suspension Bridges

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

UNIT - V: Portal Frames- Slope Deflection Method

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

UNIT - VI: Plastic Analysis of Structures

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

Text Books

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

Reference Books

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

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Professional Elective - I

GIS AND GPS

III Year – I Semester

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

Course objectives

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

Learning Outcomes

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

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

Course Content

UNIT - I: Digital Cartography

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

UNIT - II: Structure of GIS

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

UNIT - III: Data Storage and Editing

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

UNIT - IV: Applications of GIS

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

UNIT - V: Structure of GPS

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

UNIT - VI: Applications of GPS

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

Text Books

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

Reference Books

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

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Professional Elective - I

GREEN BUILDINGS

III Year – I Semester

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

Course Objectives

- To introduce students to the concept of 'Green' Building.
- To familiarize students with the 'voluntary environmental building rating systems' (VERS) operating in India.
- To communicate the logic behind the rating categories in IGBC, GRIHA, LEED, EDGE, and WELL rating systems.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- highlight the unique features of green buildings.
- suggest the most appropriate building materials and fittings for green buildings.
- identify opportunities for energy and water savings in building energy and material flows.
- propose renewable energy utilisation options specific to the building project.
- enumerate occupant comfort parameters and suggest suitable electro-mechanical systems.
- guide project proponents to get green certification for buildings.

Course Content

UNIT - I: Suitable Site Selection

Typical features of Green Buildings, benefits of green buildings – Sustainable Site Selection, maximising comfort, integration of daylight, optimising ventilation; rainwater harvesting, recharge, reuse strategies

UNIT - II: Appropriate Materials

Renewable Materials, FSC (Forest Stewardship Council) certification – Rapid Renewal, bamboo, eucalyptus, poplar, rubberwood, linoleum – Low energy walling; rammed earth, stabilised mud, Adobe–Post Consumer, Post Industrial Waste recycling – Hollow blocks, lime, pozzolona cements, agri residues – Ferro cement, Ferro concrete – Alternative roofing systems; Vaults, Domes High albedo paints

UNIT - III: Water & Energy Conservation in Buildings

Need for energy conservation in buildings, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes – Water Conservation systems in Buildings, water harvesting in buildings, waste to energy in residential complexes, Modular wastewater treatment systems

UNIT - IV: Net – Zero Energy Buildings

Wind Energy Concepts, wind energy potential and status in India, wind energy technologies – Solar Energy Concepts, solar energy potential and status in India, solar energy technologies, building scale applications and case studies - Building-scale hybrids.

UNIT - V: Indoor Environment Quality

Weather data collection, temperature, humidity, wind speed, direction–Climate change and Built Environment, how they affect each other – Occupant Comfort,design, codes, thermal comfort, lighting comfort, acoustic comfort - Mechanical Ventilation and Air Conditioning concepts – Energy Efficient Lighting Design – Passive cooling strategies, green roofs – Case studies from actual buildings

UNIT - VI: Measuring Sustainability 'voluntary environmental building rating Systems'

LEED Introduction, process, rating system, variants and levels–GRIHA Introduction, process, rating system, variants and levels– IGBC Introduction, process, rating system, variants and levels– Building Automation and BMS

Text Books

1. Alternative Building Materials and Technologies, K.S.Jagadish, B.V.Venkatarama Reddy and K.S.Nanjunda Rao, 2nd Edition, New Age International
2. Non-Conventional Energy Resources, G.D.Rai, 6th Edition, Khanna Publishers
3. GRIHA Manual and Reference Guides
4. LEED Reference Guides
5. IGBC Reference Guides

Reference Books

1. Sun, Wind, and Light: Architectural Design Strategies, Mark DeKay, G.Z.Brown, 3rd Edition, John Wiley & Sons
2. National Building Code of India (2016), Bureau of Indian Standards.

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Professional Elective - I

CONSTRUCTION MANAGEMENT

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the importance of management in construction projects.
- To familiarize with quality, safety and material management in construction projects.
- To explore environmental issues in construction project.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- illustrate the knowledge of organizing system and importance in business organisation.
- apply the quality control tools in various construction projects
- manage work men and materials in construction project
- adopt the health and safety measures in construction works
- make use of project case studies.

Course Content

UNIT - I: Organizing for Construction

General principles of forming an organization system, Importance of organization, types of organization, Forms of business organization

UNIT - II: Quality Control

Quality Control ,Importance of quality; Elements of quality; Organization for quality control; Quality assurance technique; Documentation; Quality control circles; (TQM) Total quality management; ISO – 9000s.

UNIT - III: Managing Projects

Project Review – Project Completion & Handover – Long term Project audit and review – Continuous improvement technique – Bench Marking of Performance and Process – The role of Project Leaders in the World Class Projects.

UNIT - IV: Materials Management

Importance, Objective, Functions of Material Management Department, stores management, Material procurement, Materials Handling

UNIT - V: Health & safety

(H&S) Health &Safety Management **,** Accident prevention programme; Immediate attention in case of accident; Approaches for safety improvements in construction; Safety benefits to employers, employees and customers; Prevention of fires in construction industries; Fault free analysis; Safety information system; Safety budgeting, case studies of H&S projects.

UNIT - VI: Case Studies

Environmental issues in construction- Hydel Power Projects, Thermal Power Projects, Nuclear Power Projects, and Factors to be considered in planning for big projects.

Text Books

1. Construction Engineering and Management, Dr. S. Seetharaman, Umesh Publications, 5th Edition, NaiSarark, Delhi.
2. Construction Planning, Equipment and Methods, Peurifoy and Schexnayder, Shapira, Tata Mcgrawhill.

Reference Books

1. Construction Project Management - An Integrated Approach, Peter Fewings , Taylor and Francis.
2. Construciton Management Emerging Trends and Technologies, Trefor Williams, Cengage learning.

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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, 4th Edition, B.S.Publications.
2. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman , 7th Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5th Edition (2014), Springer.

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Open Elective - II

ENVIRONMENTAL SANITATION

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To communicate the importance of institutional sanitation in maintaining public health.
- To introduce the strategies for maintaining healthy living and working environment.
- To delineate the role of environmental engineer in industrial environments.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify the common communicable diseases and the solutions for controlling them.
- suggest appropriate sanitation measures for water supply and sanitation in un-sewered areas.
- describe the process of refuse disposal in rural areas.
- draw out the procedures adopted for maintaining hygiene in institutional buildings.
- list out the occupational comfort parameters to be considered for designing built environment.
- introduce the notion of occupational health, safety and the related management approaches.

Course Content

UNIT - I: Epidemics, Epizootics

Origin and spread of Communicable diseases like Cholera, Smallpox, Tuberculosis, Malaria, 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.

Course Content

UNIT - I: Introduction

Types of industrial transport – classification and characteristics of materials – classification and selection of materials handling.

UNIT - II: Conveyor Equipment

Classification of conveyors – description and uses of belt – conveyors – apron conveyors -Roller conveyors – water – screw conveyors – pneumatic and hydraulic conveyors, Computer controlled conveyor system.

UNIT - III: Industrial Trucks

Industrial trucks – main types – purpose of hand trucks – tractors and trailers – self propelled trucks – fork trucks , Automated guided vehicles.

UNIT - IV: Auxiliary Equipment

Hoppers and gates – uses, auxiliary equipment – feeders – chutes – uses.

UNIT - V: Hoisting Appliances

types, description and uses of chain – ropes – types and description and purpose of crane hooks – Grab buckets, lifts – excavators.

UNIT - VI: Cranes

Hand-propelled and electrically driven E.O.T overhead Traveling, cranes; Traveling mechanisms of cantilever and monorail cranes.

Text Books

1. Conveyor Equipment Manufacturer's Association, "*Belt conveyors for bulk materials*" 6th edition, The New CEMA Book.
2. Rudenko N., "*Materials handling equipment*", Elnvee Publishers, 1970
3. Ishwar G Mulani and Mrs. Madhu I Mulani, "*Engineering Science and application design for belt conveyor*", Madhu I. Mulani, 2002.

Reference Books

1. Spivakovsy A.O. and Dyachkov V.K., "*Conveying Machines, Volumes I and II*", MIR Publishers, 1985.
2. Alexandrov, M., "*Materials Handling Equipments*", MIR Publishers, 1981.
3. Boltzharol, A.,"*Materials Handling Handbook*", The Ronald press company 1958.

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Open Elective - II

AUTOMOTIVE ELECTRONICS

III Year – I Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To familiarize with the electronic systems inside an automotive vehicle.
- To introduce the concepts of advanced safety systems

Learning Outcomes

Upon successful completion of the course, the students will be able to

- learn the fundamentals of automotive technology.
- describe the operation of microcomputer systems.
- acquire knowledge in automotive sensors and control systems.
- develop communications & navigation/routing in automotive vehicles.

Course Content

UNIT - I: Automotive Fundamentals

Use of electronics in the automobile, evolution of automotive electronics, the automobile physical configuration, evolution of electronics in the automobile, survey of major automotive systems, engine control or electronic control unit, ignition system.

UNIT - II: Automotive Micro-Computer System

Binary number system, binary counters, Microcomputer fundamentals-digital versus analog computers, basic computer block diagram, microcomputer operations, CPU registers, accumulator registers, condition code register-branching; microprocessor architecture, memory-ROM, RAM; I/O parallel interface, digital to analog converter and analog to digital converters with block diagram.

UNIT - III: Basics of Electronics Engine Control

Motivation for electronic engine control, exhaust emissions, fuel economy, concept of an electronic engine control system, engine functions and control, electronic fuel control configuration, electronic ignition with sensors.

UNIT - IV: Sensors and Actuators

Introduction; basic sensor arrangement; types of sensors such as oxygen sensors, crank angle position sensors, fuel metering/vehicle speed sensors and detonation sensors, altitude sensors, flow sensors, throttle position sensors, solenoids,

stepper motors, actuators – fuel metering actuator, fuel injector, and ignition actuator.

UNIT - V: Electronic Vehicle Management System

Cruise control system, antilock braking system, electronic suspension system, electronic steering control, and transmission control, safety: air bags, collision avoidance radar warning system with block diagram, low tire pressure warning system, advanced cruise control system.

UNIT - VI: Automotive Instrumentation System

Speech synthesis, sensor multiplexing, control signal multiplexing with block diagram, fibre optics inside the car, automotive internal navigation system, GPS navigation system, voice recognition cell phone dialling.

Text Books

1. William B. Ribbens, "Understanding Automotive Electronics", SAMS/Elsevier Publishing, 6th Edition. (UNIT I to VI).
2. Robert Bosch Gambh, "Automotive Electrics Automotive Electronics Systems and Components", John Wiley& Sons Ltd., 5th edition, 2007.

Reference Books

1. Ronald K Jurgen, "Automotive Electronics Handbook", 2nd Edition, McGraw-Hill, 1999.
2. G. Meyer, J. Valldorf and W. Gessner, "Advanced Microsystems for Automotive Applications", Springer, 2009.
3. Robert Bosch, "Automotive Hand Book", SAE, 5th Edition, 2000.

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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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GEOTECHNICAL ENGINEERING LAB

III Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To introduce the tests for determining the dry density of soils.
- To familiarize with different test procedures for obtaining shear strengthof soils.
- To appraise the soil properties by compaction and consolidation process.
- To familiarize with the tests for finding out the permeability of soils.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- conduct index tests and classify the soils.
- determine in-situ density and compaction control of soils.
- determine the compaction and consolidation parameters of soils.
- identify the engineering properties of the soils.

List of Experiments

1. Determine the specific gravity of solids by density bottle or pycnometer method.
2. Determination of Liquid Limit, Plastic Limit and shrinkage limit of the Soil.
3. Determine the Field Density by Core Cutter and Sand Replacement Methods.
4. Determine the compaction characteristics of soil by I. S. Light Compaction.
5. Determine the compaction characteristics of soil by I. S. Heavy Compaction
6. Determination of Free Swell Index (FSI).
7. Determine California Bearing Ratio (CBR) of soil.
8. Determine particle size distribution of soil by sieve analysis.
9. Determine particle size distribution by hydrometer method.
10. Determination of Undrained Shear Strength of Soil By Unconfined Compression (UCC) Test.
11. Determination of Shear Strength Parameters of a Soil Specimen by Triaxial Compression Test.

12. Determination of Shear Strength Parameters of the Soil by Direct Shear Test (Box Shear Test).
13. Determination of Undrained Shear Strength of Soil By Laboratory Vane Shear Test.
14. Determination of Density Index (Relative Density) of Cohesionless Soils.
15. Determination of Coefficient of Permeability of the Soil by Variable (Falling) Head method.

Note: At least 12 of the above experiments are to be conducted.

Reference Books

1. Soil Mechanics and Foundation Engineering, K.R. Arora, 7th Edition, Standard Publishers and Distributors, Delhi.
2. IS: 2720 Code
3. Lab Manual prepared by faculty of Civil Engineering dept., Gudlavalleru Engineering college.

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WATER AND WASTEWATER ENGINEERING LAB

III Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To verify the suitability of water for drinking, based on Indian Standards
- To estimate the strength of sewage in terms of biological parameters
- To identify the vital conditions for survival of aquatic life.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- test the quality of water for potability as per IS standards.
- test the strength of sewage based on biochemical parameters.
- determine the optimum coagulant dosage.

List of Experiments on Water

1. Identification of Physical Parameters – Colour, Odour, Taste
2. Estimation of Total, Volatile, Dissolved, Suspended Solids
3. Determination of Chlorides
4. Determination of Optimum Coagulant Dose
5. Determination of Chlorine Demand
6. Estimation of settleable solids using Imhoff Cone
7. Determination of Dissolved Oxygen with D.O. Meter
8. Determination of B.O.D
9. Determination of C.O.D
10. Determination of M.P.N
11. Determination of Fluorides in water
12. Determination of Nitrates
13. Determination of Sulphates
14. Determination of Iron
15. Determination of Phosphorus

Note: At least 12 of the above experiments are to be conducted

Reference Books

1. IS: 3025
2. Lab Manual prepared by faculty of Civil Engineering dept., Gudlavalleru Engineering College.

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Optional Elective - III

INFRASTRUCTURE DEVELOPMENT

III Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To evaluate infrastructure development.
- To know PPP Procurement Process in India.
- To manage the risks associated with various infrastructure projects.
- To identify the critical issues in infrastructure financing.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- PPP as a mechanism to attract private investment for development.
- risk identification, risk sharing and risk mitigation for PPP projects.
- contracting for and contract management of PPP contracts during their lives.
- financing instruments available for PPP projects.

Course Content

UNIT - I: Infrastructure Development – Introduction

Infrastructure Development and Economic Growth - Sources of Financing Infrastructure Projects - Limitations of Traditional Procurement Process.

UNIT - II: PPP – Overview

Infrastructure Development through PPP Route - Stakeholders' Perspectives - Governments Roles in Successful PPP Projects - Bidding Evaluation And Bidding Rules- Value For Money Assessment.

UNIT - III: PPP - Procurement Process

PPP Procurement Process - PPP Contractual Package - PPP Procurement Process in Indi.

UNIT - IV: Structuring a PPP: Available PPP Options

Service Contract - Management Contracts - Affermage or Lease Contracts- Concessions -Build–Operate–Transfer and Similar Arrangements -Joint Venture - Hybrid Arrangements

UNIT - V: Risk Management

Risks Associated With Various Infrastructure Projects - Risk Management - Risk Identification - Risk Assessment - Risk Allocation - Risk Mitigation - Risk Allocation Framework - PPP Road Projects in India

UNIT - VI: Project Finance

Introduction to Project Finance - Project Financing Process - Project Finance - Security Package - Preparing Financing Plan - Lending Institutions in India

Text Books

1. Public-Private Partnerships - Managing risks and opportunities, Akintoye, A., Beck, M., & Hardcastle, C. (Eds.). (2003), Oxford: Blackwell Science Limited.
2. Project financing - Asset-based financial engineering, Finnerty, J. D. (1996), New York: John Wiley & Sons, Inc.
3. Investment project design - A guide to financial and economic analysis with constraints, Kurowski, L., & Sussman, D. (2011), New Jersey: John Wiley & Sons.
4. Project finance for construction and infrastructure: Principles and case studies, Pretorius, F., Lejot, P., McInnis, A., Arner, D., & Hsu, B. F.-C. (2008), Oxford: Blackwell Publishing.

Reference Books

1. Infrastructure as an asset class - Investment strategies, project finance and PPP, Weber, B., & Alfen, H. W. (2010), West Sussex: John Wiley & Sons
2. Project Finance in Asia Pacific: Practical Case Studies, Tinsley, R. (2002). London, UK: Euromoney Books.
3. Guidelines for infrastructure development through Build-Operate-Transfer (BOT) projects, UNIDO. (1996), Vienna: UNIDO.
4. Privatized infrastructure: the Build Operate Transfer approach, Walker, C., & Smith, A. J. (1995), London: Thomas Telford.

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Optional Elective - III

BASICS OF POWER PLANT ENGINEERING

III Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the working principles of various power plants.

Learning Outcomes

Upon successful completion of the course , students will be able to

- identify the various conventional energy resources.
- explain the working principles of various power plants used in electric power generation.

Course Content

UNIT - I: Introduction

Energy and power, Sources of Energy Types of power plants and Development of Power in India.

UNIT - II: Steam Power Plant

Plant Layout, Components, Working of different Circuits, Coal Handling Systems,Ash handling systems.

UNIT - III: Gas Turbine Plant

Introduction, Types of Gas Turbine Plants, Layout with auxiliaries, Principles of working of Closed and Open Cycle Gas Turbines. Combined cycle Gas Turbine power plants, Cogeneration

UNIT - IV: Diesel power plant

Introduction- Plant layout with auxiliaries, Fuel supply system, Lubrication and Cooling system.

UNIT - V: Nuclear Power Station

Nuclear reactor- Reactor Operation,.Classification of Nuclear Reactors**:** Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast Breeder Reactor.

UNIT - VI: Hydroelectric Power Plant

Classification of Hydroelectric Power Plants, Typical Layouts, Plant auxiliaries, Classification of dams and spill ways.

Text Books

1. An Introduction to Power Plant Technology, G.D. Rai, 3rd EditionKhanna Publishers, 2004,
2. Power Plant Engineering, P.K.Nag, 4th Edition, Tata McGraw-Hill Education, 2014.

Reference Books

1. A Course in Power Plant Engineering, S.C. Arora and S. Domkundwar, Dhanpat Rai & Co. (P) Limited, 2014
2. Power Plant Engineering, R. K. Rajput, 4th Edition, Laxmi Publications, New Delhi, 2016.
3. Power Plant Technology, M.M.El-Wakil, Revised 2nd edition, Tata McGraw-Hill Education.

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Optional Elective - III

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

III Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the concepts of object oriented programming.
- To impart the knowledge of AWT components in creation of GUI.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply Object Oriented approach to design software.
- create user defined interfaces and packages for a given problem.
- develop code to handle exceptions.
- implement multi tasking with multi threading.
- develop Applets for web applications
- design and develop GUI programs using AWT components.

Course Content

UNIT - I: Fundamentals of OOP and Java

Need of OOP, principles of OOP languages, procedural languages vs. OOP, Java virtual machine, java features.

Java Programming constructs: variables, primitive data types, identifiers, keywords, Literals, operators, arrays, type conversion and casting.

UNIT - II: Class Fundamentals and Inheritance

Class fundamentals, declaring objects, methods, constructors, this keyword, overloading methods and constructors, access control.

Inheritance- Basics, types, using super keyword, method overriding, dynamic method dispatch, abstract classes, using final with inheritance, Object class.

UNIT - III: Interfaces and Packages

Interfaces: Defining an interface, implementing interfaces, nested interfaces, variables in interfaces and extending interfaces.

Packages: Defining, creating and accessing a package.

UNIT - IV: Exception Handling and Multithreading

Exception Handling- exception-handling fundamentals, uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, user-defined exceptions.

Multi Threading - Introduction to multitasking, thread life cycle, creating threads, synchronizing threads, thread groups.

UNIT - V: Applets and Event Handling

Applets- Concepts of Applets, differences between applets and applications, life cycle of an applet, creating applets.

Event Handling- Events, event sources, event classes, event listeners, Delegation event model, handling mouse and keyboard events, adapter classes.

UNIT - VI: AWT

The AWT class hierarchy, user interface components- label, button, checkbox, checkboxgroup, choice, list, textfield, scrollbar, layout managers –flow, border, grid, card, gridbag.

Text Books

1. Herbert Schildt, “Java The Complete Reference”, 7th edition, TMH.
2. Sachin Malhotra, Saurabh Choudhary, “Programming in Java”, 2nd edition, Oxford.

Reference Books

1. Joyce Farrel, Ankit R.Bhavsar, “Java for Beginners”, 4th edition, Cengage Learning.
2. Y.Daniel Liang, “Introduction to Java Programming”, 7th edition, Pearson.
3. P.Radha Krishna, “Object Oriented Programming through Java”, Universities Press.

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FOUNDATION ENGINEERING

III Year – II Semester

Lecture	: 3	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To introduce the stability of earth slopes.
- To familiarize with lateral earth pressure and stability of retaining walls.
- To familiarizewith load carrying capacity of shallow and deep foundations.

Learning Outcomes

Upon successful completion of the course, the student will be able to

- choose suitable type of boring and generate soil investigation report.
- verify stability of slopes of an embankment.
- develop pressure distribution diagrams and judge the stability of retaining walls.
- calculate bearing capacity of shallow and deep foundations.
- adopt proper construction and remedial measures of well foundations.

Course Content

UNIT - I: Soil Exploration

Need – Methods of soil exploration – Boring and Sampling methods –Penetration Tests– Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.

UNIT - II: Earth Slope Stability

Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stabilityanalysis by Swedish arc method, Bishop's Simplified method – Taylor'sStability Number.

UNIT - III: Earth Pressure Theories

Rankine's & Coulomb's theory of earth pressure, Culmann's graphical method

Retaining Walls

Types of retaining walls – Design approach of gravity, cantilever retaining walls.

UNIT - IV: Shallow Foundations

Bearing capacity–criteria for determination of bearing capacity– factors influencing bearing capacity– analytical methods to determine bearing capacity– Terzaghi,

Meyerhof and IS code methods. Safe bearing pressure based on N- value –safe bearing capacity.

UNIT - V: Pile Foundation

Classification of piles – Load carrying capacity of piles based on static pile formulae– Dynamic pile formulae– Pile load tests - Load carrying capacity of pile groups in sands and clays.

UNIT - VI: Well Foundation

Different shapes of well foundations –Forces acting on well foundation– Design of individual Components– Construction and sinking of well foundations – Tilts andshifts.

Text Books

1. Soil Mechanics and Foundation Engineering,K.R. Arora,7th Edition,Standard Publishersand Distributors, Delhi.
2. Geotechnical Engineering Principles and practices of soil mechanics and foundation engineering,VNS Murthy,2nd Edition, CRC Press.

Reference Books

1. Basic and Applied Soil Mechanics,GopalRanjan& ASR Rao,3rd Edition,New AgeInternational Pvt. Ltd, New Delhi.
2. Geotechnical Engineering,C. Venkataramiah,6th Edition, New age InternationalPvt.Ltd,(2002).
3. Soil Mechanics,T.W. Lambe and Whitman,2nd Edition, Mc-Graw Hill PublishingCompany, Newyork.
4. Foundation Analysis and Design,Joseph E. Bowles, 5th Edition, McGraw-Hill.

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HIGHWAY ENGINEERING

III Year – II Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To familiarize with different concepts in the field of Highway Engineering.
- To acquire design principles of Highway geometrics and pavements
- To learn various highway construction and maintenance procedures.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- plan the alignment of highway network for the given area.
- design the highway geometrical elements.
- design intersections and prepare traffic management plans.
- identify the suitability of pavement materials and design flexible & rigid pavements.
- understand the principles of construction and maintenance of highways.

Course Content

UNIT - I: Introduction

Types of pavements; Functions and requirements of different components of pavements.Railway Engineering- Permanent Way Components, Cross Section of Permanent way. Airport Engineering: Basic elements of airport-Runway, Taxiway, Apron, Terminal building and Hanger, Aircraft and its characteristics. Harbour Engineering- Classification of ports and harbours, requirement of a good port.

UNIT - II: Highway Development and Planning

Introduction about Roads, Jayakar Committee and its recommendations, Necessity for Highway Planning, Different Road Development plans, Classification of Roads, Road network patterns, Highway Alignment, Factors affecting Alignment, Engineering Surveys.

UNIT - III: Highway Geometric Design

Important of Geometric Design, Design Controls and Criteria, Highway Cross Section Elements, Sight Distance Elements, Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance, Design of Horizontal Alignment, Design of Super elevation, Extra Widening - Widening of pavement on horizontal

curves, Transition Curves – Objectives of providing transition curves, different types of transition curves, Calculation of length of transition curve, Vertical Alignment-Gradients – categories of gradients – compensation in gradient on horizontal curves, Vertical Curves – different types of vertical curves.

UNIT - IV: Highway Materials

Highway materials: aggregate properties and tests: crushing, abrasion and impact test, bitumen properties and tests, penetration, ductility, viscosity, binder content and softening point. Marshall Method of mix design

UNIT - V: Design of Pavements and Pavement Failures

Design of flexible pavement by C B R method as per IRC 37-2012, stresses in rigid pavement by Westergaards and IRC methods. Failures in flexible pavements, Failures in rigid pavements

UNIT - VI: Highway Construction and Maintenance

Highway construction: Earthen roads, WBM roads, bituminous concrete roads and cement concrete roads, Highway maintenance – Maintenance of Earth roads, bituminous surfaces, Cement concrete roads.

Text Books

1. Highway Engineering, S.K Khanna, C.EC Justo and A.Veeraragavan, Revised 10th Edition, Nem Chand and Bros.
2. Highway Railway Airport & Harbour Engineering, K.P Subramanian, Scitech publications.

Reference Books

1. Transportation Engineering and Planning, Papacostas C.S. and PD Prevedouros, 3rd Edition Prentice Hall of India Pvt. Ltd; New Delhi.
2. Transportation Engineering Volume II, C.Venkatramaiah, University Press
3. Transportation Engineering - An Introduction, Jotin Khisty C, Prentice Hall, 3rd Edition, Englewood Cliffs, New Jersey.
4. Highway Engineering, Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi.

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DESIGN OF RC STRUCTURES

III Year – II Semester

Lecture : 3	Tutorial : 1	Internal Marks	: 40
Credits : 3		External Marks	: 60

Course Objectives

- To familiarize with the different types of design philosophies and IS:456 - 2000 provisions
- To introduce the concepts of limit state of collapse and serviceability for analysis and design of structural elements along with detailing and drawings
- To impart the knowledge on the design of shear, development length, deflection and cracking.

Learning Outcomes

Upon successful completion of the course, students will be able to

- explain the fundamental behaviour of RCC structures and code provisions of IS 456:2000 and IS 875.
- analyze the beams for flexure in limit state of collapse and serviceability.
- analyze and design the beams subjected to shear, bond and torsion.
- design the beams for flexure in limit state of collapse and serviceability
- design the one-way and two-way slabs for flexure in limit state of collapse and serviceability.
- design the columns and footings.

Course Content

UNIT - I: Limit State Method

Introduction: Materials of reinforced concrete, Loading Standards as per IS 875, grades of concrete and grades of steel used in concrete. Introduction to working stress, Ultimate load and limit state methods. Elastic theory, design constants, modular ratio - Depth of neutral axis and moment of resistance -balanced, under-reinforced and over-reinforced sections. Concepts of limit state design– Characteristic load, Characteristic strength – Partial load and safety factors – representation of stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design, stress-block parameters and limiting moment of Resistance.

UNIT - II: Analysis of Beams

Limit state analysis of singly reinforced, doubly reinforced, rectangular, T and L beam sections.

UNIT - III: Shear and Deflection

Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Limit state design of serviceability for deflection, cracking and code provisions.

UNIT - IV: Design of Beams

Design of singly reinforced, doubly reinforced and flanged beams; simply supported, cantilever and continuous beams- Examples with detailing.

UNIT - V: Design of Slabs

Design of one-way slabs, two-way slabs, continuous slabs using coefficientsof IS code. Design of waist slab for staircase and detailing.

UNIT - VI: Design of Columns and Footings.

Short and Long columns - axial loads, uni-axial and bi-axial bending moments- use of IS Code provisions. Design of isolated footings for axial loads.

Note: All designs are to be taught in Limit State method.

Following plates should be prepared by the students.

1. Reinforcement particulars of T-beams and L-beams.
2. Reinforcement detailing of continuous beams.
3. Detailing of one way, two way and continuous slabs
4. Reinforcement particulars of columns

Semester End Examination Pattern

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

Text Books

1. Limit State Design of Reinforced concrete, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, 2007, Laxmi Publications.
2. Design of Reinforced concrete Structures, S.Ramamrutham and R Narayana, Dhanpat Rai publishing Co (P) Ltd.
3. IS Codes: IS 456:2000, IS 875(Part I & II).

Reference Books

1. Fundamentals of Reinforced concrete design, M.L. Gambhir, 3rd edition, Printice Hall of India Private Ltd.
2. Limit state design of reinforced concrete, P.C.Varghese, 2nd edition, Printice Hall of India Private Ltd.
3. Reinforced concrete design, S.Unnikrishna Pillai & Devdas Menon, 3rd edition,Tata Mc.Graw Hill, New Delhi.

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Professional Elective - II

ADVANCED STRUCTURAL ANALYSIS

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with numerical methods of Engineering analysis
- To impart the knowledge on ILDs of three hinged arches.
- To familiarize with basic principles of matrix methods of structural analysis
- To introduce the basics of theory of elasticity

Learning Outcomes

Upon successful completion of the course, students will be able to

- adopt the methods for analysing engineering products.
- draw ILD for three hinged arches.
- analyze indeterminate trusses.
- apply concept of matrix methods for framed structures up to two degree of freedom.
- explain the principle of elasticity and stress strain relationships.

Course Content

UNIT - I: Engineering Analysis

Methods of engineering analysis**-**Introduction to experimental, Analytical and numerical methods, Variational method**-**Rayleigh-Ritz method, Concept of potential energy**-**Constituents of total potential energy, Strain energy, Stationary properties and variation characteristics of total P.E, Weighed residual methods **-** Point allocation method, Sub domain method, Least squares method, Galerkin's method.

UNIT - II: Three Hinged Arches

Introduction, Influence line diagrams-Three hinged arches - point loads and udl.

UNIT - III: Indeterminate Structural Analysis

Indeterminate Trusses -Determination of static and kinematic indeterminacies-Castigliono's theorem - Solution of trusses up to two degrees of internal and external indeterminacy.

UNIT - IV: Flexibility method of Analysis

Analysis of continuous beams with support settlement and rigid jointed plane frames with static indeterminacy not exceeding two.

UNIT - V: Stiffness method of Analysis

Analysis of continuous beams with support settlement and rigid jointed plane frames with kinematic indeterminacy not exceeding two.Direct formulation of stiffness matrix for plane frames with number of bays and stories not exceeding one.

UNIT - VI: Introduction to Theory of Elasticity

Introduction to theory of elasticity: Notations for forces and stresses, components of stresses and strains,plane stress, plane strain-definitions, differential equations of equilibrium-Hooke's Law

Text Books

1. Structural analysis, T.S. Thandavamoorthy, Oxford University press, New Delhi, 2011.
2. Introduction of finite element analysis by S.Md. Jalaludeen, Anuradha publications, 2011.
3. Theory of Elasticity, Timoshenko and Goodier, McGraw Hill Publishers, 2010.
4. Structural Analysis - A Matrix Approach, G Pandit , S. Gupta, McGraw Hill Publishers, 2008.

Reference Books

1. Theory of Structures, Ramamrutham, Dhanapatraisons publications, 2014.
2. Theory of Elasticity, Sadhu Singh, Khanna Publishers, New Delhi, 1998.
3. Structural analysis-I, S SBhavakatti, Vikas publishing house pvt ltd, 2011.
4. Analysis of structures Vol-I & Vol-II, V.N.Vazirani&M.M.Ratwani, Khanna PublishersNewDelhi 1994, 1999.

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Professional Elective - II

ENVIRONMENTAL POLLUTION AND ITS CONTROL

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the concepts of Air Pollution and the control methods.
- To impart the knowledge of the Solid Waste generation problem.
- To familiarize the best practices for management of solid wastes adopted at the service provider level.
- To elucidate noise pollution problems and emphasize the necessity to control them.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- evaluate the ambient air quality based on the analysis of air pollutants.
- relate the polluting plume behaviour with weather data.
- identify suitable control methods depending on the severity and type of air pollution.
- classify solid wastes and identify suitable collection and transfer mechanisms.
- suggest suitable solid waste management methods based on the nature of solid waste and the quantities to be handled.
- identify the sources of noise pollution and suggest methods for mitigating the problem.

Course Content

UNIT - I: Air Pollution

Definitions, scope, significance and episodes – Types of pollutants, their sources and impacts (on plants, animals, materials) – Classifications, natural & artificial, primary & secondary, point &non point, linear & areal sources, stationary & mobile – Sampling and analysis of air pollutants – Ambient air quality standards by WHO (World Health Organisation) & CPCB (Centra Pollution Control Board).

UNIT - II : Air Pollution Meteorology

Properties of atmosphere: heat, pressure, wind forces, moisture and relative humidity – Lapse rates – Influence of terrain and meteorological phenomena on plume behaviour and air quality – Wind rose diagrams, plume rise models.

UNIT - III: Air Pollution Control and Monitoring

Control of particulates:control at sources, process changes, equipment modifications – Design and operation of control equipments, settling chambers, cyclone separators, fabric filters, scrubbers, electrostatic precipitators – Control of gases like SO_x, NO_x, CO and HC, Air-fuel ratio, computation and control of products of combustion – Monitoring of SPM, SO_2, NOx and CO, Stack Monitoring for flue gases.

UNIT - IV: Solid Waste Generation and Collection

Characteristics – types, sources, and properties of solid waste – Generation, typical generation rates, estimation of solid waste quantities, factors that affect generation of wastes – Collection services, types of collection systems, determination of vehicle and labour requirement and transportation of solid waste – Transfer stations, transfer means and methods.

UNIT - V: Solid Waste Management and Disposal

Engineered systems for solid waste management (refuse, reduce, reuse, recover, recycle) – Reuse of solid waste materials, processing techniques, materials recovery system, recovery of biological, thermal conversion products and recovery of energy from conversion products – Recycling of segregated waste materials – Ultimate Disposal of solid waste (Land filling, incineration, composting).

UNIT - VI: Noise Pollution and Control

Sources of noise pollution, impacts of noise, measurement of noise and permissible limits of noise, control methods of noise pollution, The Noise Pollution (Regulation and Control) Rules, 2000 as per CPCB.

Text Books

1. Air Pollution, M.N.Rao, H.V.N.Rao, 1st Edition, McGraw Hill Education.
2. Solid and Hazardous Waste Management, M.N.Rao, Razia Sultana, 1st Edition, BS Publications.
3. Noise Pollution and Its Control,H.C.Bhatia, 1st Edition, Atlantic Publisher.

Reference Books

1. Advanced Air and Noise Pollution Control, Lawrence K.Wang, Norman C. Pereira, Yung-Tss Hung, 2005 Edition, Humana Press.
2. Municipal Solid Waste Management, P.Jayarama Reddy, 1st Edition, B.S.Publications.

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Professional Elective - II

GROUND WATER DEVELOPMENT AND MANAGEMENT

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart knowledge on ground water flow in confined and unconfined aquifers.
- To familiarize with the principles involved in design and construction of wells.
- To provide awareness on improving the groundwater potential using various recharge techniques.
- To introduce the concept of saline water intrusion in coastal aquifers and its control measures.

Course Outcomes

Upon successful completion of the course, the students will be able to

- estimate aquifer parameters and yield of wells.
- analyse radial flow towards wells in confined and unconfined aquifers.
- design wells and understand the construction practices.
- select appropriate methods of artificial recharge for increasing groundwater potential.
- Illustrate effective measures for controlling saline water intrusion.

Course Content

UNIT - I: Introduction

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT - II: Well Hydraulics

Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jacob and Chow's methods, Leaky aquifers

UNIT - III: Well Design

Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

UNIT - IV: Well Development

Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open-hole, bail-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT - V: Artificial Recharge

Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies. Groundwater Basin Management: Concepts of conjunction use, Case studies.

UNIT - VI: Saline Water Intrusion

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben-Herzberg relation, Shape of interface, control of seawater intrusion.

Text Books

1. Groundwater, H.M.Raghunath, third edition, New age international publishers
2. Ground water Hydrology by David Keith Todd, second edition, John Wiley & Son.

Reference Books

1. Groundwater, S.Ramakrishnan, second edition, Scitech publications
2. Ground Water Assessment: Development and Management, K. R. Karanth, twelfth reprint, Tata McGraw-Hill.

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Professional Elective - II

GROUND IMPROVEMENT TECHNIQUES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the need of ground improvement techniques in improving the strength parameters of soils.
- To familiarize with various dewatering methods
- To introducethe applications of reinforced earth, confinement systems and geo-synthetics

Learning Outcomes

Upon successful completion of the course, the students will be able to

- select suitable ground improvement techniques according to soil conditions.
- illustrate the concepts of reinforced earth systems.
- enumerate the concepts of soil confinement systems.
- explain the types and functions of geo-synthetics.

Course Content

UNIT - I: Introduction

Introduction – Need and objectives of Ground Improvement techniques, Classification of Ground Improvement techniques

Mechanical Stabilization – Methods of compaction, Shallow Compaction, Deep compaction techniques – Vibro-floatation, Blasting, Dynamic consolidation and Compaction piles

UNIT - II: Hydraulic Stabilization

Methods of dewatering – open sumps and ditches, Well-point system, Electro-osmosis, Vacuum dewatering wells

Drains – Types, Preloading and Design features of Vertical Drains.

UNIT - III: Physical and Chemical Stabilization

Stabilization with admixtures like Cement, Lime, Calcium chloride, Fly ash and Bitumen

UNIT - IV: Reinforced Earth Techniques

Concept of soil reinforcement, Reinforcing materials, Backfill criteria, Design of reinforcement for internal stability, Applications of Reinforced earth structures. Soil Nailing and Its applications

UNIT - V: Grouting and Soil Confinement Systems

Grouting – Objectives of grouting – grouts and their applications – methods of grouting

Soil Confinement Systems – Concept of confinement, Gabion walls, Crib walls, Sand bags

UNIT - VI: Geosynthetics

Geotextiles – types, functions, properties and applications; Geo-grids & Geo-membranes - properties and applications

Text Books

1. Ground Improvement Techniques,Purushotham Raj,2nd Edition, Laxmi Publications, New Delhi
2. An introduction to Soil Reinforcement and Geosynthetics, G.L.Siva Kumar Babu, 1st Edition, Universities Press.

Reference Books

1. Engineering Principles of Ground Modification,Hausmann M.R. (1990),1st Edition, McGraw-Hill International Edition.

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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 controls loops.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe the constructional details, working principles of various generating stations.
- analyze the working of different types of controls and control loops.
- choose various measurements involved in power generation plants.
- understand the knowledge about the different types of devices used for analysis.

Course Content

UNIT - I: Overview Of Power Generation

Brief survey of methods of power generation – hydro, thermal, nuclear, solar and wind power – importance of instrumentation in power generation – thermal power plants – building blocks – details of boiler processes UP&I diagram of boiler – cogeneration.

UNIT - II: Measurements In Power Plants

Electrical measurements – current, voltage, power, frequency, power – factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor.

UNIT - III: Analyzers In Power Plants

Flue gas oxygen analyser – analysis of impurities in feed water and steam – dissolved oxygen analyser – chromatography – PH meter – fuel analyser – pollution monitoring instruments.

UNIT - IV: Control Loops In Boiler

Combustion control – air/fuel ratio control – furnace draft control – drum level control – main stem and reheat steam temperature control – super heater control – attemperator –deaerator control – distributed control system in power plants – interlocks in boiler operation.

UNIT - V: Turbine – Monitoring And Control

Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control – cooling system

UNIT - VI: Analysis in Power Plant

Thermal conductive type, paramagnetic type-Oxygen analyzer, hydrogen purity meter-chromatography – PH meter,fuel analyzer, pollution monitoring and control

Text Books

1. Sam G. Dukelow, 'The control of Boilers', Instrument Society of America,1991.
2. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.
3. E.L Wakil, M.M./Power Plant technology/Mc Graw Hill 1984.
4. J.Balasubramaniam & R.K Jain/Modern Power Plant Engineering/Khanna

Reference Books

1. Elonka,S.M.and Kohal A.L.Standard Boiler Operations, McGraw-Hill, New Delhi,1994.
2. R.K.Jain, Mechanical and industrial Measurements, Khanna Publishers, New Delhi, 1995.

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Open Elective - III

MATERIAL SCIENCE

III Year – II Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- to understand the properties of engineering materials, so as to manipulate them for the desired engineering applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- compare the different types of conductors and semi conductors and their applications
- classify magnetic materials based on their parameters
- understand the applications of dielectric principles in engineering devices.
- propose a corrosion prevention technique for a particular application
- summarize the different optical properties of metallic materials
- apply different characterization techniques for validation of metals.

Course Content

UNIT - I: Conductors, Semi Conductors and Resisters

Resistivity, Range of Resistivity- free electron theory - classical theory & quantam theory. Semiconducting materials: Energy gap in solids - intrinsic semi conductors - extrinsic semi conductors - element & compund semi conductors - crystal structure - growth & purification of semi conductor crystals.

UNIT - II: Magnetic Materials

Magnetic Materials: Classification of magnetic materials based on spin - Hard and soft magnetic materials - Dia, Para & Ferro types, atomic magnetic moment - anti ferro magnetism.

UNIT - III: DIELECTRIC MATERIALS

Dielectric Materials: Dielectric susceptability - complex die electric constant - Polarization mechanisms in dielectrics - Frequency and temperature dependence of polarization mechanism - Dielectric loss - Dielectric waveguide and dielectric resonator antenna - Piezoelectric, pyroelectric and ferroelectric materials and their applications.

UNIT - IV: Optical Properties of Materials

Introduction - electromagnetic radiation - light interactions with solids - Refraction, Reflction, Absorption, Transmission, Opacity & Translucency in insulators - Luminescence - Photo conductivity.

UNIT - V: Corrosion & Oxidation

Corrosion: Principles of corrosion - electrode potential - galvanic series - galvanic cell - polarization - passivation - electro chemical considerations - corrosion rate - forms of corrosion - corrosion prevention.

Oxidation: Mechanisms of oxidation - oxidation resistant materials.

UNIT - VI: Materials Characterization

X-ray diffraction, Neutron diffraction and Electron diffraction - X-ray fluorescence spectroscopy - Thermogravimetric Analysis (TGA) - Differential Thermal Analysis (DTA) - Differential Scanning Calorimetry (DSC).

Text Books

1. V. Raghavan, “Materials Science and Engineering”, PHI Learning Publication, 5th edition.
2. Rajendran, V. “Materials Science”,Tata McGraw- Hill,New Delhi,2011.

Reference Books

1. William D. Callister, “Materials Science and Engineering” 9th ed., John Wiley and sons, Incorporated.
2. Sam Zhang, “Materials Characterization Techniques”, CRC Press.
3. J. M. D. Coey, “Magnetism and Magnetic Materials”, Cambridge University Press.

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Open Elective - III

RENEWABLE ENERGY SOURCES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To study various types of non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze the significance of renewable energy.
- describe the principles of solar radiation and design the solar collectors.
- know the functioning of basic components of wind energy and understand the utilization of biomass in power generation.
- discuss the working principles of geothermal, ocean, tidal and wave energy techniques.
- know the functioning of direct energy conversion techniques.

Course Content

UNIT - I: Introduction

Energy Sources and their availability, Role and potential of renewable source.

Principles of Solar Radiation: Solar constant, Solar Radiation outside the Earth's atmosphere, Solar Radiation at the Earth's surface, instruments for measuring solar radiation, solar radiation geometry, solar radiation on titled surfaces with numerical problems.

UNIT - II: Solar Energy Storage and Applications

Different methods, sensible, latent heat and stratified storage, solar ponds. Solar Applications-solar heating/cooling technique, solar distillation, drying, photovoltaic energy conversion, solar central power tower concept and solar chimney. solar collectors- flat plate, concentric collectors.

UNIT - III: Wind Energy

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

Bio-Mass: Biomass Energy Sources, methods for obtaining energy from biomass, Biomass gasification.

UNIT - IV:

Geothermal Energy: Resources, types of wells, methods of harnessing the energy.

Ocean Energy: OTEC, Principles, utilization, setting of OTEC plants, thermodynamic cycles.

Tidal and wave energy: Potential and conversion techniques, Mini-hydel power plants

UNIT - V:

Direct Energy Conversion (DEC): Need for DEC, limitations, principles of DEC. Thermoelectric Power – See-beck, Peltier, Joule -Thomson effects, Thermo-electric Power generators.

UNIT - VI: MHD Power Generation

Principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion.

Fuel cells: Principles, Faraday's laws, thermodynamic aspects, selection of fuels and operating conditions, applications.

Text Books

1. Tiwari and Ghosal, "Renewable energy resources", Narosa.
2. B.H.Khan "Non – conventional Energy Resources" Tata McGraw Hill education Pvt Ltd.

Reference Books

1. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons
2. Twidell & Weir, "Renewable Energy Sources " Sukhatme, "Solar Energy", Tata McGraw-Hill Education.

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Open Elective - III

ASSISTIVE TECHNOLOGIES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce different assistive technology devices
- To familiarize with the concepts of enhance speech communication and independent living.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify the legislative policies connected with assistive Technologies
- know the universal design principles in the context of general education environments and curriculum materials.
- explore the process for finding the right technology and the right applications and determine how to pay for it.

Course Content

UNIT - I: Introduction to Assistive Technology (AT) Devices and Services

Assistive technology defined, historical overview of assistive technology, multidisciplinary nature of service provision.

UNIT - II: Adaptations Framework for Considering Assistive Technology

Introduction to the adaptations framework, setting-specific demands, person-specific characteristics, adaptations, evaluation of effectiveness of adaptations**.**

UNIT - III: Assistive Technology Assessments

Overview of assessment issues, overview of general assessments, assistive technology assessments, assessment components.

UNIT - IV: Enhance Speech Communication

Nature of spoken language, introduction to augmentative and alternative communication systems, selection techniques for aided communication systems, overview of non-electronic systems and electronic devices.

UNIT - V: Mobility and Access to Information

Introduction to mobility adaptations, basic design considerations, seating and positioning issues, introduction to information access, computer access, telecommunication, listening and print access.

UNIT - VI: Enhance Independent Living

Introduction to independent living, devices for daily life, switches and scanning, environmental control units, access to management devices.

Text Books:

1. Diane P edrotty Bryant, Brian R. Bryant, Allyn and Bacon "Assistive Technology for People with Disabilities", 2nd edition, Psycho Educational Services.
2. Amy G.Dell, Deborah A. Newton, Jerry G.Petroff, "Assistive Technology in the class room Enhancing the school experiences of students with disabilities", Pearson Publications, 2nd edition.

Reference Books

1. Marion A.Hersh, Michael A.Johnson, "Assistive Technology for the Hearing impaired, Deaf and Deafblind", Springer Publications, 2003.
2. Meeko Mitsuko K.Oishi, Ian M.Mitchell, H.F. Machiel vanderloss, "Design and use of Assistive Technology", Springer Publications, 2010.
3. Eckehard Fozzy Moritz, "Assistive Technologies for the Interaction of the Elderly", Springer Publications, 2014.

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Open Elective - III

BIO-MEDICAL ENGINEERING

III Year – II Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To introduce the basics of biological concepts and relate it to engineering.
- To familiarize with physiology of cardio-vascular system, respiratory system & the elements of Patient Care Monitoring.
- To impart the knowledge on the patient monitoring displays, diagnosis & techniques.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- know the concept of bio-medical engineering, evolution, age, development, advancements and applications.
- get awareness on noval theory related to human body and various components.
- analyze the operation of measuring the cardio-vascular system by knowing its inner organization, sensor and transducer theory & plethysmographical concepts.
- learn the principles of respiration and respiratory therapy equipment.
- understand the fundamental principles & techniques of diagnosys and bio-telemetry, monitors, recorders.

Course Content

UNIT - I: Introduction to Bio-Medical Instrumentation

Man instrumentation system-introduction & components, physiological system of the body, sources of bio-electric potentials, resting & action potentials,Electro-Cardiogram(ECG),Electro-Encephalogram(EEG), Electro Myogram (EMG),envoked responses.

UNIT - II: Electrodes & Transducers

Bio-potential electrodes, basic transducers-transduction principles, biochemical transducers, active & passive transducers, transducers of bio-medical applications, pulse sensors, respiration sensors.

UNIT - III: Cardio-Vascular System & Respiratory System Measurements

The heart & cardiovascular system, Electro-Cardiography, blood pressure measurement, measurement of blood flow & cardiac output, the physiology of the respiratory system, tests & instrumentation for the mechanics of breathing, respiratory therapy equipment.

UNIT - IV: Patient Care & Monitoring

Elements of intensive care monitoring, patient monitoring displays, diagnosis, calibration & repair ability of patient monitoring equipment, organization of the hospital for patient care monitoring, pace-makers, defibrillators.

UNIT - V: Diagnostic Techniques & Bio-Telemetry

Principles of ultrasonic measurement, Ultrasonic Imaging, Ultrasonic Diagnosis X-Ray & Radio-Isotope Instrumentations CAT Scan, Emission Computerized Tomography, MRI, Introduction & components of bio-telemetry system.

UNIT - VI: Monitors, Recorders & Shocking Hazards

Monitors, recorders, shock hazards & prevention, physiological effects & electrical equipment, methods of accident prevention, isolated power distribution system.

Text Books

1. Onkar N. Pandey, Rakesh kumar, "Bio-Medical Electronics and Instrumentation", S. K. Kataria & Sons, 2007.
2. Cromewell, Wiebell, P.feiffer, "Biomedical instrumentation and measurements", Prentice-Hall, 1973.

Reference Books

1. Joseph J.Carr, John M.Brown, "Introduction to Bio-Medical Equipment Technology", Pearson Publications, 4th Edition.
2. Khandapur, "Handbook of Bio-Medical Instrumentation", TMH, 2nd Edition.

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Open Elective - III

NODE AND ANGULAR JS

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with defining own custom AngularJS directives that extend the HTML language
- To introduce the concepts of client-side services that can interact with the Node.js web server
- To understand the best practices for server -side JavaScript

Learning Outcomes

Upon successful completion of the course, the students will be able to

- develop single page applications that reduces app's time to market without plugins.
- identify the services, modules and directives to subdivide application logic into modules and share code across apps
- explain the routing process in angular for managing URL's.
- interpret command line applications in Node.js that allows developers a more maintainable code
- develop code with use of Node.js and JSON services for web applications.
- examine how error events affect piped streams and handling events in Node.js

UNIT - I: Introduction to Node.js and JSON

Introduction, operators, decision and iterative statements, Node.js collections: create array object, insert, access, update and remove data. JSON:Create JSON object, display, access and edit data. JSON Array: Creation, display, access and edit data. Check JSON attribute.

UNIT - II: Node.js Files, Functions and Strings

File modules, reading text, creating file. Functions: creating function, types of functions, callback function. Strings: operations, string to numeric and vice-versa, string parser.

UNIT - III: Node.js Modules, Error Handling & Logging and Events

Create simple module, module class. Error handling and logging. Events: Events module, once event listener, remove events.

UNIT - IV: Introduction to Angular

Introduction to TypeScript (TS), node package manager, introduction to Angular 4, create angular application using TS and angular CLI, webpack, gulp introduction.

UNIT - V: Elements in Angular

Angular components, controllers, modules, dependency injection, angular service, providers and directives, pipes and filters, Angular forms-Reactive, lifecycle hooks.

UNIT - VI: Routing in Angular

Routing-module, component, lazy loading of components, apply route guards-security, Angular material design.

Text Books

1. Andrew Grant, “Beginning AngularJS”, Apress Publishers.
2. Agus Kurniawan, “Nodejs Programming By Example”, PE Press.

Reference Books

1. Ken Williamson,”Learning AngularJS: A Guide to AngularJS Development”, O’Relly Media.
2. Matt Frisbie, “AngularJS Web Application Development Cookbook”, Packt Publishing Ltd.
3. David Herron, “Node.js Web Development”, 4th edition, Packt Publishing Ltd.
4. Marc Wandschneider, “Learning Node.js: A Hands-On Guide to Building Web Applications in JavaScript”, Addison Wesley.

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Open Elective - III

CYBER SECURITY

III Year – II Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To understand security concepts, Ethics in Network Security.
- To familiarize with new algorithms (mathematical formulas) and statistical measures that assesses relationships among members of large data sets.
- To identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks, and apply those to design and evaluate counter measure tools.
- To gain knowledge on security threats, and the security services and mechanisms to counter them.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline management framework.
- describe various tools that can be used in cyber security management.
- write a secure access client for access to a server.
- determine firewall requirements, and configure a firewall.
- employ policies and standards to solve security problems.
- use security techniques in an organisational context.

UNIT - I: Systems Vulnerability Scanning

Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks vulnerability scanning - Netcat, understanding port and Services tools-Datapipe, Fpipe, Network reconnaissance –Nmap, THC-Amap. Network sniffers and injection tools–Tcpdump and Windump.

UNIT - II: Network Defence Tools

Firewalls and packet filters: Firewall basics, packet filter vs firewall, how a firewall protects a network, packet characteristic to filter, stateless vs stateful firewalls, network address translation (NAT) and port forwarding, the basic of virtual private networks, Snort: Intrusion detection system.

UNIT - III: Web Application Tools

Scanning for web vulnerabilities tools: Nikto, HTTP utilities-Curl, OpenSSL and stunnel, password cracking and Brute-Force tools–John the Ripper,L0phtCrack, pwdump, HTC-Hydra.

UNIT - IV: Introduction to Cyber Crime and Law

Cyber crimes, types of cyber crime, hacking, attack vectors, cyberspace and criminal behavior, clarification of terms, traditional problems associated with computer crime.

UNIT - V: Introduction to Incident Response

Digital forensics, computer language, network language, realms of the cyber world, a brief history of the Internet, recognizing and defining computer crime, contemporary crimes, computers as targets, contaminants and destruction of data, Indian IT ACT 2000.

UNIT - VI: Introduction to Cyber Crime Investigation

Firewalls and packet filters, password cracking, keyloggers and spyware, virus and worms, Trojan and backdoors, steganography, attack on wireless networks.

Text Books

1. Mike Shema, “Anti-Hacker Tool Kit (Indian Edition)”, Publication Mc Graw Hill.
2. Computer forensics and cyber crime : an introduction by Marjie T. Britz.

Reference Books

1. James Graham, Ryan Olson, Rick Howard, “Cyber Security essentials”, 1st edition.
2. Chwan-Hwa (John) Wu, J. David Irwin, “Introduction to Computer Networks and Cybersecurity”.
3. Nina Godbole and Sunit Belpure, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Publication Wiley.

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Open Elective - III

SCRIPTING LANGUAGES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with JQuery, JSON, PERL, Ruby, AJAX to develop client-side and server-side web applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- use jQuery with DOM to manipulate HTML elements, attributes and CSS.
- store and exchange data between server and browser using JSON.
- develop PERL scripts using arrays, hashes, control structures and subroutines.
- write Ruby scripts usingdata types, arrays, hashes, control structures and classes.
- retrieve data from a database using PHP and AJAX.

Course Content

UNIT - I : jQuery

Introduction, Selectors, Events, Effects, Manipulating HTML and CSS using jQuery

UNIT - II: JSON

Introduction, Syntax rules, JSON Vs XML, Data types, Objects, Arrays, Parsing JSON and using stringify() function

UNIT - II: Introduction to PERL

Basic syntax, Perl language elements: variables, operators, control flow statements, Arrays, Hashes and File handling; Regular expressions, Subroutines

UNIT - IV: Working with PERL

Packages and modules, Working with files, Retrieving documents from the web with Perl.

UNIT - V: Ruby

Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, classes, Iterators, Pattern Matching. Overview of Rails.

UNIT - VI: AJAX A New Approach

Introduction, Creating XMLHttpRequest object, Integrating AJAX with PHP, Retrieving data from a database using PHP and AJAX, Handling XML data using PHP and AJAX.

Textbooks

- Kogent , HTML 5 Black Book, 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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STRUCTURAL ENGINEERING LAB

III Year – II Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To develop the drafting skills of the structural elements by using software
- To introduce various properties of concrete and concepts of Non-destructive testing
- To familiarizewith effect of dynamic forces on a three storied building

Learning Outcomes

Upon susscefull completion of this course, students will be able to

- draw sign conventions of the materials and building drawings using software
- detail various structural elements by using software
- determine the durability properties of concrete like permeability, carbon content, corrosion etc.
- determine the reinforcement cover by profometer.
- determine the compressive strength of hardened concrete by pulse velocity method
- evaluate the effect of dynamics on structure

Students are required to drawusing software AutoCAD or Microstation:

1. Conventional signs of various materials & building components.
2. Draw plan, section and elevation of a residential building
3. Draw plan, section and elevation of a public building
4. Detailing of rectangular/ T beam
5. Detailing of oneway & Two way slabs
6. Detailing of isolated footing

Experimental Investigations:

7. Assessment of quality of concrete by Pulse velocity Method
8. Measurement of Cover and bar diameter by Profometer
9. Evaluation of permeability of concrete by poroscope
10. Measurement of corrosion of reinforcement by half cell potential measurements
11. Measurement of Crack widths of RC beams

12. Determination of carbon content in concrete
13. Determination of chloride content in concrete
14. Measurement of static strain by electrical resistance strain gauge
15. Dynamics of a three storey building frame subjected to harmonic base excitation.

Note: At least 12 of the above experiments are to be conducted.

Text Books

1. M.S.Shetty, Concrete technology,S.Chand Publications
2. S.R. DamodaraSwamy&Kavitha, Basics of Structural Dynamics and A seismic Design, Anuradha Publishers
3. Lab Manual Prepared by Faculty of civil Engineering Dept, Gudlavalleru Engineering College.

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HIGHWAY ENGINEERING LAB

III Year – II Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To develop the testing skills of the road aggregates.
- To impart the knowledge on the properties of bitumen.
- To Study the Traffic characteristics.

Learning Outcomes

Upon susscefull completion of this course, students will be able to

- characterise the highway aggregates.
- conduct tests on suitability of bitumen.
- design the traffic intersection based on traffic surveys.

List of Experiments

1. Determine the strength of the aggregates by using the Aggregate Crushing Value Test.
2. Determine the toughness of the aggregate by using the Aggregate Impact Value Test.
3. Determine the flakiness index of the given aggregate sample.
4. Determine the elongation index of the given aggregate sample.
5. Determine the Attrition value of a given aggregate sample.
6. Determine the Abrasion value of a given aggregate sample.
7. Determine the Specific gravity & Water absorption values for a given aggregate sample.
8. Determine the Penetration value of a given bitumen sample
9. Determine the Softening point value for a given bitumen sample.
10. Determine the Flash & fire point of a given bituminous material sample.
11. Determine the Ductility value of a given bituminous material sample,
12. Determine the Traffic Volume at a given section of the road.
13. Determine the Spot speed value at a given section of the road.
14. To design the bituminous mix by using the Marshall stability test.

NOTE: At least 12 of the above experiments are to be conducted

Reference Books

1. Lab Manual prepared by Department of Civil Engineering, Gudlavalleru Engineering College.

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Optional Elective - V

SMART BUILDING AND AUTOMATION

III Year – II Semester

Lecture : -	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To introduce the concept of building management systems.
- To emphasize the importance of automating the building operations for safety, health and economy.
- To demonstrate current trends in home automation.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain the concepts of DAQ, M2M, SCADA, BMS and IoT.
- list out the categories of hardware needed for automating the operation of building systems.
- identify the issues of communication standards for integrating systems.
- detail the aspects of human comfort that can be managed automatically.
- emphasize the importance of security and safety and its automation.
- illustrate current developments in the field of home automation.

Course Content

UNIT - I: Building Management Systems

Introduction: data acquisition from devices (DAQ), machine to (2) machine communication (M2M) between devices, Supervisory Control and Data Acquisition (SCADA), Building Management Systems (BMS), Internet of Things (IoT) Structure, components, commissioning – Differences between SCADA, BMS and IoT, dashboards and user interfaces.

UNIT - II : Hardware needed for control

Sensors, actuators, variable speed drives, cameras, network cabling, UPS (uninterrupted power supply), scanners, PLC (Programmable Logic Controller), ethernet, installation, integration, commissioning, retro-commissioning.

UNIT - III: Software needed for DAQ and bus standards.

Proprietary and open standards; MODBUS, Lonworks, Bacnet, KNX, Data Protocols, Data security, legacy systems integration

UNIT - IV: Controlling Occupant Comfort

Lighting, Ventilation, Cooling and Heating, Smoking Areas, Enhanced Ventilation for special areas – Automated control of comfort using BMS.

UNIT - V: Security and Access Control

Fire Safety and Smoke Detection, CCTV, intrusion alarms, parking ventilation, lifts, emergency systems, plumbing – Automated tracking of security and safety using BMS.

UNIT - VI: Smart Homes

Smart Speakers from Amazon (Echo), Google (Home), Microsoft (Invoke by Harman Kardon), Apple (Home Pod) – integration with alarms &sensors – heating &cooling– lights &switches – video Camera.

Text Books

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Hanes David, Salgueiro Gonzalo, Grossetete Patrick, Barton Rob, Henry Jerome, Pearson Education, Cisco Press, Paperback – 16 Aug 2017.
2. Automation Systems In Smart and Green Buildings,V.K. Jain, Khanna Publishers, 2009.

Reference Books

1. Building Automation: Communication systems with EIB/KNX, LON and BACnet, Hermann Merz, Thomas Hansemann, Christof Hübner, Springer 2nd Edition. 2018.
2. Internet of Things (Smart Sensors, Measurement and Instrumentation), Subhas Chandra Mukhopadhyay, Springer, 2014.

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Optional Elective - V

BUILDING INFORMATION MODELING

III Year – II Semester

Lecture : -	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To introducethe importance of Building Information Modelling (BIM) in Architecture, Engineering and Construction (AEC) industry
- To familiarise the use of BIM with owners, facility managers, architects, engineers and contractors.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply the knowledge of inefficiencies with 2D and advantages of 3D modeling
- make use of BIM tools for model designing.
- adopt BIM towards risk identification.
- appraise the advantages and applications of BIM for designers and engineers
- provide the scope and guidance of BIM for contractors and suppliers.
- acknowledge wide use of BIM enabled processes for fabrications.

Course Content

UNIT - I: Introduction

The current (Architecture, Engineering and Construction) AEC business model, Documented inefficiencies of traditional approaches, BIM: New Tools and New Processes.

UNIT - II: BIM Tools & Parametric Modeling

The Evolution of object –based parametric modelling, BIM Environments, platforms and tools, Major BIM Design platforms,

Interoperability- different kinds of exchange formats, the evolution from file-Based exchange to building.

UNIT - III: BIM for Owners and Facility Managers

BIM application areas for owners, tool guide for owners, Owner and Facility Manager's.

Building model, Barriers to Implementing BIM: Risks and Common Myths, Guidelines and Issues for Owners to Consider when Adopting BIM.

UNIT - IV: BIM for Architects and Engineers

Scope of design services, use in design processes, building object models and libraries, considerations in adoption for design practices.

UNIT - V: BIM for Contractors

Types of Construction Firms, Information Contractors Want from BIM, Processes to Develop a Contractor Building Information Model, Reduction of Design Errors Using Clash Detection, Quantity Takeoff and Cost Estimating, Construction Analysis and Planning, Integration with Cost and Schedule Control and Other Management Functions, Use of BIM Onsite: Verification, Guidance and Tracking of Construction Activities.

UNIT - VI: BIM for Subcontractors and Fabricators

Types of Subcontractors and Fabricators, BIM-Enabled Process Change, Generic BIM System Requirements for Fabricators, Major Classes of Fabricators and Their Specific Needs, Adopting BIM in a Fabrication Operation.

Text Books

1. BIM Handbook- A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors, Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, 4nd Edition, John Wiley & sons publications.
2. BIM and Construction Management: Proven Tools, Methods, and Workflows, Brad Hardin & Dave McCool, John Wiley & sons publications.

Reference Books

1. BIM for Construction Clients, Richard Saxon, 1st Edition, RIBA Publishing.
2. BIM Design: Realising the Creative Potential of Building Information Modeling, Richard Garber, John Wiley &sons publications.

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Optional Elective - V

DATABASE MANAGEMENT SYSTEMS

III Year – II Semester

Lecture : -	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To familiarize the concepts of database systems and different issues involved in the database design.
- To introduce how to write SQL for storage, retrieval and manipulation of data in a relational database.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- recognize the importance of database system over file processing system.
- analyze an information storage problem and derive an information model in the form of an entity relationship diagram.
- write simple and complex queries using Structured Query Language (SQL) for storage, retrieval and manipulation of data in a relational database.
- employ principles of normalisation for designing a good relational database schema.
- describe the issues and techniques relating to concurrency and database recovery in a multi-user database environment.

Course Content

UNIT - I: Introduction to Database

Introduction, advantages of using DBMS, data models, levels of abstraction, entity-relationship model: attributes and keys, relationship types, weak entity set, strong entity set, specialization and generalization, database design for banking enterprise, reduction to relational schemas.

UNIT - II: Relational Model and SQL

Relational Model: Basic concepts, schema and instances, keys, relational algebra, SQL: DDL, DML, integrity constraints, defining different constraints on a table, set operations, aggregate functions, group by and having clauses, nested queries.

UNIT - III: Database Design

Functional dependencies: Partial, full, transitive and trivial dependencies, Axioms, Decomposition: Lossless Join and dependency preserving decomposition, attribute closure, Normal forms: 1NF, 2NF, 3NF and BCNF.

UNIT - IV: Transaction Management

Transaction concept, ACID properties, transaction state diagram, schedules-serial, concurrent and serializable schedules, serializability- conflict and view serializability, recoverability.

UNIT - V: Concurrency Control

Concurrency Control- Concurrent execution of transactions, anomalies due to concurrent execution, lock-based protocols-2PL, Strict 2PL and Rigorous 2PL, timestamp-based protocols, Thomas write rule, deadlock handling-deadlock prevention, deadlock detection and recovery.

UNIT - VI: Crash Recovery

Crash Recovery - Failure classification, different types of recovery techniques: deferred update, immediate update, shadow paging, checkpoints.

Text Books

1. Korth and Sudarshan, "Database system concepts", 3rd edition, MH.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 3rd edition, MH

Reference Books

1. Elmasri Navate, "Fundamentals of Database Systems", 5th edition, Pearson Education
2. C.J.Date, "Introduction to Database Systems", 8th edition, Pearson Education
3. Peter Rob and C Coronel, "Database Systems Design, Implementation, and Management", 7th edition.

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PROJECT MANAGEMENT AND FINANCE

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To define the importance of project management (PM) and causes of failure in construction projects.
- To identify PM network objectives and techniques and basics of network analysis.

Learning Outcomes

Upon successful completion of the course, the Students will be able to

- apply the principles of project management in construction industry.
- adopt the applications of CPM & PERT techniques in planning & scheduling of engineering projects.
- compare alternative cash flow methods.
- prepare worth analysis and proposals of a project.
- apprise financial management of construction project.
- apply the concept of risk management in construction projects

Course Content

UNIT - I: Planning, Scheduling & Monitoring

Projects; Causes of project failure, Planning, Scheduling and controlling, Steps involved in planning; Objectives; Principles; Advantages; Limitations; Stages of planning; Scheduling, Preparation of construction schedules; Methods of scheduling; Bar charts; Mile stone charts; Controlling; Job layout; Factors affecting job layout; Project work break down structure; Activities involved and its duration.

UNIT - II: Networks

Project Management through Networks Objectives of network techniques; Fundamentals of network analysis; Events; Activities; Dummies; Types of networks; Choice of network type.

PERT & CPM: Time estimates; earliest expected time; Latest allowable occurrence time; Slack; Critical path; Probability of completion time for a project, difference between CPM and PERT; Earliest event time; Latest event time; Activity time; Float; Critical activities and critical path.

Precedence network- simple networks with less than 5 activities

UNIT-III: Comparing Alternatives Proposals

Comparing alternatives-Present worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR) Analysis, Benefit/Cost Analysis, Break Even Analysis.

UNIT - IV: Cash Flows

Time Value of Money –Cash Flow diagram –Nominal and effective interest-continuous interest; Single Payment Compound Amount Factor(P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)–Problem time zero (PTZ)-equation time zero (ETZ). Constant increment to periodic payments –Arithmetic Gradient(G), Geometric Gradient (C).

UNIT - V: Risk Management

Introduction to Risk-management; Risk uncertainties and management decision in capital budgeting- Uncertainties due to improper planning;

UNIT - VI: Financial Management

Introduction to construction finance and control, costs associated with construction facilities, Estimates- Design Estimates, Bid Estimates and Control Estimates, Effect of scale on construction cost, Means of financing, Application of financial assistance, Cost control, Financial accounting systems, financial control.

Text Books

1. Construction Project Management Theory and practice, Kumar Neeraj Jha , Pearson publications.
2. Project Planning and Control with PERT & CPM, Dr. B.C.Punmia &K.K.Khandelwal, 4th edition, Laxmi Publications.
3. Construction economics: A new approach by Danny myers, Taylor and francis publisher.
4. The construction industry aspects of its economics and management, Ofori. G, 2nd edition, Singapore University press.

Reference Books

1. Project Management byHarvey Maylor, edition-2, Mac Millan India Ltd., Delhi.
2. Construction Management & Planning by B. Sengupta& H. Guha, Tata McGraw – Hill Publishing Co. Ltd., New Delhi.
3. Construction Planning, Equipment & Methods, Peurifoy R. L, McGraw – Hill International Book Company.
4. PERT & CPM Principles and applications, L. S. Srinath; Affiliated East West Press.

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ESTIMATION, COSTING AND VALUATION

IV Year – I Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To introduce the concept of estimate, types of estimate and estimating a work.
- To build ability of calculating road and canal work quantities.
- To impart knowledge on different specifications of civil works.
- To familiarize with rate analysis, contracts and valuation.

Learning Outcomes

Upon successful completion of the course, the Students will be able to

- prepare detailed and abstract estimates for civil engineering works.
- estimate road work quantities.
- distinguish the specifications for civil works and contracts.
- work out rate analysis and prepare valuation reports for roads and buildings.

Course Content

UNIT - I: General items of work in building

Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating. Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Units of measurement; Detailed Estimates of Buildings - Individual wall method, Centre line method for various types of buildings with veranda & different rooms

UNIT - II: Rate analysis

Specifications, Purpose and method of writing specifications; General specifications. Detailed specifications for Brick work, R.C.C, Plastering, Mosaic Flooring, Stone Masonary.

Analysis of Rates: Task or out – turn work; Labour and materials required for different items of work. Rates of materials and labour.

Preparing analysis of rates for items of work like PCC, RCC Works, Brick work in foundation and super structure, Plastering, CC flooring and White washing.

UNIT - III: Earthwork for Roads and Canals

Quantity and cost estimation of a Road– Mid sectional area method, Mean sectional area method and Trapezoidal area method - Vertical drop in ground. Quantity and cost estimation of a Canal – fully in excavation case, fully in embankment case and partially in excavation & in embankment case

UNIT - IV: Reinforcement - Bar Bending and Bar Requirement Schedule

Quantity estimation and bar bending schedule for RCC items like roof slab, beam, column with footing .

UNIT - V: Contracts

Types of contracts – Contract Documents – Conditions of contract, PWD Accounts And Procedure of Works Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor carpet area; Approximate estimate; Plinth area estimate; Revised estimate; Supplementary estimate.

UNIT - VI: Valuation of Buildings

Valuation, Cost, Price & value. Methods of valuation, Depreciation, Methods for estimating cost depreciation, Valuation of building. Miscellaneous Topics Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage. Standard specifications for different items of building construction, first class building, second class building.

Note: students should submit four case studies from units one to four.

Semester End Examination Pattern

The end examination paper should consist of Part A and Part B. Part A consists of two questions in estimation of quantities by centre line method or individual wall method, out of which one question is to be answered. Part B consists of five questions out of which three are to be answered. Weightage for part A is 40% and for part B 60%.

Text Books

1. Estimating and costing in civil engineering, B.N. Dutta, twenty-seventh edition, UBS publishers, 2000.
2. Estimating and Costing, G.S. Birdie, second edition, Dhanapati Rai Publishers.

Reference Books

1. Standard Schedule of rates and standard data book by public works department.
2. I.S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
3. Estimation, Costing and Specifications, M. Chakraborthi, sixth edition, Laxmi publications.
4. Valuation of Real properties,S. C. Rangwala, second edition, Charotar Publishing House, Anand.
5. National Building Code-2016(NBC).

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DESIGN OF STEEL STRUCTURES

IV Year – I Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To familiarize with the types of structural steel sections, plastic analysis and IS code provisions.
- To introduce the principles for design of tension members, compression members and elements of truss using I.S. code.
- To impart the design aspects of laterally supported beams, unsupported beams and welded plate girder in accordance with I.S. code provisions.

Learning Outcomes

Upon successful completion of the course, the Students will be able to

- explain various types of structural steel sections and the concepts of plastic analysis.
- analyse the strength of bolted and welded joints for eccentric loads.
- design the members subjected to direct tension and compression using I.S code.
- develop lacing / batten columns and column bases.
- design laterally supported and unsupported beams.
- design elements of welded plate girder, curtailment of plate girder and simple truss elements.

Course Content

UNIT - I: Structural Steel & Plastic Analysis

Structural steel – Rolled steel sections – Convention for member axes – Types of loads – Load combinations- Design philosophies – Partial safety factors - Limit states of strength and serviceability.

Concept of Plastic analysis – Idealized stress –strain curve, behavior of beam in flexure – Plastic hinge, Shape factors of rectangle, circle, triangle, T, channel and I sections – Classification of cross–sections as per IS code.

UNIT - II: Connections

Types of connections - Riveted, Bolted and Welded connections - Bolted - Introduction - Design of ordinary and high strength friction grip bolts - Welded - Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds - Permissible stresses – IS Code requirements – Welded Bracket connections.

UNIT - III: Tension members& Compression members

Tension Members: Introduction - Types of Tension members- Effective Net Area - Shear lag – Slenderness Ratio - Types of Failures – Design strength of Tension Members- Gross Section Yielding - Net Section Rupture – Block Shear - Design of members subjected to direct tension - simple and compound members.

Compression Members: Introduction - Effective length - Slenderness ratio - Types of sections – Types of buckling – Design of axially loaded columns- simple and compound section compression members.

UNIT - IV: Built-up columns & Column bases

Built-up Columns: Introduction - Design of built-up columns, lacing and batteningsystems and column splices

Column Bases: Types - Design of Slab base and Gusset base.

UNIT - V: Beams

Introduction – Lateral Stability – Elastic Critical Moment – Bending Strength – Shear Strength – Web Buckling - Web Crippling - Deflection - Design of laterally supported, unsupported beams, Lintel and Purlins.

UNIT - VI: Plate girder & Roof Trusses

Plate Girder: Introduction – Elements - Design considerations – I.S. Code recommendations – Curtailment of flange plates - Stiffeners - Design of welded plated girder.

Roof Trusses: Introduction - Types of roof trusses – Design loads – Load combinations – I.S. Code recommendations – Structural Details – Design of simple roof trusses involving design of purlins, members and joints.

Note:

1. IS – 800 (2007), IS 875-Part III andSteel tables are permitted to use in examination Hall.
2. Welding connection should be used from Units 3 to 6.

Semester End Examination Pattern:

The end examination paper should consist of part A and part B. Part A consists of two questions in Design and Drawing, out of which one question is to be answered. Part B consists of five questions out of which three are to be answered. Weightage for part A is 40% and for part B 60%.

Text Books

1. Limit state Design of Steel Structures, S.K.Duggal, Second Edition, Tata Mc.Graw Hill Education Pvt. Limited.
2. Design of Steel Structures- Limit State Method, N. Subramanian, First Edition, Oxford University Press.

Reference Books

1. IS 800 : 2007 – General Construction in Steel - Code of Practice.
2. Limit State Design in Structural Steel, M. R. Shiyekar,Edition of 2009,PHI Learning Pvt. Limited.
3. Design of Steel Structures, K.S. Sai Ram, Second Edition, Dorling Kindersley (India) Pvt. Limited.
4. Design of Steel Structures- Limit State Method, S.S.Bhavikatti, Fifth Edition, I.K. International Publishing House Pvt. Limited.

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Professional Elective - III

PRE-STRESSED CONCRETE

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the concept of prestressing and IS code provisions.
- To impart the knowledge on analysis and losses of prestress
- To introduce design procedures of pre-stressed concrete members under flexure and shear

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply concepts & methods for pre stressing systems
- analyze pre-stressed concrete members for flexure
- design pre-stressed concrete beamsconsidering the different losses
- evaluate shearresistance of pre-stressed concrete members
- determine the deflections of pre-stressed concrete members
- analyze and design the end blocks.

Course Content

UNIT - I: Introduction to Prestressed Concrete

Historic development – General principles of pre-stressing, pre-tensioning and post tensioning – Advantages and limitations of pre-stressed concrete – Materials – High strength concrete and high tensile steel their characteristics, Durability, Cover requirements for PSC members.I.S. Code provisions, Methods and Systems of Pre-stressing; Pre-tensioning and post tensioning methods – Different systems of pre-stressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

UNIT - II: Analysis of Prestressed Members

Analysis of sections for flexure: Elastic analysis of concrete beams pre-stressed with straight, concentric, eccentric, bent and parabolic tendons. Pressure Line or Thrust Line, concept of load balancing.

UNIT - III: Losses of Prestress

Losses of pre-stress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete,

Relaxation of steel, slip in anchorage bending of member and frictional losses, total Losses allowed for design

UNIT - IV: Design of Section for Flexure and Shear

Design of Section for Flexure and Shear: Allowable stress, Design criteria as per I.S. Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.

UNIT - V: Deflections of Prestressed Concrete Beams

Importance of control of deflections –factors influencing deflections–short term deflections of un-cracked member's prediction of long term deflections, Deflection of Cracked members.

UNIT - VI: End Blocks

Analysis of End Blocks by Guyon's method and Magnel method, Anchorage zone stresses - Approximate method of design –Anchorage zone reinforcement - Transfer of pre-stress pre-tensioned members.

Text Books

1. Prestressed Concrete by N Krishna Raju, 5thedition, Tata McGraw Hill Publications.
2. Prestressed Concrete by Ramamrutham, 5thedition, Dhanpatrai Publications.

Reference Books

1. Fundamentals of Pre-stressed Concrete by Sinha N.C. and Roy S.K, 3rdedition, S.Chand & Company limited.
2. Pre-stressed concrete structures by N.Rajagopalan, 2nd edition, Alpha Science International Ltd
3. Design of Pre-stressed concrete structures by T.Y. Lin & Ned H.Burns, 3rdedition, John Wiley & Sons
4. IS 1343- 2012 Indian standard code of practice for Pre-stressed concrete.

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Professional Elective - III

ADVANCED FOUNDATION ENGINEERING

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with advanced knowledge of foundations in various practices
- To appreciate the foundation practices in difficult soil conditions under different loading conditions

Learning Outcomes

Upon successful completion of the course, the students will be able to

- compute the bearing capacity of foundations at abnormal conditions
- calculate oil settlements for cohesive and cohesion less soils using advanced methods
- explain swelling characteristics of soil
- check various stability conditions for retaining structures

Course Content

UNIT - I: Mat Foundation

Mats/ Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils

UNIT - II: Settlement Analysis

Immediate settlement of footings resting on granular soils – Schmertmann& Hartman method – De Beer and Martens method - Immediate settlement in clays – Janbu's method – Correction for Consolidation settlement using Skempton and Bjerrum's method – Correction for construction period

UNIT - III: Earth Retaining Structures

Cantilever sheet piles – anchored bulkheads – fixed and free earth support methods – design of anchors – braced excavations – function of different components – forces in ties – stability against bottom heave.

UNIT - IV: Laterally Loaded Piles

Negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock Method – laterally loaded piles in cohesive soils – Davisson and Gill method – Broms' analysis.

UNIT - V: Swelling Characteristics

Swelling - factors affecting swelling; Swelling potential - swell pressure - Methods of determination – factors affecting swelling potential and swell pressure; Heave – factors affecting heave- methods of determination of heave

UNIT - VI: Foundation Practices in Expansive Soils

Sand cushion – Belled Piers – Granular pile, Under – reamed pile foundations – Construction techniques – design specifications – Load - carrying capacity in compression and uplift of single and multi – under reamed piles in clays and sands

Text Books

1. Basic and applied soil mechanics, Gopal Ranjan and AS Rao, 2nd Edition, New Age Publishers.
2. Principles of Foundation Engineering, BM Das, 7th Edition, Cengage Learning

Reference Books

1. Foundation Analysis and Design, JE Bowles, 5th Edition, Mc Graw Hill Publications
2. Soil Mechanics and Foundation Engineering, VNS Murthy, 1st Edition, CBS Publishers
3. Foundation Design, WC Teng, 13th Edition, Prentice Hall Publishers.

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Professional Elective - III

TRAFFIC ENGINEERING

IV Year – I Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To introduce fundamental knowledge of traffic engineering.
- To acquire design principles of traffic engineering.
- To familiarize with various traffic issues including planning, safety, operation and control.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- develop a basic knowledge on the fundamental issues in traffic engineering.
- demonstrate the clear understanding of the factors influencing road vehicle performance.
- define the basic principles in highway geometric design and apply these principles to solve simple problems.
- apply the principles of traffic flow and queuing theory in designing signaling systems.
- explain the critical procedures for highway capacity and level of service analysis.

Course Content

UNIT - I: Traffic Characteristics

Basic traffic characteristics - Speed, volume and concentration, Relationship between Flow, Speed and Concentration Volume Studies- Objectives, Methods, Speed studies - Definition of Spot Speed, time mean speed and space mean speed, Methods of conducting speed studies; Presentation of speed study data;

UNIT - II: Highway Capacity and Level of Service

Head ways and Gaps; Critical Gap; Gap acceptance studies. Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways, multilane highways and freeways.

UNIT - III: Parking Studies and Traffic Accident Studies

Parking Studies and Traffic Safety, Types of parking facilities - on street parking and off-street Parking facilities, Parking studies and analysis, Accident studies

and analysis; Causes of accidents-The Road, The vehicle, The road user and the Environment; Engineering, Enforcement and Education measures for the prevention of accidents.

UNIT - IV: Intersection Design

Type of Intersection, Conflicts at Intersection – At grade intersection – Uncontrolled, Channelization, signalized intersection - Design of Isolated Traffic Signal by Webster method, Types of Grade Separated Intersection and Design of Rotary.

UNIT - V: Traffic Regulation and Signals

Traffic Regulation and Environment: - Traffic Signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram Warrants for signalization, Signal Coordination methods. Detrimental effects of Traffic on Environment; Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic

UNIT - VI: Intelligent Transportation Systems

Components of ITS, Traffic Management - Incident Management, Advanced vehicle control and safety systems, Electronic toll collection, Traveller Information System, Benefits and costs of ITS.

Text Books

1. Traffic Engineering and Transportation Planning, L. R. Kadiyali, 4th Edition, Khanna Publishers, 1991
2. Highway Engineering, S. K. Khanna & C.E.G Justo, 9th Edition, Nem Chand & Bros Publisher, 2012
3. Intelligent Transport Systems Standards, Bob Williams, 2008, Artech House Publishers

Reference Books

1. Traffic Engineering-Theory & Practice, Louis J. Pignataro, 2nd Edition, Prentice Hall Publication, 1973
2. Transportation Engineering-An introduction, C. Jotin Khistry, 3rd Edition, Prentice Hall Publication, 2002
3. Traffic Flow Fundamentals, A.D., Prentice Hall Inc., 1990, New Jersey.

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Professional Elective - III

INDUSTRIAL WASTEWATER MANAGEMENT

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the knowledge of industrial wastes and their pollution potential.
- To introduce manufacturing processes of different types of industries.
- To elucidate the high-level strategies adopted to deal with industrial effluents.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- characterise industrial effluents.
- identify relevant pre and primary treatment options for specific effluents.
- relate pollution problems to specific constituents of effluents and their removal.
- suggest pollution control strategies for food processing industries.
- suggest pollution control strategies for material manufacturing industries.
- draw up action plan for setting up a common effluent treatment plant.

Course Content

UNIT - I: Sources of Pollution

Physical, Chemical and Biological properties of Industrial Wastes – Differences between industrial and municipal wastewaters, difficulty to generalise industrial waste characteristics – Discontinuity and seasonality of some wastes) – Direct disposal, combined treatment, dedicated treatment – Effects of industrial effluents on sewers and treatment plants.

UNIT - II: Pre and Primary Treatment

Equalization, objectives, parameters that could be treated by equalisation – Proportioning, dilution with other effluents – Neutralization, mixing wastes – Oil Separation by Floatation**,** quiescent flotation and mechanically aerated floatation, types of solids that can be removed by floatation.

Waste Reduction – Volume Reduction, conservation of wastewater – Strength Reduction – Recirculation of industrial wastes.

UNIT - III: Waste Treatment Methods

Nitrification and De-nitrification, Aerobic biological methods, algal ponds – Phosphorous removal, chemical precipitation, Aerobic biological methods, algal ponds – Heavy metal removal, chemical precipitation, precipitation reactions – Membrane Separation Process – Air Stripping and Adsorption Processes– Special

Treatment Methods, ion exchange, advanced oxidation, distillation – Disposal of Treated Waste sludge – Disposal of Treated Wastewater.

UNIT - IV: Food Processing Industries

Manufacturing Processes, Characteristics and Composition of wastewater in the following industries; Dairy, Sugar, Fermentation (Brewery, Distillery, Pharmaceutical industry), Fisheries.

Flow diagrams for process and wastewater treatment, byproducts if any from wastewater treatment.

UNIT - V: Material Manufacturing Industries

Manufacturing Processes, Characteristics and Composition of wastewater in the following industries; Metal (Steel, mineral processing), Liquid (Petroleum Refineries), Fibre (Paper and Pulp, Flow diagrams for process and wastewater treatment, byproducts if any from wastewater treatment – Apparel Manufacturing Industries, Manufacturing Processes, Characteristics and Composition of wastewater in the following industries; Textiles, Tanneries – Energy Transformation Industries: Manufacturing Processes, Characteristics and Composition of wastewater in the following industries; Coal based power plants, Atomic Energy Plants, Flow diagrams for process and wastewater treatment, byproducts if any from wastewater treatment.

UNIT - VI: Effluent Treatment Plants

Joint Treatment of Raw Industrial wastewaters and Domestic Sewage – CommonEffluent Plants (CETPs) - (Location (Site and Process Selection) planning, plant design, commissioning)

Operation and Maintenance Problems- (fouling of equipment due to industrial wastes)

Economical aspects - (cost considerations and funding of projects, special requirements)

Text Books

1. Industrial Water Pollution Control, W. Wesley Eckenfelder Jr., McGrawHill.
2. Wastewater engineering - Treatment & Reuse, Metcalf and Eddy, TATA McGrawHill.

Reference Books

1. Liquid Waste of Industry - Theories, Practices & Treatment, N.L.Nemerow, Addison Wesley.
2. Environment Engineering, Peavy, Rowe & Tchobanoglous, McGrawHill.
3. Water and Wastewater Engineering Volume 1 (water supply and wastewater removal), Fair, Gayer and Okun, John Wiley and Sons.
4. Water and Wastewater Engineering Volume 2 (water purification and wastewater treatment and disposal, Fair, Gayer and Okun, John Wiley and Sons.

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Professional Elective - IV

ADVANCED DESIGN OF RC STRUCTURES

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the design procedure for flat slabs and footings.
- To make understand the loading pattern and design procedure for silos and bunkers.
- To familiarize with I.R.C loads and their application on designing the R.C bridges.
- To introduce the design procedure of R.C water tanks.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- design footings
- analyze and design the flat and grid slabs
- anayze and design cantilever and counter fort retaining wall
- design the R.C silos and bunkers.
- design R.C. deck slab bridges using I.R.C loadings.
- design elevated R.C water tanks.

Course Content

UNIT - I: Footings

Different types of footings – Design of isolated footing for axial and bending moments, Rectangular and circular footings subjected to axial loads only.

UNIT - II: Flat slab

Design of Flat slab - Direct design method -reinforcement detailing, Shear - beam shear and punching shear, Reinforcement detailing of flat slab.

UNIT - III: Retaining Walls

Types of retaining wall, Forces on retaining wall, stability requirements, Design of cantilever and design principles of counter fort Retaining walls.

UNIT - IV: Silos and Bunkers

Introduction – Concepts of loading and Design, design of Circular silos and rectangular R.C. bunkers.

UNIT - V: Bridges

Introduction to concrete bridges – IRC loadings, Deck Slab Bridge – Design concepts

UNIT - VI: Water Tanks

Design of R.C elevated circular and rectangular water tanks.

Text Books

1. Advanced Reinforced concrete structures, Varghese, Prentice Hall India Pvt. Ltd.
2. Design and Drawing of concrete structures, N. Krishnam Raju, University press 2005.

Reference Books

1. Reinforced concrete structures Vol.2, B.C.Punmia, Ashok Kumar Jain &Arun Kumar Jain. Laxmi publications Pvt.Ltd., New Delhi.
2. Essentials of Bridge engineering, D.Johnson Victor, Oxford and IBM publications Co.Ltd.
3. Reinforced concrete structures, I.C.Syal and Goel, S.Chand publishers.
4. All Relevant I.S. codes for Bridges IRC-6:2010 – Loading specifications IRC-112:2011 Design specifications For Water tanks BIS –IS-3370.

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Professional Elective - IV

HYDRAULIC STRUCTURES

IV Year – I Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To familiarize with the design principles of hydraulic structures on permeable foundations.
- To impart knowledge on various types of dams and selection of suitable type depending on site conditions
- To familiarize with the design principles of irrigation structures

Course outcomes

Upon successful completion of the course, the students will be able to

- select a suitable location for a dam, the criteria for selecting a particular dam type
- analyze stability of gravity dams
- plan and design diversion head works
- design ogee spillways and energy dissipation works
- illustrate the design principles of irrigation canal structures

Course Content

UNIT - I: Reservoirs and Dams

Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve, types of dams, merits and demerits, factors affecting selection of type of dam, factors governing selecting site for dam.

UNIT - II: Gravity Dams

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, stability analysis, drainage galleries

UNIT - III: Diversion Head Works

Diversion Head works: Types of Diversion head works-diversion and storage head works, weirs and barrages, layout of diversion head works, components. causes and failure of hydraulic structures on permeable foundations, Bligh's creep theory,

Khosla's theory, determination of uplift pressure, impervious floors using Bligh's and Khosla's theory, exit gradient, functions of u/s and d/s sheet piles.

UNIT - IV: Spillways

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances

UNIT - V: Canal Regulation Works

Canal regulation works: Head and Cross Regulator, Principles of design of distributary and head regulators, canal outlets, proportionality, sensitivity and flexibility

UNIT - VI: Cross Drainage Works

Cross Drainage works: Types, selection of site, design principles of aqueduct, siphon aqueduct and super passage.

Text Books

1. Irrigation and water power engineering, B.C. Punmia, Pande B.B Lal, Ashok Kumar Jain & Arun Kumar Jain, sixteenth edition, Laxmi publications.
2. Irrigation Water Resources and Water Power Engineering, P.N.Modi, seventh edition, Standard Book House

Reference Books

1. Water resources engineering principles and practice, Satyanarayana Murthy. Challa, revised second edition, New Age International Publishers
2. Irrigation engineering and hydraulic structures, S.K Garg, thirty forth edition, Khanna Publishers.

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Professional Elective - IV

GEOSYNTHETICS

IV Year – I Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To familiarize with geosynthetics.
- To impart knowledge on designing the geosynthetic material for various functions.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain geosynthetics.
- interpret the test methods of different materials of geosynthetics.
- explain the design considerations for different materials of geosynthetics.

Course Content

UNIT - I: Introduction

Overview of Geosynthetics, types – geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners and geocomposites – their manufacturing

UNIT - II: Geotextiles

Properties and test methods – functions – designing for separation, reinforcement, stabilization, filtration, drainage.

UNIT - III: Geogrids

Properties and test methods – design for geogrid reinforcement for roads, reinforced wall, foundation, slopes and embankments.

UNIT - IV: Geonets and Geosynthetic clay liners (GCL)

Geonets: Properties and test methods – design for geonet drainage in view of environmental and transportation application

Geosynthetic clay liners (GCL): Properties and test methods, designing with GCL as single and composite liners – GCL on slopes

UNIT - V: Geomembranes

Properties and test methods – design considerations of geomembrane in pond, canal, reservoirs and solid liners

UNIT - VI: Geocomposites

Geocomposites in separation, reinforcement, filtration and drainage

Text Books

1. Designing with Geosynthetics, Koerner, R.M, Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. An Introduction to Soil Reinforcement & Geosynthetics, G L Siva Kumar Babu, 1st edition, University press

Reference Books

1. Soil Reinforcement with Geotextiles,Jewell, R.A.,Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.
2. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.

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Professional Elective - IV

DISASTER PREPAREDNESS AND PLANNING

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To provide an exposure to disasters, their significance and types.
- To familiarize with impacts of disaster key skills.
- To impart the knowledge on different approaches of Disaster risk reduction.

Learning Outcomes

Upon successful completion of the course, students will be able to

- differentiate the types of disasters, causes and their impact on environment and society.
- analyze relationship between development and disasters.
- explain the process of risk management.
- assess vulnerability and various methods of risk reduction measures as well as mitigation.

Course Content

UNIT - I: Introduction

Concepts and definitions: disaster, disaster Management,hazard, vulnerability, risk, capacity, mitigation. Types of Disasters, five priorities for action, relationship between disaster and human development, Disaster Management cycle,

UNIT - II: Disasters classification

Disasters classification; Natural disasters –floods, Drought, earthquake, cyclone, landslide. Manmade disasters –industrial pollution, nuclear radiation, chemical spills, bio terrorism, transportation accidents. Hazard and vulnerability profile of India.

UNIT - III: Disaster Impacts

Introduction, Life and livestock loss, Habitation, agricultural and livelihood loss, Additional health hazards, Contamination of drinking water sources, impact on children, Environmental loss. Impacts of climate change, greenhouse gases.

UNIT - IV: Disaster risk reduction

Disaster management cycle- its phases,prevention, mitigation, preparedness, relief & recovery; structural and non-structural measures, basic strategies and practices

of disaster risk reduction,global policies and practices, risk management framework, vulnerabilityand capacity assessment.

UNIT - V: Education and Community Preparedness:

Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience buildingcommunity capacity for action

UNIT - VI: Role of Technology in Disaster Management

Disaster management for infra structures, mitigation program for earthquakes – flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training- transformable indigenous knowledge in disaster reduction.

Text Books

1. Disaster Management – Global Challenges and Local Solutions, Rajib shah & R R Krishnamurthy, 2009, Universities press.
2. Disaster Science & Management, Tushar Bhattacharya, 2012, Tata McGraw Hill Education Pvt. Ltd., New Delhi.

Reference Books

1. Disaster Management – Future Challenges and Opportunities, Jagbir Singh, 2007, I K International Publishing House Pvt. Ltd.
2. Disaster management, Ghosh G.K, 2006, APH Publishing Corporation.
3. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf).

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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.,

Course Content

UNIT - I: Introduction to Non-Destructive Testing

Radiographic test**,** Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography

UNIT - II: Ultrasonics Test

Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect, Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

UNIT - III: Liquid Penetrant Test

Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing

UNIT - IV: Magnetic Particle Test

Magnetic Materials, Magnetization of Materials, Demagnetization of Materials,Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test.

UNIT - V: Eddy Current Test

Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current Testing Effectiveness of Eddy Current Testing

UNIT - VI: Industrial Applications of NDE

Span of NDE Activities Railways, Chemical Industries, Automotive Industries, NDE of pressure vessels, castings, welded constructions.

Text Books

1. Non-Destructive Test and Evaluation of Materials, J Prasad, GCK Nair, TMH Publishers.
2. Ultrasonic Testing by Krautkramer and Krautkramer.
3. Non-Destructive Testing, Warress, JMc Gonmade.

References Books

1. Ultrasonic inspection training for NDT: E. A. Gingel, Prometheus Press.
2. ASTM Standards, Vol 3.01, Metals and alloys.
3. Non-Destructive, Hand Book – R. Hamchand.

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Open Elective - IV

CYBER PHYSICAL SYSTEMS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To prototype the Smart objects and provides a holistic understanding of development Platforms, connected products of Internet of things (IoTs).
- To familiarize with real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes

Upon successful completion of the course, the students will be able to

- develop prototypes using appropriate Platforms of internet-connected products.
- assess and improve the reliability & security of a simple Cyber-Physical System.
- differentiate various methodologies and tools of automatic synthesis of controls and software

Course Content

UNIT - I: Introduction to Cyber physical System

Cyber-Physical Systems (CPS); history; key features; CPs design challenges; model-based design and design methodologies; simulation, validation, verification, and synthesis; platform-based design and contract-based design.

UNIT - II: Modeling

Introduction to models of computation; languages and tools for system design; mathematical background; notions of complexity and computability, finite state machines; synchronous/reactive model.

UNIT - III: Analysis

Cyber-Physical System requirements (functional, extra-functional, safety, liveness, reliability, real-time); specification languages; temporal logic; overview of requirement analysis and validation techniques, core engines for algorithmic system verification;

UNIT - IV: Introduction to Internet of Things

Definition and evolution of IoT, architecture of IoT, resource management, data management and analytics, security issues, identity management and

authentication, privacy, standardization and regulatory limitations, opportunities for IoT.

UNIT - V: IoT Enabling Technologies

Wireless Sensor Networks: Overview, history, the node, connecting nodes, networking nodes. securing communication- standards. cloud computing, Big data analysis, communication protocols, wireless communication protocols, wireless communication protocols and application protocols.

UNIT - VI: Use cases and IoT applications

Home automation, smart building, smart health, location tracking, environment, energy, agriculture, smart cities and other IoT electronic industries.

Text Books

1. E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems, A Cyber-Physical Systems Approach," 2nd Edition, http://LeeSeshia.org, 2015.
2. R. Alur, "Principles of Cyber-Physical Systems," MIT Press, 2015.

Reference Books

1. Arshdeep Bahga, Vijay Madisetti "Internet of Things - A Hands-on Approach", Published by Arshdeep Bahga & Vijay Madisetti, 1st Edition.
2. Dieter Uckelmann, Mark Harrison Florian, Michahelles "Architecting the Internet of things", Springer-Verlag Berlin Heidelberg, 1st Edition.

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Open Elective - IV

SIGNALS AND SYSTEMS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the basic concepts of signals and systems.
- To introduce various transform techniques on signals.
- To develop an understanding of sampling and correlation techniques on signals.

Course Outcomes

Upon successful completion of the course, the students will be able to

- classify the signals and various operations on signals.
- perform Fourier analysis on the signals.
- analyze the various systems.
- perform correlation operational on signals.
- apply the various sampling techniques on continuous time signals.
- analyze the various continuous time signals through transformation (Fourier and Laplace) techniques.

Course Content

UNIT - I: Signal Analysis

Classification of signals, basic operations on signals-amplitude and time scaling, time shifting, addition and multiplication, introduction to elementary signals-unit step, impulse, ramp, parabolic, rectangular, triangular, sinusoidal, exponential, signum, sinc and gaussian functions.

UNIT - II: **Fourier Series Representation of Continuous Time Signals**

Trigonometric and exponential Fourier series, relationship between trigonometric and exponential Fourier series, representation of a periodic function by the Fourier series over the entire interval, convergence of Fourier series, alternate form of trigonometric series, symmetry conditions-even and odd, complex Fourier spectrum.

UNIT - III: Fourier Transform

Representation of an arbitrary function over the entire interval: Fourier transform, Fourier transform of some useful functions and periodic function, properties of Fourier transform, energy density spectrum, Parseval's theorem.

Sampling: Sampling theorem for band limited signals- explanation, reconstruction of signal from samples, aliasing, sampling techniques- impulse, natural and flat top sampling.

UNIT - IV:LTI Systems

Properties of systems, Linear Time Invariant (LTI) system, response of LTI system-convolution integral, properties of LTI system, transfer function and frequency response of LTI system.

Signal Transmission Through LTI Systems: Filter characteristics of LTI systems, distortion less transmission through LTI system, signal bandwidth, System bandwidth, ideal LPF, HPF and BPF characteristics, causality and physical realizability- Paley-Wiener criterion, relationship between bandwidth and rise-time.

UNIT - V: **Correlation of Continuous Time Signals**

Cross correlation and auto correlation of continuous time signals (finite and nonfinite energy signals), relation between convolution and correlation, properties of cross correlation and autocorrelation, power density spectrum, relation between auto correlation function and energy/power spectral density function.

UNIT - VI: **Laplace Transform**

Laplace transform of signals, properties of Region of Convergence (ROC), unilateral Laplace transform, properties of unilateral Laplace transform, inversion of unilateral and bilateral Laplace transform, relationship between Laplace and Fourier Transforms.

Text Books

1. B.P.Lathi, "Signals, Systems &Communications", BS Publications, 2003 (Units I-VI).
2. A.V. Oppenheim, A.S. Willsky and S.H.Nawab, "Signals and Systems",PHI, 2nd Edition (Units I, III, VI)

Reference Books

1. Simon Haykin and Van Veen, "Signals &Systems", Wiley, 2nd edition
2. Michel J. Robert , "Fundamentals of Signals and Systems", TMGH Int. Edition, 2008
3. C.L.Philips, J.M. Parr and Eve A. Riskin, "Signals, Systems and Transforms", Pearson Education, 3rd Edition, 2004.

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Open Elective - IV

DIGITAL FORENSICS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To provide a comprehensive overview of digital forensic process.
- To familiarize with the different roles a computer in crime investigation.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- formulate a Digital Forensic Process
- employ fundamental computer theory in the context of computer forensics practices
- apply the principles of effective digital forensics investigation techniques
- explain the role of digital forensics in the field of information assurance and information security
- evaluate the effectiveness of available digital forensic tools
- outline the file storage mechanisms of DOS systems
- examine computer incidents in crime scene

Course Content

UNIT - I: Introduction to Digital Forensics

What is Computer Forensics?, Differences between Computer Forensics and Digital Forensics, History of Digital Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists, Types of Computer Forensics Technology**.**

UNIT - II: Computer Forensics Evidence and Capture

Data Recovery, Data Back-up and Recovery, The Role of Back-up in Data Recovery, The Data-Recovery Solution, Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options, Obstacles, Types of Evidence, the Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody.

UNIT - III: Duplication and Preservation of Digital Evidence, **Computer Image Verification and Authentication, Processing Crime and Incident Scenes:** Identifying Digital Evidence, Collecting Evidence in Private-Sector Incident Scenes, Securing a Computer Incident or Crime Scene, Seizing Digital Evidence at the Scene, Storing Digital Evidence, Obtaining a Digital Hash, Reviewing a Case.

UNIT - IV: Digital Forensics Analysis and Validation

Determining what data to collect and analyze, Validating Forensic data, Data-Hiding Techniques, Examining Encrypted Files, Recovering Passwords, Performing Remote Acquisitions, Virtual Machines, Network Forensics and performing Live Acquisitions, Email Investigations, Mobile Device Forensics.

UNIT - V: Current Digital Forensics Tools

Types of Forensics Tools, Tasks performed by Forensic Tools, Tool Comparisons, Software Tools – Command-line Forensics Tools, UNIX/Linux Forensics Tools, other GUID Forensics Tools, Hardware Tools – Forensic Workstations, Using a Write-Blocker, Validating and Testing Forensic Software - Using National Institute of Standards and Technology (NIST) Tools, Using Validation Protocols.

UNIT - VI: Working with Windows and DOS Systems

File Systems, exploring Microsoft File Structures, examining NTFS disks, whole Disk Encryption, Windows Registry, Microsoft Start-up Tasks, MS-DOS Start-up Tasks, and Virtual Machines.

Text Books

1. John R.Vacca, "Computer Forensics: Computer Crime Scene Investigation", 2nd edition, Charles River Media.
2. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", 3rd edition, CENGAGE Learning.

Reference Books

1. Tony Sammes and Brian Jenkinson, "Forensic Computing, A Practitioners Guide", 1st edition. Springer
2. Christopher L. T. Brown, "Computer Evidence: Collection and Preservation", 2nd edition, Firewall Media.
3. Jesus Mena, "Homeland Security, Techniques and Technologies", 1st edition Firewall Media.

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Open Elective - IV

BUSINESS INTELLIGENCE AND DECISION SUPPORT SYSTEMS

IV Year – I Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To identify the process of decision making and use of model for decision making.
- To use various visualization tools for delivery of knowledge.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify the need of Business Intelligence
- explain the process of decision making
- use mathematical model for decision making
- compare simple linear regression model with multiple linear regression model for prediction.
- choose a marketing model to design sales territory
- construct charts, graphs and widgets to deliver the knowledge for decision makers

Course Content

UNIT - I: Introduction to Business Intelligence

Effective and timely decisions, Data, information and knowledge, Role of mathematical models, Business intelligence architectures, Ethics and business intelligence.

UNIT - II: Decision support systems

Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system.

UNIT - III: Mathematical models for decision making

Structure of mathematical models, Development of a model, Classes of models.

Regression: Structure of regression models, Simple linear regression, Multiple linear regression.

UNIT - IV: BI Applications

Marketing Models: Relational Marketing, Sales force Management, Business case studies.

UNIT - V: Data envelopment analysis

Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices.

UNIT - VI: Knowledge Delivery

Visualization, Scorecards and Dashboards, Geographic Visualization, Integrated analytics, Considerations: Optimizing the presentation for the Right message.

Text Books

1. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications.
2. David Loshin, "Business Intelligence: The Savvy Manager's Guide", 2nd edition, Morgan Kaufman Publications.

Reference Books

1. Efraim Turban, Jay E Aronson, Teng-Peng Liang, Ramesh Sharda, "Decision Support and Business Intelligence Systems", 8th Edition, Pearson.
2. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", 2nd edition, Morgan Kaufmann Publishers.
3. Larissa T. Moss and Shaku Atre, "Business Intelligence Roadmap: The complete Project Life Cycle of Decision Making", 1st edition, Addison Wesley.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw- Hill.

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Open Elective - IV

ADHOC AND SENSOR NETWORKS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To acquire fundamental concepts of ad hoc networks.
- To learn design considerations of wireless sensor networks.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- evaluate architecture and protocols in adhoc and wireless sensor networks.
- identify applications of adhoc and WSN's.
- illustrate wireless sensor networks design aspects.
- synthesize routing protocols for adhoc wireless networks.
- outline Transport layer and security protocols for Ad hoc wireless networks.
- summarize layer wise functionalities of wireless sensor networks.
- describe MAC protocols in adhoc and WSN's.

Course Content

UNIT - I: Introduction

Fundamentals of wireless communication technology, the electromagnetic spectrum, radio propagation mechanisms, characteristics of the wireless channel.Ad hoc wireless networks: introduction, cellular and Ad hoc wireless networks, applications of ad-hoc networks, issues in ad hoc wireless networks.

UNIT - II: MAC Protocols for Adhoc Wireless Networks

Issues in designing a MAC protocol for ad hoc wireless networks, classifications of MAC protocols, Contention based protocols.

UNIT - III: Routing protocols for Adhoc Wireless Networks

Issues in designing a routing protocol for ad hoc wireless networks, classifications of routing protocols, table-driven routing protocols, on-demand routing protocols.

UNIT - IV: Transport layer and Security Protocols for Adhoc Wireless Networks

Introduction, Issues, design goals, classification of transport layer solutions, TCP over ad hoc wireless networks: TCP-F, TCP-ELFN, TCP-BUS, ATCP, split-TCP. Network security attacks.

UNIT - V: Sensor Networks Design Considerations-I

Introduction, energy consumption, sensing and communication range, design issues, localization scheme, clustering of SN's, MAC layer, Applications of wireless sensor networks.

UNIT - VI: Sensor Networks Design Considerations-II

Routing layer, flat versus hierarchical, operation-based protocols, location-based protocols, high level application layer support.

Text Books

1. Carlos de Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", 2nd Edition, World Scientific Publications, 2011.
2. C. Siva Ram Murthy, B.S. Manoj "Ad Hoc wireless networks: Architectures and protocols ", Pearson, 2017.

Reference Books

1. Prasant Mohapatra and Srihanamurthy, "Ad Hoc Networks Technologies and Protocols", Springer, Springer International Edition, 2009.
2. Subir kumar sarkar, C. Puttamadappa, T.G.Basavaraju, "Ad hoc mobile wireless networks:principles, protocols and applications", Taylor & Francis India Pvt Ltd - New Delhi, 2007.
3. Jagannathan, sarangapani, "wireless ad hoc and sensor networks protocols, performance, and control", CRC press, 2007.

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Open Elective - IV

INFORMATION RETRIEVAL SYSTEMS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To provide the foundation knowledge in information retrieval.
- To familiarize about different applications of information retrieval techniques in the Internet or Web environment.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify basic theories in information retrieval systems.
- identify the analysis tools as they apply to information retrieval systems.
- understand the problems solved in current IR systems.
- describes the advantages of current IR systems.
- understand the difficulty of representing and retrieving documents.
- understand the latest technologies for linking, describing and searching the web.

Course Content

UNIT - I: Introduction to Information Storage and Retrieval System

Introduction, Domain Analysis of IR systems and other types of Information Systems, IR System Evaluation. Introduction to Data Structures and Algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

UNIT - II: Inverted files

Introduction, Structures used in Inverted Files, Building Inverted file using a sorted array, Modifications to Basic Techniques.

UNIT - III: Signature Files

Introduction, Concepts of Signature Files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT - IV: New Indices for Text

PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT trees as PATRICA Trees, PAT representation as arrays.

UNIT - V: Stemming Algorithms

Introduction, Types of Stemming Algorithms, Experimental Evaluations of Stemming to Compress Inverted Files.

UNIT - VI: Thesaurus Construction

Introduction, Features of Thesauri, Thesaurus Construction,Thesaurus construction from Texts, Merging existing Thesauri.

Text Books

1. William B. Frakes, Ricardo Baeza-Yates, "Information Retrieval: Data Structures and Algorithms", Prentice Hall.
2. Ricardo Baeza-Yates, Bertheir Ribeiro-Neto, "Modern Information Retrieval", Pearson Education.
3. Robert R. Korfhage, "Information Storage and Retrieval", John Wiley & Sons.

Reference Books

1. Gerald Kowalski, Mark T Maybury, "Information Storage and Retrieval Systems-Theory and Implementation", 2nd edition, Kluwer Academic Press, 1997.
2. David A. Grossman, Ophir Frieder, "Information Retrieval:Algorithms and Heuristics", 2nd edition, Springer.

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Open Elective - IV

FUZZY LOGIC

IV Year – I Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To impart the knowledge of fuzzy set theory and its applications in Engineering.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- distinguish between crisp set and fuzzy set.
- compose the operations on fuzzy sets to characterize the belongingness of elements in the sets
- construct fuzzy relations to draw inferences
- illustrate the methods of defuzzification to drive the control mechanism.
- apply fuzzy logic to control automatic engineering systems.

Course Content

UNIT - I: Crisp Sets Vs Fuzzy Sets

Crisp sets an overview, Concept of fuzziness, the notion of Fuzzy sets, basic concepts of fuzzy sets.

UNIT - II: Operations of Fuzzy Sets

Fuzzy set operations-fuzzy complement, fuzzy union, fuzzy intersection, combinations of operations.

UNIT - III: Fuzzy Relations

Fuzzy Cartesian product ,Fuzzy relations, operations on fuzzy relations, properties of fuzzy relations, lamda cut for fuzzy relations and composition, Fuzzy tolerance and equivalence relations.

UNIT - IV: Fuzzification and Defuzzification

Features of membership function, fuzzification, defuzzification to crisp set, Defuzzification to scalars (centroid method, centre of sums method, mean of maxima method).

UNIT - V: Fuzzy Logic

Introduction to fuzzy logic, Crisp connectives vs Fuzzy logical connectives, Approximate reasoning.

UNIT - VI: Applications of Fuzzy Systems

Fuzzy Control System, Control System Design Problem, Simple Fuzzy Logic Controller, general applications of fuzzy logic (washing machine, air conditioner controller).

Text Books

1. Timothy J.Ross., Fuzzy Logic with Engineering Applications - Second Edition, Wiley Publications, 2007, New Delhi.
2. S.Rajasekaran, G.A.Vijayalakshmi Pai, Neural networks, Fuzzy logic, and genetic algorithms synthesis and applications- – Prentice-Hall of India private limited, 2008, New Delhi.

Reference Books

1. H.J. ZIMMERMAN, Fuzzy set theory and its applications, 4th edition — SPRINGER, 2006. New Delhi.
2. Recommended Text S.Nanda and N.R.Das “Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi.

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COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB

IV Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To familiarise with programming languages to solve the civil engineering problems
- To introduce the concept of designing structures by using software.
- To impart the knowledge on Arc GIS software in solving civil engineering problems

Learning Outcomes

Upon successful completion of the course, the students will be able to

- develop a program for solving a simple civil engineering problems.
- design an RC structural element by using software.
- apply Arc GIS techniques to solve civil engineering problems

List of Experiments

Write any Four Programs Using C or C++, JAVA etc

1. Design a Reinforced beam for flexure by Limit state method
2. Design a T beam by Limit state method
3. Design of one way.
4. Design of Two way slab.
5. Design of RCC compression member
6. Determination of bearing capacity of soil by IS code
7. Estimation of Settlement of foundations in Cohesive Soil.
8. Estimation of runoff for a catchment area.

Analyze and Design any four of the following Elements using STAAD Pro or STRUDS or STRAP

1. Analyze and design any type of determinate structure
2. Analyze and design any continuous beam
3. Analyze and design of a Compression Member.
4. Analyze and design any portal frame without sway

5. Analyze and design any portal frame with sway
6. Analyze a simple truss
7. Design of a frame against Wind loads.
8. Design of a frame against Earthquake loads.

Exercise any four of the following GIS Experiments

1. Creation of AOI, Clip and Mosaic (Satellite Imagery or Toposheet)
2. Digitization of Satellite Map/Toposheet and Creation of thematic maps
3. Calculate Geometry for vector data.
4. Developing Digital Elevation model from contours.
5. Catchment and stream delineation from DEM using QGIS
6. Supervised classification.

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Optional Elective - VII

PROJECT SCHEDULING AND CONTRACTS

IV Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the knowledge on contract documents and specifications.
- To illustrate the Methodology of scheduling for activities and resources.
- To distinguish scheduling methods and contracts.
- To address the need of tender, estimation and bidding process.

Course Outcomes

Upon successful completion of the course, the students will be able to

- explain the role of key stake holders in construction projects.
- apply available techniques for scheduling.
- evaluate event time probabilities and activity durations.
- distinguish the scope of construction contracts.
- develop pre- qualification process for construction projects.
- determine the estimation and bidding process from contractor.

Course Content

UNIT - I: Introduction to Contracts

Contract- Study of Construction Drawings & Specifications, details of project- role of project manager and estimator, Schedule of Meetings-Superintendent and Subcontractors, and Meeting with the client, contractor and the Architect.

UNIT - II: Physical Creation of the Schedule

Software tools available – Primavera, Microsoft Project , Division of Project into Subnet works, Develop Responsibility Codes, Information Codes, Specific Subnet works, Draft the Logic Diagram, Number the Activities , Tie the Subnets Together, Computerization, Refinement , Scheduler Refinement, The Circular Path, Float Analysis, Refinement with Superintendent and

UNIT - III: Scheduling Methods

Program Evaluation and Review Technique (PERT) Introduction, PERT Defined, Computing PERT Durations, Calculating PERT Event Times and Probabilities, Advantages and Disadvantages of PERT, Linear Scheduling Method (LSM): Definitions, Elements of LSM Schedules, Preparation of LSM Schedules, Use of LSM Schedules, Advantages of LSM Schedules, advantages of LSM Schedules

UNIT - IV: Construction Contracts

Contract Document, The Contract Drawings, The Specifications, The General Conditions of Contract (GCC), The Special Conditions of Contract (SCC),The Bill of Quantities (BOQ).

Classification of Engineering Contracts: Separated Contract, Management Contract, Integrated Contract, Discretionary Contract.

UNIT - V: Pre-qualification Process

Pre-qualification Process, Notice Inviting Tender, Submission of Bids, Analysis of Submitted Tenders, Basis for Evaluation and Acceptance, Letter of Intent, Work Order, Agreement , CPWD Contract Conditions, FIDIC form of Contract Agreement, Need and Principles of FIDIC Contracts, Salient Features of FIDIC form of Contract, New Engineering Contract (NEC).

UNIT - VI: Contractor's Estimation and Bidding Process

Pre-qualification Process, Study of Tender Document preparation, Drawings and Tender Summary, Decisions to take, Arrange for Site Visit and Investigation, Consultation, Queries and Meetings, and Other Associated Works, Construction Schedule and Other Related Schedules, Collect Information, Determination of Bid Price, Analysis of Rates, Fix Mark-up, Computing Bid Price, Submit Bid, Post-Submission Activities.

Text Books

1. Construction Project Scheduling, Michael T.callahan, Daniel quackenbush james E. Rowings-Mcgraw-Hill series in construction engineering and project management.
2. Construction Project Management-Theory and Practice, Kumar Neeraj Jha .
3. Project Planning and control with PERT & CPM, B.C.Punmia & K.K.Khandelwal: Laxmi Publications.
4. Construction economics: A new approach, Danny Myers, Taylor and Francis publisher.

Reference Books

1. The Construction industry aspects of its economics and management, Ofori. G.Singapore University press.
2. Estimating and Costing, B.N.Dutta,UBS Publishers, 2000.
3. Construction Management & Planning, B.Sengupta & H.Guha; TataMcGraw-Hill Publishing Co.Ltd. New Delhi.

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Optional Elective - VII

OPTIMIZATION TECHNIQUES

IV Year – I Semester

Lecture : -	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To familiarize with various methods of optimization, decision making methods and design of civil engineering systems structural members.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- formulate objective functions and constraints
- understand intricacies of classical and non-traditional optimization methods
- understand applicability of optimization methods to civil engineering problems

Course Content

UNIT - I: Introduction

Basic theory and elements of optimization Terminology and definitions Basic principles and procedure of optimization. Classical Methods of Optimization: Trial and error method, Monte Carlo method and Lagrangian Multiplier Method.

Linear Programming: Introduction, terminology, standard form of linear programming problem, geometrical interpretation, canonical form of equation graphical and algebraic methods of solving L.P. problems,

UNIT - II: Linear Programming

Simplex, methods, Dual formulations.Network analysis: Introduction to network theory, transportation and assignment models formulation of mathematical models and solutions

UNIT - III: Non Linear programming

Non Linear programming: Unconstrained and constrained methods of optimization on .Univariate search, Steepest Descent Methods, Kuhn Tucker conditions – Penalty functions, slack variables and Lagrangian Multiplier methods

UNIT - IV: Dynamic Programming

Dynamic Programming, Necessity of non-traditional optimization methods, Differential Evolution and Particle Swarm Optimization Methods.

UNIT - V: Role of Multiobjective Optimization

Role of Multiobjective Optimization, Multicriterion criterion Decision Making Methods Compromise Programming, Analytical Hierarchy Process, TOPSIS

UNIT - VI: Structural Optimization

Optimum structural design of reinforced concrete T and L beams Optimization of planner trusses, Optimization of reinforced concrete beams, Optimization of concrete mix proportioning,Optimization of reservoir operation, Optimization of Pavement systems

Text Books

1. Engineering Optimization, S.S. Rao, New Age Internationals (1999)
2. Multicriterion Analysis in Engineering and Management, K.Srinivasa Raju, D. Nagesh Kumar, Prentice Hall of India (PHI) Learning Pvt. Ltd, New Delhi, 2014
3. Vedula, S. and Mujumdar, P. P., (2005) Water Resources Systems: Modeling Techniques and Analysis, Originally Published by Tata-McGraw Hill

Reference Books

1. Introduction to Optimum Design, 2nd Edition,McGraw-Hill Book Company, 2000.
2. MorrIs A.J., “Foundations of Structural Optimization - A UnifiedApproach”, 3rd Edition, John Wiley and Sons, 2003.

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Optional Elective - VII

ENTREPRENEURSHIP

IV Year – I Semester

Lecture : -	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To understand entrepreneurial process and its significance in economic development of a nation.
- To provide awareness about entrepreneurship.
- To develop idea generation, creative and innovative skills.
- To design business plan.

Course Outcomes

Upon successful completion of the course, the students will be able to

- Analyse the business environment andidentify business opportunities.
- Identify the elements of success of entrepreneurial ventures.
- Statutory legal and financial regulations to start a business.
- Evaluate effectiveness of different entrepreneurial strategies.
- Specify performance indicators of entrepreneurship.

Course Content

UNIT - I: Introduction to Entrepreneurship

Entrepreneur – Characteristics and qualities, Entrepreneurs vs. Intrapreneurs and Managers – Classification of Entrepreneurs; Problems and challenges - Entrepreneurship in Economic Growth, Factors influencing Entrepreneurship. Opportunities for Entrepreneurs in India and Abroad.

UNIT - II: Micro, Small and Medium Enterprises

Small Enterprises – Definition, Classification – Characteristics, – Project Formulation – Steps involved in setting up of a Small Business – Identifying, Selecting a Business.Forms of Business; Women Entrepreneurship; Rural Entrepreneurship.

UNIT - III: Idea Generation and Feasibility Analysis

Sources of Ideas - Methods of idea generation - - Product Identification - Opportunity Selection - What is a Business Plan - Significance - Formulation of

Business Plan - Business Opportunities in Various Sectors - Errors in Business Plan Formulation – Preparation of Project Report.

UNIT - IV: Institutional support for Entrepreneurship

Role of Central and State Government in promoting Entrepreneurship - Introduction to various incentives, subsidies and grants. District Industries Centres (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship and Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB).

UNIT - V: Financial Closure for Start-ups

Need – Sources of Finance,Banking sources; Non banking Institutions and Agencies; Venture Capital – Meaning and Role in Entrepreneurship; Government Schemes for funding business; Pre launch, Launch and Post launch requirements; Procedure for getting License and Registration; Challenges and Difficulties in Starting an Enterprise.

UNIT - VI: Support to Entrepreneurs

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting. Sick Industries Companies Act, 1985.

Text Books

1. Entrepreneurial Development, S.S.Khanka, S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
2. Entreprenuership – Theory, Process and Practice, Donald F Kuratko, 9th edition, Cengage Learning 2014.
3. The Dynamics of Entrepreneurial Development and Management, Vasanth Desai, Himalaya Publishing House, 2011.

Reference Books

1. Entrepreneurship, Hisrich Robert D, Peters M P, 8th Edition, Tata McGraw-Hill, 2013.
2. Entrepreneurship, Rajeev Roy, 2nd edition, Oxford University Press, 2011.

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Professional Elective - V

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

IV Year – II Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To familiarize with basics of structural dynamics and earthquake engineering.
- To impart the knowledge of analyzing and designing earthquake resistant structure
- To introduce the seismic planning concepts and design principles of shear wall

Learning Outcomes

Upon successful completion of the course, the students will be able to.

- understand the basics of earthquake engineering
- apply the basic concepts of structural dynamics
- analyze and design earthquake resistant structure
- summarize the ductility considerations while designing a structure
- illustrate the seismic planning configurations
- design shear wall and analyze masonry buildings

Course Content

UNIT - I: Engineering Seismology

Seismology –Earthquake Terminology – Causes and effects of earthquakes – Elastic rebound and plate tectonics theories – Classification of earthquakes – Seismic waves – Earthquake size-Magnitude and Intensity – Seismic zones-Seismic zoning map of India.

UNIT - II: Introduction to Structural Dynamics

Theory of vibrations – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Multi-degree of freedom (MDOF) systems: Formulation of equations of motion – Orthogonal properties of normal modes

UNIT - III: Earthquake Analysis

Introduction –Earthquake response analysis of single and multi-storied buildings – Use of seismic coefficient and response spectrum method.

UNIT - IV: Codal Provisions of Ductile Detailing

Ductility considerations in earthquake resistant design of RCC buildings, Ductility factors as per IS13920 and IS: 4326 provisions – Beam, column and joints

UNIT - V: Seismic Planning & Design of Shear Walls

Plan Configurations – Torsion Irregularities – Re-entrant corners – Non-parallel systems– Diaphragm Discontinuity – Vertical Discontinuities in load path – Irregularity in strength and stiffness – Mass Irregularities –Vertical Geometric Irregularity – Proximity of Adjacent Buildings.

shear walls: Types – Design of Shear walls as per IS:13920 – Detailing of reinforcements

UNIT - VI: Lateral Load Analysis of Masonry Buildings

Introduction- Lateral load analysis of Masonry buildings- determination and distribution of lateral forces-determination of rigidity of shear wall-shear and forces due to torsion - increase in axial load.

Text Books

1. Earthquake Resistant Design of Structures, Pankaj Agarwal & Manish Shrikhande, 1st Edition, Prentice Hall of India, New Delhi
2. Earthquake Resistant Design of Structures, S. K. Duggal, 2nd Edition, Oxford University press.

Reference Books

1. Dynamics of Structures, Clough &Penzien, Second Edition, International Edition-McGraw Hill.
2. Dynamics of Structures, A. K. Chopra 4th Edition Pearson Education, Indian Branch, Delhi
3. Earthquake Tips, C.V.R. Murty- I.I.T. Kanpur.
4. Relevant Indian Standard codes: IS-875, IS-1893, IS-4326, IS-13920.

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Professional Elective - V

LOGISTICS INFRASTRUCTURE ENGINEERING

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with various components, their functions and design principles of geometry in a railway track.
- To introduce the design principles of airport geometrics and pavements.
- To impart the knowledge of planning, construction and maintenance of Docks and Harbours.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify the various components of a railway track
- design geometrics in a railway track.
- enumerate the need of turnouts and controllers in transportation network
- choose the area required for the construction of airports as per ICAO and FAA specifications
- design airfield pavements and suggest the methods to eliminate the pavement failures.
- explain the different elements in Docks and Harbours.

Course Content

A) Railway Engineering

UNIT - I: Components of Railway Engineering

Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast – Rail Fastenings – Creep of Rails - Theories related to creep – Adzing of Sleepers - Sleeper density – Rail joints.

UNIT - II: Geometric Design of Railway Track

Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT - III: Turnouts & Controllers

Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing.

Signal Objectives – Classification – Fixed signals – Stop signals – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations.

B) Airport Engineering

UNIT - IV: Airport Planning & Design

Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

UNIT - V: Runway Design

Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements.

C) Docks & Harbours

UNIT - VI: Planning, Layout, Construction & Maintenance of Docks & Harbours

Classification of ports – Requirement of a good port – classification of Harbours – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbours – Navigational aids.

Text books

1. Railway Engineering, Saxena & S. P. Arora, Revised edition 2013 or 2010 , Dhanpat Rai, New Delhi
2. Airport Engineering, S. K. Khanna, M. G Arora & S. S. Jain, 6th edition 2012, Nemchand Bros, New Delhi.
3. Docks and Harbour Engineering, Bindra S.P, edition 2012, Dhanpathi Rai & Sons, New Delhi

Reference Books

1. Railway Engineering, Satish Chandra and Agarwal M.M., publication 2013, Oxford University Press, New Delhi
2. Transportation Engineering Planning Design, Wright P.H. &Ashfort N.J, 4th edition, John Wiley & Sons.
3. Airport Engineering, Virendra Kumar, Edition 1,Galgotia Publishers P.Ltd, New Delhi.
4. Transportation Engineering, Srinivasa Kumar R, publication 2014, University Press, Hyderabad
5. Highway, Railway, Airport and Harbour Engineering, Subramanian KP, publication in 2010, Scitech Publications (India) Pvt. Limited, Chennai.

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Professional Elective - V

FINITE ELEMENT METHODS

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the fundamentals of finite element method.
- To impart knowledge of solving one dimensional and two dimensional problems by FEM.
- To introduce the concepts of axi-symmetric and iso-parametric formulation.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- summarize the fundamentals of finite element method.
- develop the shape functions and stiffness matrices for various elements.
- solve the problems of one dimensional and two dimensional by FEM.
- apply the concepts of axi-symmetric and iso-parametric formulation for solving problems.
- evaluate higher order element problems by numerical techniques.

Course Content

UNIT - I: Introduction to FEM

Introduction, Need of FEM, FEM Vs Classical Methods, Advantages & Disadvantages, Applications of FEM, Functional Approximation Methods - Rayleigh – Ritz Method -Weight Residual Techniques, Steps involved in FEM as applicable to structural problems.

UNIT - II: One Dimensional Problems

Finite element modelling, Co-ordinates & shape functions, one dimensional scalar variable problems, Application to structural problems, Element stiffness of bar element due to axial loading, Formulation of stiffness matrix of bar element by direct stiffness method, minimum potential energy principle, Temperature effects.

UNIT - III: Analysis of Beams &Trusses

Derivation of stiffness matrix for beams by strain energy concept & direct stiffness method - problems on these concepts,Moment-curvature relation,Derivation of Stiffness matrix for trusses, stress calculations and problems on these concepts

UNIT - IV: Two Dimensional Problems

Finite element modelling of 2-D elements, Derivation of shape functions for two dimensional linear element(Triangular) by area co-ordinates, problems on these concept. Stress strain relationship matrix formulation for 3D & 2D systems, and stiffness matrix for CST element, Problems on these concepts.

UNIT - V: Axi-Symmetric Problems

Introduction, Axi-symmetric formulation, Derivation of shape function for axisymmetric triangular element, stress –strain relationship matrix, Strain & Stress displacement matrices- Stiffness matrix for Axi-symmetric triangular element & Problems on these concepts.

UNIT - VI: Iso-Parametric Elements & Numerical Integration

Introduction, Iso-parametric formulation, Higher order elements, Derivation of shape functions for a four noded quadrilateral element using natural coordinates, strain displacement matrix, stress-strain relationship matrix, stiffness matrix for Iso-parametric element, Numerical Integration, Gauss quadrature for performing numerical integrations.

Text Books

1. Finite Elements Methods in Engineering by TirupatiR.Chandrapatla and Ashok D.Belgaundu, 4th Revised Edition, 2012, Pearson Higher Education
2. Finite Element Analysis by Sk.Md ,Jalaludin , 2012, Anuradha Publishers

Reference Books

1. FEA –Theory & Programming by C.S.Krishna Murthy- Tata Mcgraw Hill, New Delhi.
2. FEA by S.S. Bhavakatti-New age international publishers FEA by David V Hutton,TataMcgraw Hill, New Delhi.

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Professional Elective - V

DESIGN AND DRAWING OF IRRIGATION STRUCTURES

IV Year – II Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To impart the knowledge and principles of hydraulic structures.
- To impart the knowledge on design principles of irrigation structures.
- To enhance partical design concept.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- illustrate the components of surplus weir.
- analyze various elements of tank sluice with tower head.
- design the components of canal drop-notch type.
- design the canal regulator and its components,
- design and draw Syphon Aqueduct type-III,

Course Content

Design and Drawing of

1. Surplus weir
2. Tank sluice with tower head
3. Canal drop-Notch type
4. Canal regulator
5. Syphon Aqueduct type - III

Semester End Examination Pattern:

Any two questions of the above five questions maybe asked out of which the candidate has to answer one question

Text Books

1. Water Resources Engineering Principles and Practice, C.Styanarayana Murthy, New Age International Publishers.

Reference Books

1. Irrigation and Water Power Engineering, Punmia & Lal, Laxmi publications Pvt. Ltd., New Delhi.
2. Irrigation engineering and hydraulic structures, Sk.Garg, standard book house.

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Professional Elective - VI

PRE-ENGINEERED BUILDINGS

IV Year – II Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To impart the concepts of designing water tanks, bridges, transmission line towers and chimneys.
- To familiarize on plastic behavior, plastic moment and plastic mechanism of steel structures like simple beams and portal frames.

Learning Outcomes

Upon successful completion of the course, the Students will be able to

- adopt principles of plastic analysis, plastic mechanism and apply to simple beams & frames.
- apply the design principles to gantry girderand elevated steel water tanks.
- identify the configuration of truss bridges and understand the design principles of truss elements.
- develop the methodology of designing transmission line tower structures.
- understand the design concepts of self-supporting chimneys & foundations.

Course Content

UNIT - I: Plastic Analysis

Plastic analysis of steel structures – Plastic bending in beams, collapse mechanism – Fully plastic Moment – Shape factor and Plastic moment – Ultimate load carrying capacity of simple beams and portal frames.

UNIT - II: Gantry girder

Introduction –loads-Fatigue effects- Specifications-Design procedure.

UNIT - III: Pre-engineered buildings

Introduction.Steel building systems: Origin- types -advantages and disadvantages. Prefabricated construction- necessity, advantage , disadvantages. Prefabricates classification-foundation- columns-beams-roof and floor panels, wall panels, box prefabricates, erection and assembly.

UNIT - IV: Bridges

Design of pedestrian Bridge (N-Truss), Design of through type truss bridge members for dead load and equivalent live load including top, bottom bracings.

UNIT - V: Towers

Towers Loading, Analysis & Design of Transmission line towers – simple problems

UNIT - VI: Chimneys

Design of self-supporting steel chimneys including foundation.

Note: Designs are by limit state method as per IS 800-2007.

Text Books

1. Design of Steel Structures Vol. I & II,Ramchandra,3rd Edition.
2. Design of Steel Structures, A.S.Arya & J.L.Ajmani, Nem chand & Brothers, Roorkee.

Reference Books

1. Comprehensive Design of steel structures, B.C.Punmia, Ashok kumar jain& Arun kumar jain, Laxmi publications, New Delhi.
2. Design of Steel Structures, S.K.Duggal Tata Mc Graw Hill, New Delhi.
3. Design of Steel Structures, P.Dayaratnam, Wheeler publishing, New Delhi.
4. Steel Structures, V.N.Vazirani & M.M.Ratwani, Khanna publications, New Delhi.
5. Plant cast, Precast and Prestressed Concrete ,Phillips, W.R. and Sheppard, D.A. (1980), , McGraw Hill, New York.
6. Relevant steel codes of Bureau of Indian standard.

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Professional Elective - VI

URBAN TRANSPORTATION PLANNING

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the various procedures for travel demand estimation.
- To impart the knowledge on various data collection techniques for origin and destination data.
- To familiarize with various models and techniques for trip generation, trip distribution, mode choice and traffic assignment.
- To introduce alternative urban transport network plans.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- estimate travel demand for an urban area.
- plan the transportation network for a city.
- identify the corridor and plan for providing good transportation facilities.
- evaluate various alternative transportation proposals.

Course Content

UNIT - I: Urban Transportation Characteristics and Issues

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, characteristics of transportation system, Evolution of Planning Process, Travel Attributes, Assumptions in Demand Estimation, factors influencing travel demand

UNIT - II: Transport Planning Process

Data Collection And Inventories: Collection of data – Organisation ofsurveys and Analysis, Study Area, Zoning, Types and Sources of Data, RoadSide Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Use of Secondary Sources, Economic data – Income – Population – Employment –Vehicle Owner Ship.

UNIT - III: Trip Generation Analysis

Trip Generation:UTPS Approach, Trip Generation Analysis:Zonal Models, Category Analysis, Household Models, Trip Attraction models,Commercial Trip Rates;

UNIT - IV: Trip Distribution Analysis

Trip Distribution: Growth Factor Methods, average factor method, furness method, GravityModels, calibration of gravity model, disadvantages of growth factor method

UNIT - V: Mode Choice Analysis

Mode Choice Behaviour, Competing Modes, ModeSplit Curves, Aggregate and Disaggregate Approaches; Discrete ChoiceAnalysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit,Multinomial Logit Model – IIA property; Aggregation

UNIT - VI: Traffic Assignment

Route Properties, Path Building Criteria, Skimming Tree,All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation ofAssigned Volumes, Equilibrium Assignment.

Text Books

1. Introduction to Urban System Planning by Hutchinson, B.G., 1st edition (1974), McGraw Hill.
2. Transportation Engineering - An Introduction by Khisty C.J., 3rd Edition, Prentice Hall.

Reference Books

1. Urban Transportation Planning: A decision oriented Approach by Mayer M and Miller E, 2nd Edition, McGraw Hill.
2. Fundamentals of Transportation Planning by Papacostas, 3rd Edition, Tata Mc Graw Hill.
3. Traffic Engineering and Transportation Planning by Kadiyali.L.R, 6th Edition, Khanna Publishers, New Delhi.

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Professional Elective - VI

SOIL DYNAMICS AND MACHINE FOUNDATIONS

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart knowledge on free and forced vibrations with and without damping for single degree freedom system.
- To familiarize field and laboratory methods of determination Dynamic Soil Properties.
- To introduce the designconsiderations of foundations for reciprocating machine, impact type and rotary type.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze free and forced vibrations with and without damping for single degree freedom system.
- solve one dimensional wave motion using wave propagation theory.
- understand pressure bulb concept by Pauw's Analogy.
- evaluate dynamic soil properties by field and laboratory tests.
- analyze machine foundations.

Course Content

UNIT - I: Introduction

Theory of vibrations: Basic definitions- free and forced vibrations with and without damping for single degree freedom system- Resonance and its effect – magnification – Logarithmic decrement.

UNIT- II: Soil Dynamics

Natural frequency of foundation – Soil system: Barkan's and IS methods – pressure bulb concept – Pauw's Analogy.

UNIT - III: Wave propagation

One dimensional wave motion – propagation in an elastic infinite medium – wave propagation in an elastic half space – propagation of flexural waves in beams on elastic foundations

UNIT - IV: Dynamic Soil Properties

Field and Laboratory methods of determination – Uphole, Down hole and cross hole methods –Cyclic plate load test – Block vibration test – Determination of Damping factor

UNIT - V: Block foundation

Degrees of freedom - analysis under different modes of vibration – codal provisions for design and construction of foundations for reciprocating machine, impact type and rotary type.

UNIT - VI: Vibration Isolation

Generation and propagation of vibrations – basic concept of vibration isolation – base isolation – shock isolation – seismic isolation of bridges

Text Books

1. Handbook of Machine Foundations, P.Srinivasulu and G.V.Vaidyanathan, 1st edition, Tata McGraw Hill
2. Soil Dynamics, ShamsherPrakash, 1981 edition, McGraw Hill Publishers.
3. Soil Dynamics and machine foundations, Swami Saran, 1999 edition, Galgotia Publications Pvt Ltd.

Reference Books

1. Dynamics of Bases and Foundations, Barken, McGraw Hill Publishing Co.,New York.
2. Vibration of Soils and Foundations, Richart, Hall and Woods, Prentice Hall, eaglewood Cliffs, New Jersy, USA.

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Professional Elective - VI

ENVIRONMENTAL IMPACT ASSESSMENT

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with various methodologies of EIA for project assessment.
- To distinguish impact prediction, assessment based on significance and preparation of audit report.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain the concept and importance of EIA
- delineate various methodologies available for assessment
- assess and predic the impacts related to soil and water.
- assess and predic the impacts related to air, noise, vegetation and wild life.
- prepare the outline of environmental audit.
- quote case studies of prominent developmental project.

Course Content

UNIT - I: Introduction

Salient Features of EIA, EIA Procedure, Scope of EIA, Classification And prediction of Impacts, Systematic Approach for Using EIA as a planning tool for major project Activities, Preparation of an EIA report

UNIT - II: EIA Methodologies

introduction, Criteria for the selection of EIA Methodology, EIA methods, Ad-hoc methods, matrix methods, Network method, Environmental Media Quality Index method, overlay methods, cost/ benefit Analysis, Predictive or Simulation Methods

UNIT - III: Soil and Water Assessment

Prediction and Assessment of Impacts on Soil and Ground Water Environment, Prediction and Assessment of Impacts on Surface Water Environment- (relevant case studies addressing the above impacts)

UNIT - IV: Prediction and Assessment of Impacts- Air, Noise, vegetation and wild life

Prediction and Assessment of Impacts on the Air Environment, Prediction and Assessment of Impacts of Noise on the Environment, Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation - (relevant case studies addressing assessment of impacts)

UNIT - V: Environmental Audit

Environmental Audit & Environmental legislation, objectives of Environmental Audit, Types of environmental Audit, stages of Environmental Audit, preparation of Audit report-(relevant case study addressing audit process)

UNIT - VI: Case Studies

Case studies of EIA of developmental projects, Guidelines for Preparations of TOR's for Life of Industrial Development Projects for Initial Environmental Examination.

Text Books

1. Y. Anjaneyulu, V. Manickam, "Environmental Impact Assessment Methodologies", 2nd edition, B.S. Publication.
2. Larry W. Canter, "Environmental Impact Assessment", 1st edition, McGraw-Hill (international edition).

Reference Books

1. David P. Lawrence, "Environmental Impact Assessment - Practical Solutions to Recurrent Problems", 1st Edition, Wiley-Interscience.
2. Judith Petts, "Handbook of Environmental Impact Assessment" Volume I and II, Conwell Science.

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