ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

CIVIL ENGINEERING

B.Tech Four Year Degree Course

(Applicable for the batches admitted from 2020-21)

GUDLAVALLERU ENGINEERING COLLEGE

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

Seshadri Rao Knowledge Village

GUDLAVALLERU - 521 356, Krishna District, Andhra Pradesh

CONTENTS

VISION, MISSION

OF THE

COLLEGE & DEPARTMENT

PEOs, POs & PSOs

ACADEMIC REGULATIONS

AND

CURRICULAR COMPONENTS

VISION & MISSION OF THE COLLEGE

Vision

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

Mission

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

VISION & MISSION OF THE DEPARTMENT

Vision

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

Mission:

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

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

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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

IV. PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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

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

V. PROGRAM SPECIFIC OUTCOMES (PSOs)

Students will be able to

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

VI. ACADEMIC REGULATIONS

Applicable for the students of B.Tech. from the Academic Year 2020-21.

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)
vii. Artificial Intelligence and Data Science (AI&DS)
viii. Internet of Things (IoT)

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. Award of B.Tech. Degree

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.

il) Students, who fail to complete their four years' course of study within eight years from the year of their admission or fail to acquire the **160** credits within this period shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

iii) 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.

iv) Students, who fail to complete their three years course of study within six years from the year of their admission or fail to acquire the **120** credits for the award of degree within this period shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

v) **Award of B. Tech. (Honors) / B. Tech. (Minor):** B. Tech. with Honors or a B.Tech. with a Minor will be awarded if a student earns 20 additional credits as per the regulations/guidelines. Registering for Honors / Minor degree is optional.

5. Duration and Pattern of the Program

i) The duration of the program is four academic years consisting of eight semesters for regular students and three academic years consisting of six semesters for lateral entry students.

ii) Each semester consists of a minimum of ninety instructional days.

iii) Three week induction program is mandatory for all the first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.

iv) A student has to register for all the courses in a semester.

v) Grade points, based on percentage of marks awarded for each course will be the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

vi) Award of division shall be based on the CGPA acquired.

vii) A pool of interdisciplinary, skill development courses, industry internship, socially relevant projects etc., which are relevant to the industry are integrated into the curriculum of the branch of engineering concerned.

viii) As a mandatory rule, all the students shall be registered for the mandatory non-credit courses as per AICTE/UGC/APSCHE guidelines.

6. Attendance Regulations

i) A student is eligible to write the semester end examinations if he acquires a minimum of 40% attendance in each subject and a 75% of attendance in aggregate of all the subjects.

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

iii) 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. (Regular) / three year (six semesters) course work of B.Tech. (Lateral).

iv) 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 within 4 weeks from the date of commencement of classwork.

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

vi) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end-examinations of current semester and their registration shall stand cancelled.

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

viii) A student is required to put up a minimum of 75% of attendance in the mandatory non-credit courses for getting the satisfactory grade. However, condonation of the shortage of attendance upto 10% shall be applicable for all mandatory non credit courses and a fee stipulated by the college shall be payable towards condonation fee.

7. Distribution and Weightage of marks - Evaluation

The distribution of Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) marks for each course is given in the table:

Sl.No.	Components	Internal	External	Total
1	Theory / Integrated Theory and Laboratory/ Project Based Theory	30	70	100
2	Engineering Graphics/ Design/ Drawing	30	70	100
3	Practical / Skill Development Courses	15	35	50
4	Community Service Project / Internship	-	100	100
5	Project Work	60	140	200
6	Mandatory Non-Credit Courses			
	i) Environmental Studies and Constitution of India	30	70	100
	ii) Sports & Games/ Cultural and NSS/Fine Arts /Yoga /Self Defence	100	-	100

(i) Continuous Internal Evaluation

Theory Courses:

a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one online objective examination(OE) consisting of 20 multiple choice questions for 10 marks for a duration of 20 minutes (ii) one descriptive examination(DE) consisting of 3 descriptive questions for 5 marks each a total of 15 marks for a duration of 90 minutes and (iii) one assignment(AT) for 5 marks.

b) First mid-term examination(Mid-I) shall be conducted from first 50% of the syllabus and second mid-term examination(Mid-II) shall be conducted from the rest of the 50% of syllabus.

c) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The final marks of each mid-term examination shall be displayed in the respective department notice boards within 10 days of completion of last examination.

d) Internal marks can be calculated with the sum of the 80% marks of better scored mid-term examination and 20% marks of less scored mid-term examination .

Example:

Mid-1 marks = Marks secured in (online examination-1 + descriptive examination-1 + one assignment-1)

Mid-2 marks = Marks secured in (online examination-2 + descriptive examination-2 + one assignment-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

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

Integrated Theory and Lab Courses

For the integrated theory and laboratory course, the distribution of 30 marks for internal evaluation shall be, 15 marks for theory based on two descriptive examinations and 15 marks for laboratory. The pattern for the descriptive examination is as same as the pattern for the regular theory courses. Sum of the 80% marks of better scored descriptive examination and 20% marks of less scored descriptive examination are considered. Of the 15 marks for the laboratory, 5 marks for the day-to-day performance, 5 marks for record and 5 marks for the semester end internal examination.

Project Based Theory Courses

For the project based theory course, the distribution of 30 marks for internal evaluation shall be, 15 marks for the theory based on two descriptive examinations and 15 marks for project. The pattern for descriptive examination is as same as the pattern for the regular theory courses. Sum of the 80% marks of better scored descriptive examination and 20% marks of less scored descriptive examination are considered. 15 marks for project shall be awarded by the department review committee based on the project report and the performance in oral presentation.

Drawing / Design Courses

For the subjects such as Engineering Graphics, Engineering Drawing, Building Planning and Drawing, Estimation, Costing & Valuation, Design & Drawing of

Steel Structures etc., the distribution of 30 marks for internal evaluation shall be, 15 marks for day-to-day work, and 15 marks based on two descriptive examinations. The pattern for the descriptive examination is as same as the pattern for regular theory courses. Sum of the 80% marks of better scored descriptive examination and 20% marks of less scored descriptive examination are considered.

Practical Courses

For the practical courses the distribution of 15 internal marks shall be, 5 marks for day-to-day performance, 5 marks for record and 5 marks for an internal laboratory test conducted at the end of a semester.

Skill Development Courses

Each student shall register for seven skill development courses (total 10 credits) offered by the department concerned. The distribution of 15 internal marks shall be 10 marks for day-to-day performance, and 5 marks for an internal examination conducted at the end of a semester.

For courses like Logic Building and Basic Coding Principles, Logic Building and Algorithmic Programming and Programming for corporate distribution of 15 internal marks shall be 10 marks for day-to-day performance(these marks will be awarded by taking no. of assignments completed, no. of quizzes attempted and amount of time spent in learning each topic on the LMS prescribed) and 5 marks for an internal laboratory test (internal Lab examination will be conducted on the assessment portal) conducted at the end of a semester.

Project Work

Of the 60 internal marks for a project work, 30 marks shall be awarded by the supervisor based on the student's involvement and 30 marks shall be awarded by the project review committee consisting of a supervisor, a senior faculty member and the HoD concerned based on the performance in Viva-Voce examination at the end of the semester.

Mandatory Non-Credit Courses

a) Each student shall register for four mandatory non-credit courses like Environmental Studies, Constitution of India, Sports & Games/Cultural and NSS/Fine arts/Yoga/Self Defense offered by the respective departments as per the course structure.

b) For courses like Environmental Studies and Constitution of India, two descriptive examinations shall be conducted for 30 marks each along with the mid-term examinations of regular theory courses.

c) Each descriptive examination consists of 3 descriptive questions for 10 marks each with a total of 30 marks for a duration of 90 minutes.

d) Sum of the 80% marks of better scored descriptive examination and 20% marks of less scored descriptive examination are considered.

e) For courses like Sports & Games/Cultural and NSS/Fine arts/Yoga/Self Defense, 100 marks for continuous internal evaluation shall be awarded by the respective class teacher based on the day-to-day participation and performance in the activities organized under each event.

II) Semester End Examinations – Evaluation:

Theory/ Drawing/ Integrated theory and laboratory/ Project based theory Courses

i) For all Theory/Drawing/Integrated theory and laboratory/Project based theory Courses, the semester end examination shall be conducted for 70 marks consisting of five internal choice questions (i.e "either" "or" choice), carrying 14 marks each. There will be two questions from each unit and the student should answer either of the two questions.

ii) There will not be any external assessment for laboratory and project components for integrated theory and laboratory course and project based theory course respectively.

iii) For design courses like Estimating, Costing & Valuation, Design of steel structures, Design of RC structures, Design of Irrigation structures, etc., the pattern for the semester end examination is given along with the syllabus of the respective subject.

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

Practical Courses:

The semester end examination shall be conducted for 35 marks by the teacher concerned and an external examiner appointed by the controller of examinations.

Skill Development Courses:

The semester end examination shall be conducted for 35 marks along with the practical examinations in the presence of an external and an internal examiner (course instructor or mentor).

For courses like Logic Building and Basic Coding Principles, Logic Building and Algorithmic Programming and Programming for corporate, semester end examination paper shall consists of 3 sets of questions and student has to choose any one set of Questions. Each set shall have three questions with three levels of complexity and evaluated for a total of 35 marks.

Community Service Project

i) Every student should put in a minimum of **180 hours** for the community service project during the summer vacation.
ii) Each class/section shall be assigned with a mentor.
iii) Departments shall concentrate on their major areas of respective departments concerned. For example, Dept. of Computer Science can take up activities related to computer Literacy to different sections of people like - youth, women, housewives, etc
iv) A log book to record the activities undertaken / involved shall be maintained by every student.
v) The log book has to be countersigned by the mentor concerned.
vi) A report shall be submitted by each student at the end of the semester.
vii) Based on the report and active participation of the student the semester end examination for 100 marks shall be awarded by a committee consisting of a mentor and a senior faculty member of the department.

Internship:

i) It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of specialization of the UG programme.
ii) Students shall pursue this course during summer vacation just before it is offered as per course structure. The minimum duration of this course is at least 6 weeks.
iii) A supervisor shall be allotted to each batch of students to guide and for taking up the summer internship. The supervisor shall monitor the attendance of the students during the internship. Attendance requirements are as per the norms of the college.
iv) After successful completion, students shall submit a summer internship technical report to the department concerned.
v) A certificate from industry / skill development centre shall be included in the report.
vi) Semester end examination for 50 marks shall be conducted by a committee consisting of an external examiner, head of the department and supervisor for the internship. The report and the oral presentation shall carry 40% and 60% weightage respectively.

Project Work:

i) The major project work shall be carried out during the IV year 2nd semester.
ii) The project evaluation and semester end Viva–Voce examination for 140 marks shall be awarded by the committee consisting of an external examiner, head of the department and the supervisor of the project based on the report submitted and performance in Viva-Voce examination.

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

Mandatory Non-Credit Courses:

i) For courses like Environmental Studies and Constitution of India, semester end examination shall be conducted by the respective departments internally for 70 marks.

ii) The pattern for examination is same as the regular theory courses.

iii) There is no semester end examination for courses, such as Sports & Games/ Cultural and NSS/Fine arts/Yoga/Self Defense.

Massive Open Online Courses (MOOCs):

i) Each student shall register for one Massive Open Online Course (MOOC) as per the course structure.

ii) A student shall register for MOOC offered by NPTEL, CISCO, MICROSOFT and SAYLOR or any other agency with a prior approval from the departmental committee.

iii) The duration of the course shall be a minimum of 12 weeks.

iv) The Head of the Department shall appoint one mentor for each course.

v) The courses should be other than those offered under regular curriculum and are to be approved by the departmental committee consisting of the head of the department, mentor and one/two senior faculty members before the commencement of each semester.

vi) During the course, the mentor monitors the students' assignment submissions given by the agency.

vii) Students need to submit all the assignments given and need to take final exam at the proctor centre.

viii) The required credits shall be awarded on submission of certificate from the approved agency.

ix) In case if student does not qualify in the chosen subject, the same or an alternative equivalent subject may be registered again in the next semester with the recommendation of the HoD concerned and shall pass.

8. Criteria for Passing a Course, Award of Grades and Award of Division:

i) Criteria for Passing a Course:

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

b) A candidate shall be declared to have passed in skill development courses/ industrial internship/socially relevant project if he/she secures a minimum of 40% marks in the semester end examination.

c) For non-credit mandatory courses, like environmental studies and constitution of India, the student has to secure minimum 40% aggregate marks (continuous internal evaluation & semester end examination marks put together) for passing the course. For courses like Sports & Games/Cultural and NSS/Fine arts/ Yoga/Self Defense, student shall be declared to have passed in the courses if he/she secures a minimum 40% of marks in continuous internal evaluation. No marks or letter grade shall be printed in the grade cards for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified. A student has to repeat the course whenever it is offered; if he does not get satisfactory grade or does not fulfill the attendance requirements in each non-credit course for getting the degree awarded.

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

ii) Method of Awarding Letter Grade and Grade Points for a Course:

a) A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range A+ to E as given below.

b) Letter grade 'F' in any course implies failure of the student in that course and no credits earned. Absent is also treated as no credits earned.

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

Marks Range Theory (Max - 100)	Marks Range Lab (Max. - 50)	Level	Letter Grade	Grade Points
≥ 90	≥ 45	Outstanding	A+	10
≥ 80 & ≤ 89	≥ 40 & 44	Excellent	A	9
≥ 70 & 79	≥ 35 & 39	Very Good	B	8
≥ 60 & 69	≥ 30 & 34	Good	C	7
≥ 50 & 59	≥ 25 & 29	Above Average	D	6
≥ 40 & 49	≥ 20 & 24	Average	E	5
< 40	< 20	Fail	F	0
		Absent	AB	0

iii) 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 = 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.

Illustration of SGPA: Let us assume there are 6 subjects in a semester. The grades obtained as follows:

Course	Credits (CR)	Grade Point (GP)	CR x GP
Subject 1	3	8	24
Subject 2	2	9	18
Subject 3	4	7	28
Subject 4	3	6	18
Subject 5	3	9	27
	∑CR=15		**∑CR x GP = 115**

$$SGPA = \frac{\sum CRxGP}{\sum CR} = \frac{115}{15} = 7.67$$

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

The CGPA is calculated as given below:

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

where CR = Credits of a course
GP = Grade points awarded for a course

Illustration of CGPA:

Semester1	Semester2	Semester3	Semester4	Semester5	Semester6	Semester7	Semester8
Credits:15	Credits:22	Credits:24	Credits:22	Credits:23	Credits:21	Credits:20	Credits:20
SGPA:7.67	SGPA:7.86	SGPA:7.87	SGPA:8.67	SGPA:8.78	SGPA:8.50	SGPA:8.60	SGPA:9.00

$$CGPA = \frac{(15x7.67) + (22x7.86) + (24x7.87) + (22x8.67) + (23x8.78) + (21x8.50) + (20x8.60) + (20x9.00)}{(15 + 22 + 24 + 22 + 23 + 21 + 20 + 20)} = 8.38$$

v) 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:

Class of Award	CGPA to be Secured	Remarks
First Class with Distinction	≥ 7.75 (Without any Supplementary Appearance)	From the CGPA secured from 160 Credits
First Class	≥ 6.75	
Second Class	≥ 5.75 & < 6.75	
Pass Class	≥ 5.00 & < 5.75	

9. Grade Card and Consolidated Grade Card

i) A grade card shall be issued for each semester separately both for regular and supplementary examinations irrespective of passing the examination.

ii) A grade card consists of a letter grade and credits earned for all courses of that semester along with SGPA and CGPA.

iii) A consolidated grade card consisting of all semesters' courses with the letter grade and credits secured for each course, CGPA and award of division shall be issued if he/she fulfills the academic regulations B.Tech. program.

10. Supplementary Examinations

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

11. 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 6.

ii) The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in Regulation 6 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 40% 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 40% 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 40% 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.

12. Revaluation

i) Students can apply for revaluation of his/her 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.

vi) There is no revaluation for practical/ Mini Project/ Skill Development Courses/ Social relevant Project/ Main Project courses.

13. Re-admission Criteria

i) A candidate, who is detained in a semester due to the 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 11 by paying the required tuition fee & special fee in addition to paying an administrative fee of Rs.1000/-

14. 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 fee and special fees should be paid by the candidate to condone his break in study.

15. Transitory Regulations

When a student is detained due to lack of credits or shortage of attendance, he/she may be readmitted into the same semester in which he/she has been detained. However, the academic regulations under which the detained student was first admitted shall continue to be applicable to him/her.

Transfer candidates (from an Autonomous College affiliated to JNTUK)

A student who has secured the required credits up to 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 shall be equal to 160 for regular students and 120 for lateral entry students.

16. 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 such student will be withheld. His degree will also be withheld in such cases.

17. Malpractices and Punishments

i) Every student appearing for the Examinations is liable to be charged with committing malpractice(s), if he/she is observed as committing any one or more of the acts mentioned in of examination malpractices and punishments.

ii) 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.

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

DISCIPLINARY ACTION FOR MALPRACTICES/IMPROPER CONDUCT IN EXAMINATIONS

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

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

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

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

iv) Malpractices identified at spot centre during valuation

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.

18. 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.

18. 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.

Honors Degree Guidelines

I. Introduction

The goal of introducing B.Tech. (Honors) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research. All the students pursuing regular B.Tech. with prerequisite CGPA are eligible to register Honors degree course. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the B.Tech. Honors degree. The additional courses shall be advanced subjects in the concerned department/discipline. The department concerned will determine required courses for award of Honor degree. The subjects in the Honor degree would be a combination of core (theory and lab) and some electives.

II. Objectives

The objectives of initiating the B.Tech. (Honors) degree certification are:

a) To encourage the under graduates towards higher studies and research
b) To prepare the students to specialize in core Engineering streams
c) To attain the high-level competence in the specialized area of under graduate programme
d) To learn the best educational and professional skills in the specialized area after the completion of his under graduate courses.
e) To provide the opportunity to learn the post graduate level courses in the specified under graduate programme

III. Eligibility

a) The following departments are offering B.Tech. (Honors);
   - Civil Engineering
   - Electrical and Electronics Engineering
   - Mechanical Engineering
   - Electronics and Communication Engineering
   - Computer Science and Engineering

b) B. Tech students (both Regular and Lateral Entry) pursuing a major degree programme can register for Honors degree at their choice in the same department offering major degree from IV semester onwards.

c) Students registering for Honors degree shall select the subjects from same branches/department based on the recommendations of BoS committee. For example, if a student pursuing major degree in Electrical and Electronics Engg. shall the selects subjects in Electrical and Electronics Engg. only and he/she will get major and Honors degree in Electrical and Electronics Engineering.

d) Students registered for honors shall not be permitted to register for B. Tech (Minor).

e) Students who have a CGPA of 8.00 or above, without any backlogs, up to III semester for regular students and only III semester for lateral entry students will be permitted to register for honors degree.

f) CGPA of more than 8.00 has to be maintained in the subsequent semesters of regular degree and also 8.00 GPA has to be maintain in Honors degree to keep the Honor degree registration active.

g) Student registered for Honors degree in a discipline must register and pass in all subjects with a minimum CGPA of 8.0 that constitute requirement for award of Honors degree.

h) The subjects completed under Honors degree programme shall not be considered as equivalent subjects in case the student fails to complete the major degree programme.

IV. Registering for Honor degree

a) Total number of seats offered for a Honors programme shall be a maximum of 35% of sanctioned intake of major degree programme.

b) There is no fee for registration of subjects for Honors degree programme

c) The department offering the honors degree will declare courses offered before the start of the semester.

d) The eligible list of students shall be displayed in the respective department notice board before the start of the semester.

e) The eligible interested students shall submit a registration form to the HoD of concerned department and the department shall maintain the record of students pursing the Honors degree. The process of registration should be completed within one week before the start of every semester.

f) If the student wishes to withdraw, he/she shall inform the same to HoD of concerned department within two weeks after registration of the Honors degree.

V. Attendance Requirements

a) The overall attendance in each semester of regular B. Tech courses and Honors courses shall be computed separately.

b) A student shall maintain an overall attendance of 75% in all registered courses of Honors to be eligible for attending semester end examinations. However, condonation for shortage of attendance up to 10% may be given as per college norms. On the recommendations of College Academic Committee, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee of Rs. 500/-.

c) Student having less than 65% attendance in Honors courses shall not be permitted for end semester examinations.

d) A student detained due to lack of attendance in major B. Tech programme shall not be permitted to continue Honors programme.

e) If a student is detained due to lack of attendance in Honors degree courses, he/she shall not be permitted to continue Honors programme.

VI. Credits requirement

a) Honors degree shall not be awarded at any circumstances without completing the regular major B.Tech. programme in which a student got admitted.

b) A Student will be eligible to get Honors degree along with major degree engineering, if he/she gets an additional 20 credits offered through Honors degree courses.

c) Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses of Honors degree, with four courses(both theory and lab), each carrying 4 credits. The remaining 4 credits must be acquired with two courses through online from platforms like NPTEL, etc., which shall be domain specific, each with 2 credits and with a minimum duration of 12 weeks as recommended by the Board of Studies.

d) Students shall produce a certificate issued by the online platforms like NPTEL, etc. as a proof of credit attainment.

e) Transfer of credits from a particular Honors to regular B.Tech. and Vice-Versa shall not be permitted.

f) If a student fails in any registered course of the Honors degree, he/she shall not be eligible to continue the B.Tech. Honors degree. However, the additional credits and grades thus far earned by the student shall be included in the separate grade card but shall not be considered to calculate the CGPA.

VII. Examinations

a) The examination for the Honors courses offered shall be conducted along with regular B.Tech. programme.

b) The pattern of internal and semester end examinations for Honors degree courses will be similar to regular B.Tech. courses.

c) A separate grade card shall be issued for the Honors subjects passed in each semester.

d) There is no supplementary examination for the failed subjects in a Honors programme.

e) Examination Fee to be paid will be as per the college norms.

Note: ***In the event of any tie during the seat allotment for a Honors degree, the concerned major degree department offering Honors shall conduct a test on the prerequisite subjects of Honors degree and final decision shall be taken.***

Minor Degree Guidelines

I. Introduction

Looking to global scenario, engineering students should have knowledge of subjects from other branches and some advanced subjects of their respective branch in which they are perusing the degree. To complement the same college has decided to take an initiative from 2020-21 in academics by introducing minor degree to the undergraduate students enrolled in the B.Tech. This gives a provision to the students to pursue minor other than the discipline in which student got admitted. An aspiring student can choose the courses and laboratories in any other discipline and can get a minor degree in the chosen specialization in addition to regular major B.Tech. degree. This way undergraduates are not restricted to learn about courses only in the discipline they get admitted to, but can choose courses of their interest to later on take up a career path of their liking. The students taking up a minor degree course will get additional credits. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the minor degree. The department concerned will determine the required courses for award of minor degree. The subjects in minor programme would be a combination of mostly core and some electives.

II. Objectives

The objectives of initiating the minor degree certification are:

a) To diversify the knowledge of the undergraduates.
b) To make the undergraduates more employable.
c) To have more educational and professional skills after the completion of his undergraduate courses.
d) To give a scope to specialize students in other streams of engineering in addition to the ones they are currently pursuing.

III. Eligibility

a) The following departments are offering B.Tech. (Minor);
   - Civil Engineering
   - Electrical and Electronics Engineering
   - Mechanical Engineering
   - Electronics and Communication Engineering
   - Computer Science and Engineering
   - Information Technology

b) The B.Tech. students (both Regular and Lateral Entry) pursuing a major degree programme can register for minor degree at their choice in any other department offering minor from IV semester onwards.

c) Student pursuing major degree in any engineering branch is eligible to register for minor in any other engineering branch. For example, if a student pursuing major degree in Electrical and Electronics Engineering shall complete minor in Civil Engineering and he/she will get major degree of Electrical and Electronics Engineering with minor of Civil Engineering.

d) However, students pursuing major degree in a particular engineering branch are not allowed to register for minor in the same branch.

e) The students are permitted to opt for only a single minor degree in his/her entire tenure of B.Tech. programme.

f) The students registered for minor degree shall not be permitted to register for B.Tech. (Honors.)

g) Students who have a CGPA of 7.75 or above, without any backlogs, up to III semester for regular students and only III semester for lateral entry students will be permitted to register for a minor.

h) CGPA of more than 7.75 has to be maintained in the subsequent semesters of regular degree and also 7.75 GPA has to be maintain in Minor degree to keep the Minor degree registration active.

i) A student registered for minor in a discipline must register and pass in all subjects with a minimum CGPA of 7.75 that constitute requirement for award of minor.

j) The subjects completed under minor degree shall not be considered as equivalent subjects in case the student fails to complete the major degree programme.

IV. Registering for Minor Degree

a) Total number of seats offered for a minor degree programme shall be a maximum of 35% of sanctioned intake of major degree programme.

b) There is no fee for registration of subjects for minor degree programme

c) The department offering the minor will declare courses offered before the start of the semester.

d) The eligible list of students shall be displayed in the respective department notice board before the start of the semester.

e) The eligible interested students shall apply to the HoD offering the minor degree through HoD of his/her parent department and after scrutiny the department offering minor will announce the final list of the selected students for the minor degree.

f) The selected students shall submit a registration form to the HoD offering the minor degree through HoD of his/her parent department. The process of registration should be completed within one week before the start of every semester.

g) Both parent department and department offering minor shall maintain the record of students pursing the minor degree.

h) If the student wishes to withdraw, he/she shall inform the same to HoD of department offering minor degree through HoD of parent department within two weeks after registration of the minor degree.

V. Attendance Requirement

a) The overall attendance in each semester of regular B.Tech. courses and minor courses shall be computed separately.

b) A student shall maintain an overall attendance of 75% in all registered courses of minor degree to be eligible for attending semester end examinations. However, condonation for shortage of attendance up to 10% may be given as per college norms. On the recommendations of College Academic Committee, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee of Rs. 500/-.

c) Student having less than 65% attendance in minor courses shall not be permitted for end semester examinations.

d) A student detained due to lack of attendance in major B.Tech. programme shall not be permitted to continue minor degree programme

e) If a student is detained due to lack of attendance in minor degree courses, he/she shall not be permitted to continue minor programme

VI. Credits requirement

a) Minor degree shall not be awarded at any circumstances without completing the regular major B.Tech programme in which a student got admitted.

b) A Student will be eligible to get minor degree along with major degree engineering, if he/she gets an additional 20 credits offered through minor degree courses.

c) Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses of minor degree, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired with two courses through online platforms like NPTEL, etc., which shall be domain specific, each with 2 credits and with a minimum duration of 12 weeks as recommended by the Board of Studies.

d) Students shall produce a certificate issued by the online platforms like NPTEL, etc. as a proof of credit attainment.

e) Transfer of credits from a minor to regular B.Tech and Vice-Versa shall not be permitted.

f) If a student fails in any registered course of the minor degree, he/she shall not be eligible to continue the B.Tech. minor degree. However, the additional credits and grades thus far earned by the student shall be included in the separate grade card but shall not be considered to calculate the CGPA.

VII. Examinations

a) The examination for the minor courses offered shall be conducted along with regular B.Tech. programme.

b) The pattern of internal and semester end examinations for minor degree courses will be similar to regular B.Tech. courses.

c) A separate grade card shall be issued for the minor degree subjects passed in each semester.

d) There is no supplementary examination for the failed subjects in a minor degree programme.

e) Examination Fee to be paid will be as per the College norms.

Note: ***In the event of any tie during the seat allotment for a Minor degree, the concerned department offering Minor degree shall conduct a test on the prerequisite subjects of Minor degree and final decision shall be taken.***

COURSE STRUCTURE

&

SYLLABUS

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	EG3501	Functional English	3	-	-	3
2	MA3501	Linear Algebra and Calculus	3	1	-	4
3	PH3501	Engineering Physics	3	-	-	3
4	CT3501	Problem Solving Using C *	3	-	2	4
5	ME3503	Engineering Graphics *	2	-	4	4
6	EG3502	Functional English Lab	-	-	2	1
7	PH3503	Engineering Physics Lab	-	-	2	1
		Total	**14**	**1**	**10**	**20**
8	EN3501	Environmental Studies (Mandatory Non-Credit Course)	2	-	-	-

* **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	EG3503	Professional Communication	2	-	-	2
2	MA3505	Integral Transforms and Vector Calculus	3	1	-	4
3	CH3501	Engineering Chemistry	3	-	-	3
4	CE3501	Applied Mechanics	3	1	-	4
5	UH3501	Universal Human Values 2: Understanding Harmony	2	1	-	3
6	EG3504	Professional Communication Lab	-	-	4	2
7	CH3502	Engineering Chemistry Lab	-	-	2	1
8	CE3502	Applied Mechanics Lab & Building Trade Practice	-	-	2	1
		Total	**13**	**3**	**8**	**20**
9	BA3501	Constitution of India (Mandatory Non-Credit Course)	2	-	-	-

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	CE3503	Building Materials and Building Construction	2	-	-	2
2	ME3507	Elements of Mechanical and Electrical Engineering	2	1	-	3
3	CE3504	Mechanics of Solids	3	1	-	4
4	CE3505	Fluid Mechanics	2	1	-	3
5	CE3506	Surveying	2	1	-	3
6	CE3507	Engineering Geology & Geo-Spatial Applications *	2	-	2	3
7	CE3508	Mechanics of Solids Lab	-	-	2	1
8	CE3509	Survey Field Work	-	-	2	1
9	SD3501	Logic Building and Basic Coding Principles	-	-	2	1
		Total	**13**	**4**	**8**	**21**
10	SG3501	Sports and Games / Cultural (Mandatory Non-Credit Course)	-	-	2	-

* **Integrated Course with Theory and Laboratory**

II Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	MA3513	Numerical & Statistical Methods	2	1	-	3
2	CE3510	Structural Analysis	3	1	-	4
3	CE3511	Hydraulics & Hydraulic Machines	2	1	-	3
4	CE3512	Concrete Technology	3	-	-	3
5	CT3508	Python Programming *	2	-	2	3
6		**Open Elective - I**	3	-	-	3
7	CE3515	Fluid Mechanics & Hydraulic Machines Lab	-	-	2	1
8	CE3516	Concrete Technology Lab	-	-	2	1
9	SD3503	Programming for Corporate	-	-	2	1
		Total	**15**	**3**	**8**	**22**
10	NS3501	NSS / Fine Arts / Yoga / Self Defense (Mandatory Non-Credit Course)	-	-	2	-

* **Integrated Course with Theory and Laboratory**

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

III Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	CE3517	Theory of Structures	3	1	-	4
2	CE3518	Soil Mechanics	2	1	-	3
3	CE3519	Water & Waste Water Engineering	3	-	-	3
4		**Professional Elective - I**	3	-	-	3
5		**Open Elective - II**	3	-	-	3
6	CE3526	Geotechnical Engineering Lab	-	-	2	1
7	CE3527	Water Waste Water Engineering Lab	-	-	2	1
8	CE3528	Building Drafting Studio Lab	1	-	2	2
9	SD3504	Problems Solving Enhancement	-	-	2	1
10	CE3529	Community Service Project	-	-	8	4
		Total	**15**	**2**	**16**	**25**

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	CE3530	Foundation Engineering	3	-	-	3
2	CE3531	Hydrology & Irrigation Engineering	3	-	-	3
3	CE3532	Design and Drawing of R.C. Structural Elements**	2	-	2	3
4	CE3533	Highway Engineering	3	-	-	3
5		**Professional Elective - II**	3	-	-	3
6		**Open Elective - III**	3	-	-	3
7	CE3540	Highway Materials Lab	-	-	2	1
8	CE3541	Structural Engineering Lab	-	-	2	1
9	SD3506	Linguistic Competency Building	-	-	2	1
		Total	**17**	**-**	**8**	**21**

** **Project base Theory Course**

L : Lecture T : Tutorial P : Practical

IV Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	BA3504	Engineering Economics and Financial Analysis	2	-	-	2
2	CE3542	Estimation, Costing & Valuation	2	-	2	3
3	CE3543	Design & Drawing of Steel Structures	2	-	2	3
4		**Professional Elective - III**	3	-	-	3
5		**Professional Elective - IV**	3	-	-	3
6		**Professional Elective - V**	3	-	-	3
7	CE3556	Computer Applications in Civil Engineering Lab	-	-	2	1
8	CE3557	Internship/ Industrial Training/ Practical Training	-	-	6	3
8	CE3558	MOOCs	-	-	-	2
		Total	**15**	**-**	**12**	**23**

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	CE3559	Major Project Work	-	-	16	8
		Total	**-**	**-**	**16**	**8**

Open Elective - I

Sl. No.	Course Code	Name of the Course / Laboratory	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE3513	Elements of Civil Engineering (other than CE)	CE	3	-	-	3
2	CE3514	Environment Laws and Policies (other than CE)	CE	3	-	-	3
3	EE3513	Electrical Materials (other than EEE)	EEE	3	-	-	3
4	EE3514	Control Systems Engineering(other than EEE&ECE)	EEE	3	-	-	3
5	ME3517	Automotive Engineering (other than ME)	ME	3	-	-	3
6	ME3518	Elements of Mechanical Transmission (other than ME)	ME	3	-	-	3
7	EC3520	Introduction to Embedded Systems (other than ECE/IoT)	ECE	3	-	-	3
8	EC3521	Fundamentals of Communication Systems (other than ECE/IoT)	ECE	3	-	-	3
9	CS3503	Information Retreival Systems (Other than CSE & AI&DS)	CSE	3	-	-	3
10	CT3522	Computer Graphics (Other than CSE, IT & AI&DS)	CSE	3	-	-	3
11	IT3504	System Software (Other than IT)	IT	3	-	-	3
12	IT3505	Free & Open Source Software (Other than IT)	IT	3	-	-	3
13	MA3516	Fuzzy Mathematics	BS&H	3	-	-	3

Open Elective - II

Sl. No.	Course Code	Name of the Course / Laboratory	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE3524	Remote Sensing & GIS (other than CE)	CE	3	-	-	3
2	CE3525	Green Building Technology (other than CE)	CE	3	-	-	3
3	EE3524	Modeling & Simulation of Engineering Systems (other than EEE)	EEE	3	-	-	3
4	EE3525	Power Systems Engineering (other than EEE)	EEE	3	-	-	3
5	ME3528	Renewable Energy Sources (other than ME)	ME	3	-	-	3
6	ME3529	Venture Development (other than ME)	ME	3	-	-	3
7	EC3535	Automotive Electronics (other than ECE & IoT)	ECE	3	-	-	3
8	EC3536	Introduction to Signal Processing (other than ECE&IoT)	ECE	3	-	-	3
9	CS3504	Network Programming (Other than CSE)	CSE	3	-	-	3
10	CT3529	Social Network Analysis(Other than CSE/CSE(AI&ML))	CSE	3	-	-	3
11	CT3530	Cyber Security (Other than IT)	IT	3	-	-	3
12	IT3508	E-Commerce (Other than IT)	IT	3	-	-	3
13	AD3502	Intelligent Systems (Other than AI&DS)	AI&DS	3	-	-	3
14	CT3531	Recommender Systems(Other than CSE, IT, CSE(AI&ML) & AI&DS)	AI&DS	3	-	-	3
15	IN3514	Introduction to IoT Architecture (Other than IoT)	IoT	3	-	-	3
16	IN3515	Introduction to Smart Sensors (Other than IoT)	IoT	3	-	-	3

Open Elective - III

Sl. No.	Course Code	Name of the Course / Laboratory	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE3538	Basics of Environmental Engineering (other than CE)	CE	3	-	-	3
2	CE3539	Disaster Preparedness, Planning & Management (other than CE)	CE	3	-	-	3
3	EE3535	Principles of Special Electric Machines (other than EEE)	EEE	3	-	-	3
4	EE3536	Electrical Instrumentation (other than EEE)	EEE	3	-	-	3
5	ME3541	Green Engineering (other than ME)	ME	3	-	-	3
6	ME3542	3D Printing Technologies (other than ME)	ME	3	-	-	3
7	EC3548	Assistive Technologies(other than ECE)	ECE	3	-	-	3
8	EC3549	Introduction to Bio-Medical Engineering (other than ECE&IoT)	ECE	3	-	-	3
9	CS3511	DevOps (Other than CSE and IT)	CSE	3	-	-	3
10	CS3512	Object Oriented Analysis & Design (Other than CSE)	CSE	3	-	-	3
11	IT3515	Scripting Languages (Other than IT)	IT	3	-	-	3
12	IT3516	Fundamentals of Software Project Management(Other than CSE&IT)	IT	3	-	-	3
13	AD3505	Web Mining (Other than AI&DS)	AI&DS	3	-	-	3
14	AD3506	AI Chatbots (Other than AI&DS and CSE (AI&ML))	AI&DS	3	-	-	3
15	IN3521	Trends in IoT (Other than IoT)	IoT	3	-	-	3
16	EG3505	Academic Communication	ENG	3	-	-	3

Professional Electives

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1		**Professional Elective - I**	3	-	-	3
	CE3520	i) Advanced Concrete Technology				
	CE3521	ii) Project Planning & Control				
	CE3522	iii) Air Pollution and Control				
	CE3523	iv) Advanced Surveying Techniques				
2		**Professional Elective - II**	3	-	-	3
	CE3534	i) Finite Element Analysis				
	CE3535	ii) Ground Improvement Techniques				
	CE3536	iii) Watershed Management				
	CE3537	iv) Solid Waste Management				
3		**Professional Elective - III**	3	-	-	3
	CE3544	i) Prestressed Concrete Structures				
	CE3545	ii) Advanced Foundation Engineering				
	CE3546	iii) Hydraulic Structures				
	CE3547	iv) Industrial Wastewater Treatment				
4		**Professional Elective - IV**	3	-	-	3
	CE3548	i) Advanced Design of R.C. Structures				
	CE3549	ii) Construction Technology and Practices				
	CE3550	iii) Earthquake Resistant Design				
	CE3551	iv) Railways, Harbours & Airport Engineering				
5		**Professional Elective - V**	3	-	-	3
	CE3552	i) Repairs, Retrofitting and Rehabilitation of Structures				
	CE3553	ii) Precast Concrete Structures				
	CE3554	iii) Earth Retaining Structures				
	CE3555	iv) Design & Drawing of Irrigation Structures				

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

HONORS DEGREE COURSE STRUCTURE

Earthquake Engineering

Sl. No.	Code	Year & Sem.	Name of the Course	No.of Periods per week			No.of Credits
				L	T	P	
1	HCE3501	II - II	Introduction to Earthquake Engineering	4	-	-	4
2	HCE3502	III - I	Theory of Elasticity and Plasticity	3	-	2	4
3	HCE3503	III - II	Structural Dynamics *	4	-	-	4
4	HCE3504	III - II	MOOCs	-	-	-	2
5	HCE3505	IV - I	Seismic Resistant Design of Structures**	4	-	-	4
6	HCE3506	IV - I	MOOCs	-	-	-	2
			Total	**15**	**-**	**2**	**20**

* Integrated Course with Theory and Laboratory

** Project Base Theory Course

SYLLABUS

FUNCTIONAL ENGLISH
(Common to All Branches)

I Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

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.

Course Outcomes

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

- speak with a reasonable degree of fluency using communication strategies (i.e. using language appropriately to carry out functions such as greeting, requesting information, seeking confirmation, disagreeing) as well conventions of politeness and courtesy
- speak with a reasonable degree of fluency and accuracy in contexts requiring tasks such as narrating and describing
- listen to short audio and video clips
  - in standard Indian accent with understanding of the types listed in D (1) (a) below; and
  - in native English accent (British and American), especially clips in which the speakers or voice actors speak slowly, and gain both understanding of messages and sensitivity to native-speaker accents

- read fluently comprehending texts of different kinds using multiple strategies to understand explicitly-stated information as well as underlying meanings
- write coherent paragraphs with attention to elements of writing such as content, organization, language, style, and mechanics and the conventions of academic writing
- write survey reports with attention to conventions of report writing
- guard against mistakes Indians typically make in their speech and writing in English

Course Content

UNIT – I:

Listening : Listening Comprehension – Task 1 (IWE - Chapt II)

Speaking : Communication Functions – Conversation between Raghu and Sridhar (IWE - Chapt II)

Reading : Reading Comprehension – Task 1 (DPM)

Vocabulary: (a) GRE Words – 1.1, (b) Collocations – 2.1 (VB)

Grammar : Tenses – Simple Present and Present Continuous (IWE - Chapt II)

Writing : Paragraph-Writing (IWE - Chapt II)

UNIT – II:

Listening : Listening comprehension – Task 2 (WR)

Speaking : Communication Functions – Exercise (DPM)

Reading : Reading Comprehension – Task 2 (DPM)

Vocabulary : (a) Words Often Confused–3.1, (b) One-Word Substitutes–4.1 (VB)

Grammar : (a) Indianism and (b) *Have to* (IWE - Chapt II)

Writing : Paragraph-Writing (IWE - Chapt II)

UNIT – III:

Listening : Listening Comprehension – Task 3 (IWE - Chapt III)

Speaking : Communication Functions – Conversation between Shreya and Kalpana (IWE - Chapt III)

Intensive Reading : Reading Comprehension Task – 3 (DPM)

Extensive Reading : *The Adventures of Huckleberry Finn* by Mark Twain

Vocabulary: (a)Idioms – 5.1, (b) Phrasal Verbs – 6.1 (VB)

Grammar : Tenses – Simple Past and Present Perfect (IWE - Chapt III)

Writing : Paragraph-Writing – Coherence (IWE - Chapt III)

UNIT – IV:

Listening : Listening Comprehension – Task 4 (IWE - Chapt IV)

Speaking : Communication Functions – Conversation between professor and Mayur (IWE - Chapt IV)

Reading : Reading Comprehension – Task 4 (DPM)

Vocabulary: (a) GRE words–1.2, (b) Collocations–2.2, (c) Words Often Confused–3.2(VB)
Grammar : Expressing Futurity (IWE - Chapt IV)
Writing : Clutter-Free Writing (IWE - Chapt IV)

UNIT – V:
Listening : Listening comprehension – Task 5 (WR)
Speaking : (a) Communication Functions and (b) Telephone Etiquette – Exercises (IWE - Chapt IV)
Intensive Reading : Reading Comprehension – Task 5 (DPM)
Extensive Reading : *More Tales from Shakespeare* by Charles and Mary Lamb
Vocabulary: (a) One-Word Substitutes – 4.2, (b) Idioms – 5.2, (c) Phrasal verbs – 6.2 (VB)
Grammar : Structure – *Going to* (IWE - Chapt IV)
Writing : Technical Report Writing (DPM)

- IWE – *Innovate with English* by T Samson (Foundation)
- Chapt – Chapter
- DPM – Department-produced materials (handouts)
- WR – Web-resources
- VB – *Vocabulary Builder for Students of Engineering and Technology* by Vijaya Lakshmi et al (Maruthi)

Text books

1. T. Samson, Innovate with English, First Edn., Cambridge University Press India Pvt. Ltd. under the imprint of Foundation Books, Hyderabad, 2010.
   - Units TWO, THREE and FOUR only
2. M. Vijaya Lakshmi, et al., Vocabulary Builder for Students of Engineering and Technology, Second Edn., Maruthi Publications, Hyderabad, 2017.
3. 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
4. Audio and video clips carefully selected by the Department in order to sensitize the students to native-speaker accents
5. Department-produced material on survey 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) Eight comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, etc. are to be set. Four of the eight questions will be

multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 8 x ½ = 4**

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 4 = 4**

II. Twelve 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: 12 x ½ = 6**

III.

a) Correction of grammatical errors: Eight 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: 8 x ½ = 4**

b) Eight objective-type questions based on one retold classic: *The Adventures of Huckleberry Finn*. **Marks: 8 x ½ = 4**

IV.

a) Completing a conversation (in which informational and interactional functions are performed) with appropriate expressions. **Marks: 8 x ½ = 4**

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: 4 x ½ = 2**

ii. Re-writing paragraph (b), which is poorly organized, into a coherent paragraph choosing appropriate sequence signals or connectives. **Marks: 4 x ½ = 2**

Second Mid-Term Examination

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

I.a) Eight contextualized questions on 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: 8 x ½ = 4**

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: 4 x ½ = 2**

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: 4 x ½ = 2**

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

a) Eight comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, etc. are to be set. Four of the Eight questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 8 x ½ = 4**

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 4 = 4**

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: 1 x 4 = 4

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: 1 x 4 = 4**

IV.

a) Correction of grammatical errors: six sentences with grammatical errors of the following types (dealt with in Unit 4 of *Innovate with English*) will be given: futurity and Indianism. **Marks: 6 x ½ = 3**

b) Six objective-type questions based on one retold classic: *More Tales from Shakespeare.* **Marks: 6 x ½ = 3**

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. Seven 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 seven questions should be multiple-choice questions.
- In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 7 x 1 = 7**

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 an incomplete conversation that takes place in an academic or social or professional context (where informational and interactional functions are performed) and answering the following questions on it:

a. Completing the conversation with appropriate expressions. The expressions are to be chosen from among the ones given in a box. In the answer book, the examinee is expected to number the blanks as 1, 2, 3, etc., and write against each the expression he/she has chosen. **Marks: 7 x 1 = 7**

b. Writing a dialogue extending the scope of the original conversation following the instructions given in the question on how it should be extended. The instructions must include five communication strategies/functions, and the examinee is expected to use them in his/her dialogue. **Marks: 1 x 7 = 7**

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

a. identifying the reasons for the failure or breakdown of communication in the conversation **Marks: 1 x 7 = 7**

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 7 = 7**

b. Re-writing paragraph (b), which is poorly organized, into a cohesive paragraph choosing appropriate sequence signals. **Marks: 1 x 7 = 7**

V.

a. Writing a paragraph of 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: 1 x 7 = 7**

b. Writing a survey report using the data on the table(s)/graph(s) given. The report must:

- indicate acquaintance with the conventions of academic writing; and
- the ability to interpret data intelligently.

However, high standards of performance need not be expected as the students are in the first year of their course. It also follows that complex tables/graphs should be avoided. **Marks: 1 x 7 = 7**

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: 14 x 1 = 14**

VII. Correction of grammatical errors:

- Either a conversation with fourteen grammatical errors of the types dealt within the Textbook 1 (*Innovate with English*), or isolated sentences with fourteen grammatical errors will be given.
- The errors will include at least seven 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: 14 x 1 = 14**

* * *

LINEAR ALGEBRA AND CALCULUS
(Common to CE, EEE, ME, ECE, IoT, CSE & IT)
I Year – I Semester

Lecture : 3	Tutorial : 1	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- To understand the procedure to solve the system of linear equations.
- To know the method for finding eigenvalues and eigenvectors.
- To familiar with the knowledge of differential calculus to support their concurrent and subsequent engineering studies.
- To know how to find maxima and/or minima for a given surface.
- To understand the methods to evaluate areas and volumes using integrals.

Course Outcomes

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

- solve the system of linear equations in various engineering problems.
- evaluate the eigenvalues and eigenvectors.
- solve linear ordinary differential equations .
- apply the techniques of partial differentiation in optimization problems and solve first order partial differential equations.
- compute areas and volumes using double and triple integrals.

Course Content

UNIT– I: System of Linear Equations

Rank of a matrix – Echelon form, Normal form. System of linear equations – consistency and inconsistency - Gauss-elimination method.

UNIT– II: Eigenvalues and Eigenvectors

Finding eigenvalues and eigenvectors for a given matrix, Properties of Eigenvalues and Eigenvectors, Cayley –Hamilton theorem - finding inverse and powers of a matrix. Singular value decomposition.

UNIT– III: Ordinary Differential Equations

Review on first order ordinary differential equations. Application – Newton's Law of cooling. Solving Second and Higher Order Differential Equations : Homogeneous differential equations and Non-Homogeneous differential equations when RHS terms are of the form e^{ax}, sin ax, cos ax, polynomial in x, $e^{ax}v(x)$ and method of variation of parameters.

Overview of Cauchy's and legendre's differential equations.

UNIT– IV: Partial Differentiation and Equations

Introduction - total derivative, chain rule. Jacobian, Applications - finding maxima and minima (two & three variables).

Solutions of first order linear P.D.E. Solving Non-Linear P.D.E by charpit's method.

UNIT– V: Multi Integrals

Evaluation of double and triple integrals. Areas by double integrals and Volumes by triple integrals. Change the Order of integration.

Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, Maitrey Printech Pvt. Ltd, Noida, 2014.
2. B.S.Grewal, Higher Engineering Mathematics, 44th edition, Khanna Publishers, New Delhi, 2020.

Reference Books

1. Schaum's Series, Differential Equations, Tata-Mc Graw Hill Company Limited.
2. Bali & Iyengar,Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd.

* * *

ENGINEERING PHYSICS

I Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To Impart the concept of periodic motion
- To apply principles of optics for engineering applications.
- To explore various NDT using ultrasonic's
- To characterize sound propagation in buildings

Course Outcomes

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

- derive expression for oscillations (SHM).
- analyze the wave nature of light
- explore LASERS for engineering situations.
- relate basic knowledge of Ultrasonic's in NDT.
- assess the main characteristics of acoustics of building

Course Content

UNIT – I: Simple Harmonic Oscillations

Characteristics of wave – Equation for Simple Harmonic Motion – Expression for total energy of Simple Harmonic Motion – Theoretical analysis (a) Free vibrations, (b) Damped vibrations, (c) Forced vibrations – Resonance.

UNIT – II: Physical Optics

Introduction - Interference in thin films – Newton's Rings. Fraunhofer Diffraction-single slit-Diffraction Grating-Polarization- Double refraction- Nicol's Prism-Wave Plates- Photo elasticity.

UNIT – III: LASER

Introduction – Basic characteristics – Spontaneous and stimulated emission – Einstein's coefficient and their relations – Pumping Schemes – Ruby laser – He-Ne Laser – Semiconductor Laser – Application of LASER.

UNIT – IV: Ultrasonic and Non-Destructive Testing

Introduction- Production and detection of ultra-sonic waves- Piezoelectric Method-Engineering applications - Basic principles of Non – Destructive Testing - Methods of NDT - Transducer – couplent and inspection standards- Inspection Methods – Pulse Echo Technique-Flaw detector- Different Types of scans- Applications.

UNIT – V: Acoustics

Acoustical design of an auditorium. Reverberation time and absorption coefficient of a hall – Sabine's formula –Factors affecting the Acoustics of Buildings and remedies.

Text Books

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

Reference Books

1. Robert Resnick, Jearl Walker, David Halliday, Principles of Physics, Wiley; 10th edition, 2015.
2. Ajoy Ghatak, Optics(5th Edition), Tata McGraw-Hill
3. B.B. Laud, Laser and Non-Linear Optics, New Age international publishers
4. J. Prasad, C. G. Krishnadas Nair, Non-Destructive Test and Evaluation of Materials, McGraw Hill Education; 2 edition.
5. Robert D. Finch, Introduction to Acoustics, Pearson Education India; First edition.

* * *

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

Lecture : 3	Practice : 2	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

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

Course Outcomes

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

- outline problem solving steps and solve sample problems.
- use control statements for writing the programs.
- apply the concepts of arrays, strings and pointers in problem solving.
- decompose a problem into functions to develop modular reusable code.
- use structures and files for efficient handling of data.

Course Content

UNIT – I: Problem Solving Steps and Introduction of C

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

Introduction of C: General form of a C program, variable declaration, C tokens, basic data types, type conversion, console i/o statements, expressions precedence and associativity, order of evaluation.

Problem Solving: Sample Problems such as evaluating expressions, to calculate area of geometrical shapes.

Programs :

1. 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.
2. Write a C Program to find the largest number and smallest among three numbers using ternary operator.

UNIT – II: Control Statements

Selection-Making Decisions – single-way, two-way selection, multi-way selection statements and conditional operator.

Iteration Statements – concept of loops, pre-test and post-test loops in C.

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

Problem Solving: Calculate the sum of first N numbers, check the given number is prime, and generate Fibonacci series.

Programs :

1. Design and develop a flowchart or an algorithm that takes three coefficients (a, b, and c) of a quadratic equation (ax2+bx+c=0) as input and computes all possible roots. An equation is quadratic only if a is non zero. If a is zero and b is non zero in the above equation then it becomes a linear equation (bx + c = 0).If a and b are zeros then the it becomes a constant equation. Implement a C program for the developed flowchart / algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages.
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. Write a C program to find the sum of n natural numbers and sum of squares of n natural numbers.
4. Read a number from the user input, print all the prime numbers up to that number and print their sum.
5. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print “Correct values”, otherwise print “Wrong values”

UNIT – III: Arrays and Strings

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

Strings – String Input /Output functions, string manipulation functions.

Problem Solving: Perform addition and multiplication of two matrices, C programs isomg string handling functions.

Programs:

1. Write a C programto search whether the given element is in the array or not.
2. Write a C programto perform addition and multiplication of two matrices.
3. Write a C program to find whether the given string is palindrome or not with and without string handling functions.

UNIT – IV: Pointers and Functions

Pointers – Declaration, Initialization and operations of Pointers.

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

Problem Solving: Programs on pointer arithmetic’s, Factorial and fibonacci calculation with recursion and without recursion.

Programs:

1. Write a C programto add two numbers using pointers.

2. Write a C programto find the factorial of a given integer using recursive function.
3 Write a C program to exchange (Swap) values of two integers using call by reference.

UNIT – V: Structures and Unions and File Handling

Structures and Unions: Definition, declaration, initialization, accessing members of structures and unions, nested structures, array of structures, array within structures, union within structure.

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

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

Programs :

1. Write a C Program using arrays of structures to read the Name, Date of Birth, Five subject marks of N students and display all the details of students along with calculated CGPA of each student.
2. Write a C program to append multiple lines at the end of a text file.
3. Write a C program to count the number of lines, words and characters in a file.

Text Books

1. Programming in C, Pradip Dey, Manas Ghosh, 2nd Edition, Oxford Higher Education.
2. Programming in C, Reema Thareja, 2nd Edition, Oxford Higher Education.

Reference Books

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, Cengage, 2020.
2. Programming in ANSI C, E Balaguruswamy, 7thedition, McGrawHill.
3. Let Us C, Yashvant Kanetkar, 17th Edition, BPB publications.

* * *

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

Lecture : 2	Practical : 4	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- To highlight the significance of universal language of engineers.
- To introduce the concepts of drawing 3-D objects in 2-D planes.
- To impart computer aided drafting skills.

Course Outcomes

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

- construct polygons and conic sections.
- draw projections of points, lines, planes and solids in different positions.
- draw orthographic and isometric views of different parts.
- create engineering drawing using drafting package.

Course Content

UNIT – I: Geometrical Constructions, Conics and Orthographic Projections

Geometrical Constructions: Bisecting a line and arc, division of a circle, construction of polygons

Conics: Construction of ellipse, parabola, hyperbola using general method

Orthographic Projections: Principles of orthographic projections, projections of points in various quadrants

Practice of basic drawing and editing commands using CAD Package.

UNIT – II: Projections of Straight Lines

Lines parallel to both planes, parallel to one and inclined to other plane, straight lines inclined to both planes, determination of true lengths and true angles , traces.

Drawing of projections of straight lines using CAD Package.

UNIT – III: Projections of Planes

Regular planes perpendicular / parallel to one reference plane and inclined to other reference plane, planes inclined to both the reference planes.

Drawing of projections of planes using CAD Package.

UNIT – IV: Projections of Solids

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

Drawing of projections of solids using CAD Package

UNIT – V: Isometric and Orthographic Views

Isometric drawing of plane figures, prisms, pyramids, cylinders and cones, Conversion of isometric views to orthographic views and vice versa.

Drawing of orthographic views and isometric views using CAD Package.

Text Books

1. N.D. Bhatt, Engineering Drawing, 53rd edition , Chariot Publications.
2. K.VenuGopal and V Prabhu Raja , Engineering Drawing with AutoCAD, 5th edition, New Age International Publishers.

Reference Books

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

* * *

FUNCTIONAL ENGLISH LAB
(Common to All Branches)

I Year – I Semester

Practical	: 2	Internal Marks	: 30
Credits	: 1	External Marks	: 70

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
- It seeks to develop in them 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.

Course Outcomes

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

- give short impromptu speeches with confidence and fluency.
- take part in conversations in different functional contexts using English following appropriate communication strategies.
- use conventions of politeness and courtesy in speech and enhance the effectiveness of their communication in English.
- articulate the sounds of English (vowels, consonants, and diphthongs) with accuracy.
- check the pronunciation of words in a dictionary using their knowledge of phonemic symbols.
- pause at appropriate places in their speech in English, enhancing thereby the comprehensibility of their communication.
- speak English with adequate attention to stress, rhythm, and intonation.
- speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English.
- read out texts of different kinds fluently with appropriate pauses, stress, and intonation.

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, et al., *Strengthen Your Communication Skills*, First Edn., Maruthi Publications, Hyderabad, 2014.
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**	**30 marks**
a.	Regular performance in the Language/Communications Lab	15 marks
b.	Completing the tasks in the lab manual	05 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.	05 marks
II.	**External**	**70 marks**
a.	Test of writing	
	Writing a dialogue on the situation set	10 marks
	Answering 'Yes/No' questions on pronunciation	05 marks
	Marking sentence stress and intonation	05 marks
	Writing English word for the word in phonetic transcription	05 marks
b.	Test of speaking	25 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	

* * *

ENGINEERING PHYSICS LAB

I Year – I Semester

Practical	: 2	Internal Marks	: 30
Credits	: 1	External Marks	: 70

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.

Course Outcomes

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

- use spectrometer, travelling microscope for making measurements.
- test optical components using principles of interference and diffraction of light
- determine the rigidity, coupling constant of vibrations.
- verify the width of narrow slits, spacing between close rulings using lasers and appreciate the accuracy in measurements.

List of Experiments

1. Determine the rigidity modulus of given wire-Torsional Pendulum.
2. Determine the coupling constant of Coupled oscillator.
3. Study of normal modes in string using Forced vibrations in rods-Melde's experiment.
4. Determination of lattice constant – lattice dimensions kit.
5. Determine the radius of curvature of plano convex lens-Newton Rings.
6. Determine the thickness of thin object-wedge method.
7. Laser beam divergence and spot size determination.
8. Determination of wave length of source using diffraction grating.
9. Determine the dispersive power of a given material of the prism.
10. Determine the specific rotation of sugar solution by using a Polarimeter.
11. The velocity of Ultrasonic Waves in Water by the Debye-Sears Effect
12. Ultrasonic Interferometer
13. Volume Resonator

Note: Any 8 experiments out of 13 experiments.

Reference Books

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

* * *

ENVIRONMENTAL STUDIES
(Common to CE, ME, IoT & IT)
I Year – II Semester

Lecture	: 2	Internal Marks	: 30
Credits	: -	External Marks	: 70

Course Objectives

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

Course Outcomes

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

- create awareness among the people in protection of environment.
- analyze structure and functional attributes of an ecosystem.
- explain the values of biodiversity.
- identify the sources of environmental pollution, assess their effects and suggest suitable control measures.
- adopt sustainable waste management practices.

Course Content

UNIT – I: Multidisciplinary Nature of Environmental Studies

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

UNIT – II: Ecosystem

Concept of an ecosystem – Structural features of an ecosystem – Functional attributes of an ecosystem: Trophic structure – Food Chains – Food Web – Ecological Pyramids – Energy Flow– Biogeochemical Cycles – Ecological Succession.

UNIT – III: Biodiversity & Its Conservation

Definition – Levels of Biodiversity – Bio-geographical zones of India – Values of biodiversity (Consumptive use value, Productive use value, Social value, Ethical value, Aesthetic value, Option values, Ecosystem service values) – India as a mega diversity nation–Hot spots of biodiversity-Threats to biodiversity – Endangered &Endemic species of India – Conservation of biodiversity.

UNIT – IV: Environmental Pollution

Definition, causes, effects & control measures of : Air pollution – Water pollution – Noise pollution-Soil pollution. Global climatic issues: IPCC- Introduction – Role of IPCC-Global warming – Acid rains – Ozone layer depletion.

UNIT – V: Waste Management

Waste water treatment – Municipal solid waste management – Biomedical waste

management – Hazardous waste management – E-waste management – 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.

Text Books

1. Anubha Kaushik, C.P.Kaushik, Environmental Studies, Fourth Edition, New Age International Publishers.
2. P.Anandan, R.Kumaravelan, Environmental Science & Engineering, Scitech Publications (INDIA) Pvt. Ltd.

Reference Books

1. Shashi Chawala, Environmental Studies, Tata McGraw Hill Education Private Limited.
2. Deeksha Dave & P. Udaya Bhaskar, Environmental Studies, Cengage Learning.
3. Dr.Suresh, K.Dhameja, Society and Environment, S.K. Kataria & Sons.
4. Benny Joseph, Environmental studies, Tata McGraw Hill Publishing Company Limited.

* * *

PROFESSIONAL COMMUNICATION
(Common to All Branches)

I Year – II Semester

Lecture	: 2	Internal Marks	: 30
Credits	: 2	External Marks	: 70

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.

Course 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)
- add to the effectiveness of their oral communication by using communication strategies, conventions of politeness and courtesy, and stress and intonation.
- 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 (e.g. texts expressing opinions and making a convincing case for one's standpoint, professional emails, and summaries of lengthy texts) with attention to elements of writing such as content, organization, language, style, and mechanics
- guard against grammatical errors Indians typically make in their speech and writing in English

Course Content

UNIT – I:

Listening : Listening comprehension – Task 1 (IWE – Chapt VII)
Speaking : Communication Strategies: Conversation Amith& Mahesh (IWE – Chap VII)
Reading : Reading Comprehension – Task 1 (IWE – Chapt VII)
Vocabulary: (a) GRE words – 1.3, (b) Collocations – 2.3 (VB)
Grammar : *If* Clause (IWE – Chapt VII)
Writing : Email writing (IWE – Chapt VII)

UNIT – II:

Listening : Listening comprehension – Task 2 (WR)
Speaking : Exercise on Communication Strategies (IWE – Chapt VII)
Reading : Reading Comprehension – Task 2 (DPM)
Vocabulary: Words often confused – 3.3, One-word substitutes – 4.3 (VB)
Grammar : Modal verbs (IWE – Chap VII)
Writing : Email writing and Argumentative Essay (IWE – Chapt VII)

UNIT – III:

Listening : Listening comprehension – Task 3 (WR)
Speaking : Communication Strategies – Exercise (DPM)
Intensive Reading : Reading Comprehension – Task 3 (DPM)
Extensive Reading: *Pride and Prejudice* by Jane Austen
Vocabulary: (a) Idioms – 5.3, (b) Phrasal verbs – 6.3 (VB)
Grammar : Indianism (IWE – Chapt VII)
Writing : Argumentative Essay (DPM)

UNIT – IV:

Listening : Listening comprehension – Task 4 (IWE – Chapt VIII)
Speaking : Communication Strategies and Presentation: Conversation between Suchitra, Lakshmi, Guhan and Karan ((IWE – Chapt VIII)
Reading : Reading Comprehension – Task 4 (DPM)
Vocabulary: (a) GRE Words – 1.4, (b) Collocations – 2.4, (c) Words Often Confused – 3.4 (VB)
Grammar : Indefinite Articles (IWE – Chapt VIII)
Writing : Presentation – Analysis (DPM)

UNIT – V:

Listening : Listening comprehension – Task 5 (WR)
Speaking : Communication Strategies – Exercise (IWE – Chapt VIII)
Intensive Reading : Reading Comprehension Task – 5 (DPM)
Extensive Reading : *Gulliver's Travels* by Jonathan Swift
Vocabulary: (a) One-Word Substitutes – 4.4, (b) Idioms – 5.4, (c) Phrasal-verbs – 6.4 (VB)
Grammar : Definite Articles (IWE – Chapt VIII)
Writing : Presentation – Rewriting

- IWE – *Innovate with English* by T Samson (Foundation)
- Chapt - Chapter
- DPM – Department-produced materials (handouts)
- WR – Web-resources
- VB– *Vocabulary Builder for Students of Engineering and Technology* by Vijaya Lakshmi et al (Maruthi)

Textbooks

1. T. Samson, *Innovate with English*, First Edn., Cambridge University Press India Pvt. Ltd. under the imprint of Foundation Books, Hyderabad, 2010.
   - Unit SEVEN and EIGHT only
2. M. Vijaya Lakshmi, et al., *Vocabulary Builder for Students of Engineering and Technology, Second Edn.,* Maruthi Publications, Hyderabad, 2017.
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.
5. Department-produced materials on reading comprehension.

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) Eight comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, interpretation of the writer's ideas, etc. are to be set. Four of the Eight questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 8 x ½ = 4**

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 4 = 4**

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 3 = 3**

b) Rewriting the e-mail using the standards of professional e-mail communication. **Marks: 1 x 3 = 3**

III.

a) Eight 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: 8 x ½ = 4**

b) Correction of grammatical errors: Eight 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: 8 x ½ = 4**

IV.

a) Completing a conversation (where informational and interactional functions are performed) with suitable expressions. **Marks: 8 x ½ = 4**

b) Answering eight 'true-or-false' questions on communication strategies and functions given in form of short dialogues. **Marks: 8 x ½ = 4**

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 4 = 4**

b) Rewriting the e-mail using the standards of professional e-mail communication **Marks: 1 x 4 = 4**

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

a) Eight comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, interpretation of the writer's ideas, etc. are to be set. Four of the Eight questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks 8 x ½ = 4**

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 4 = 4**

III.

a) Eight 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: 8 x ½ = 4**

b) Correction of grammatical errors: Eight sentences with grammatical errors of the following types (dealt with in Unit 8 of *Innovate with English*) will be given: articles and Indianism. **Marks: 8 x ½ = 4**

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) **Marks: 1 x 3 = 3**

b) Summarizing the text using the notes already made **Marks: 1 x 3 = 3**

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 the email failing to meet the standards of professional email communication. The analysis must identify and discuss at least seven reasons. (Length: 100-150 words) **Marks: 1 x 7 = 7**

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 7 = 7**

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. Seven comprehension questions: **Marks: 7 x 1 = 7**

- 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 seven questions should be multiple-choice questions.
- In case of non-multiple-choice questions, the length of each answer should not exceed 50 words.

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: 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. **Marks: 14 x 1 = 14**

- 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)

V. Reading a on a professional or semi-professional issue and answering two questions on it:

a. Matching suitable expressions selected from the dialogue with the given communication strategies. **Marks: 7 x 1 = 7**

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: 14 x 1 = 14**

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: 6 x 1 = 6**

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

* * *

INTEGRAL TRANSFORMS AND VECTOR CALCULUS
(Common to All Branches)

I Year – II Semester

Lecture : 3	Tutorial : 1	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- To gain the knowledge of Laplace and inverse transforms.\
- To understand the concepts of Fourier series and Fourier Transforms.
- To know about vector differentiation and integration.

Course Outcomes

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

- evaluate improper integrals using Laplace transforms.
- apply Laplace transforms to find the solutions of initial and boundary value problems.
- find the Fourier series representation of a function in one variable and apply Fourier transform in various engineering problems.
- apply the concepts of vector differentiation in their engineering fields.
- verify the relation between line, surface and volume integrals using integral theorems.

Course Content

UNIT – I: Laplace Transforms

Laplace transforms of standard functions – Shifting Theorems - Multiplication and division by t, transforms of derivatives and Evaluation of Improper Integrals - Unit step function – Dirac Delta function.

UNIT – II: Inverse Laplace Transforms

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

Application: Solution of Initial value problems and Boundary value problems.

UNIT – III: Fourier Series and Fourier Transforms

Fourier Series: Fourier series in an arbitrary interval, Half-range sine and cosine series.

Fourier integral theorem (only statement). Fourier transforms and inverse Fourier transforms, Fourier sine and cosine transforms and inverses. Properties of Fourier transforms.

UNIT – IV: Vector Differentiation

Gradient – unit normal – angle between surfaces – directional derivative . Divergence – solenoidal vector. Curl – irrotational vector – scalar potential. Laplacian operator.

UNIT – V: Vector Integral theorems

Greens theorem , Stokes theorem and Gauss Divergence Theorem - related problems. Applications: Work done, flux across the surface.

Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, Maitrey Printech Pvt. Ltd, Noida, 2014.
2. B.S. Grewal, Higher Engineering Mathematics, 44th edition, Khanna Publishers, New Delhi, 2020.

Reference Books

1. Schaum's Series, Differential Equtions, Tata-Mc Graw Hill Company Limited.
2. Bali & Iyengar,Text Book of Engineering Mathemtics, Laxmi Publications (P) Ltd.

* * *

ENGINEERING CHEMISTRY

I Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart the knowledge of bonding in molecules, adsorption, electrochemistry, corrosion and its prevention.
- To impart the knowledge of water treatment, green chemistry, manufacture and setting of cement, nano materials and spectroscopic techniques.

Course Outcomes

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

- analyze the types of bonds in a molecule and explain the applications of adsorption.
- explain the electrochemistry of batteries, analyze the corrosion of metals and apply a suitable method of corrosion prevention.
- solve the numerical problems on hardness of water and explain water treatment methods and principles, methods of synthesis and applications of green chemistry.
- explain the methods of synthesis, properties and applications of nano materials and explain the composition of cement and its hardening process.
- interpret the IR spectra of simple molecules and explain the principles and applications of UV- visible spectroscopy and X ray diffraction technique.

Course Content

UNIT – I: Molecular Structures and Surface Chemistry

Molecular orbital theory – bonding in diatomic molecules (O_2, N_2 and CO), calculation of bond order for simple molecules. Supramolecular interactions: Ion-ion interactions, ion-dipole interactions, dipole-dipole interactions, hydrogen bonding, Van der Waal's forces, identification of intermolecular forces in a given molecule.

Surface Chemistry: Adsorption **–** Types of adsorption, Freundlich and Langmuir adsorption isotherms, applications of adsorption.

UNIT – II: Electrochemical energy systems and Corrosion

Electrochemical Energy Systems: Electrochemistry and applications of lead-acid battery, VRLA technology, lithium ion battery, Zinc-air battery and H_2 - O_2 fuel cell.

Corrosion: Electrochemical theory of corrosion – galvanic corrosion, corrosion due to differential aeration cells and pitting corrosion. Factors influencing the rate of

corrosion (position of metal in electro chemical series, temperature, pH) – cathodic protection method – impressed current method and sacrificial anode method.

UNIT – III: Water Treatment and Green Chemistry

Water Treatment: Hardness of water – calculation of hardness, techniques for water softening (Ion exchange process, phosphate conditioning) – Potable water – WHO standards – Production of potable water from brackish water by RO method.

Green Chemistry: Principles, methods of Green synthesis (supercritical fluid extraction), zero waste technology – applications of green chemistry.

UNIT – IV: Nano Materials and Cement

Nano materials: Classification, synthesis of nanomaterials – sol-gel method – characterization of nanomaterials by SEM and TEM methods. carbon nanotubes – types – properties and applications.

Cement: Chemical composition of cement – Manufacture of portland cement, setting and hardening of cement – RCC – decay of RCC and its prevention.

UNIT – V: Spectroscopic Techniques and Applications

Basic concepts of spectroscopy – Beer Lambert's Law – numerical problems. Ultraviolet-visible spectroscopy – types of electronic transition. Applications of UV-visible spectroscopy. Infrared (IR) spectroscopy: Principle, types of vibrations, problems on interpretation of IR spectra of simple molecules of alcohols, aldehyde and ketones. Principle, instrumentation and applications of XRD spectroscopy**.**

Text Books

1. Engineering Chemistry - Fundamentals and Applications, Shikha Agarwal, 1st edition (2015), Cambridge University Press, New Delhi.
2. A Text book of Engineering Chemistry by Dr. Bharathi Kumari Yalamanchili. VGS Techno series, 6th Edition, 2019.

Reference Books

1. A Textbook of Engineering Chemistry by Sunita Rattan, S.K. Kataria & Sons, New Delhi, first edition, 2012.
2. Text book of Engineering Chemistry by Jain & Jain. Dhanpat Rai Publishing Company, sixteenth edition, 2015.
3. Essentials of Physical Chemistry, B.S. Bahl, G. D. Tuli and Arun Bahl, S. Chand and Company Limited, New Delhi.
4. Spectroscopic identification of organic compounds by Robert M.Silverstein, sixth edition,Wiley, 2005.
5. Physical chemistry, Peter Atkins, tenth edition, Oxford University Press, 2014.

* * *

APPLIED MECHANICS

I Year – II Semester

Lecture : 3	Tutorial : 1	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- To impart the basic concepts of force systems, free body diagrams and equilibrium conditions.
- To introduce the concept of friction and virtual work principle and to familiarize on calculating the geometric properties like centroid, centre of gravity and moment of inertia of various sectional areas and masses.
- 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.

Course Outcomes

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

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

Course Content

UNIT – I: Force systems-Resultant and Equilibrium Conditions, Moment of a force and Couple

Introduction to engineering mechanics –Types of forces-Coplanar, Concurrent and parallel forces in a plane and space – 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 and 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 beams.

UNIT – III: Centroid and Centre of Gravity

Centroid: Centroid of standard figures (from first principles) – Centroids of Composite figures.

Centre of gravity: Centre of gravity of standard bodies (from first principles), centreof gravity of composite bodies, Pappu's and Guldinus theorems – simple problems.

UNIT – IV: Moment of Inertia

Area Moment of Inertia: Definition, Moment of Inertia of standard figures using first principles – Parallel axis theorem – Polar Moment of Inertia, Moment of Inertia of composite figures.

Mass Moment of Inertia : Center of Mass and Mass Moment of Inertia - Definition, Transfer Formula for Mass moment of Inertia, Mass moment of Inertia of standard bodies using first principles-Mass moment of inertia of composite bodies.

UNIT – V: Kinematics and Kinetics

Kinematics of a Particle: Rectilinear motion-Relations between time, displacement, velocity and acceleration; Curve-linear motion-rectangular components, normal & tangential components. Kinematics of bodies in fixed axis rotation- Derivation -Simple problems

Kinetics: Kinetics of a particle in translatory motion, Newton's laws of motion and D'Alembert's principle- simple problems.

Work, Power & Energy – Definitions and their units – Work-Energy Principle, Law of conservation of energy; Simple problems on Work, Power and Energy; Impulse and Momentum in linear motion – Law of conservation of momentum; Linear momentum-collision of bodies; Simple problems.

Text Books

1. Engineering Mechanics, Timoshenko, Young and J.V. Rao, Tata McGraw Hill education (India) Pvt. Ltd.
2. Engineering Mechanics, Basudeb Bhattacharya, Oxford University Press.

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, R.K.Bansal, 6th edition, Laxmi Publications

* * *

UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY
(Common to CE, ME, IoT & IT)

I Year – II Semester

Lecture : 2	Tutorial : 1	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To help students understand the need, basic guidelines, content and process of value education.
- To help students initiate a process of dialog with in themselves to know what they really want to be in their life and profession.
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
- To understand the harmony in nature and existence.
- To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

Course Outcomes

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

- be aware of themselves and surroundings
- be responsible in life
- develop personality to be happy continuously and prosper
- handle the problems with sustainable solutions.
- possess human nature in mind
- apply what they have learnt to their own self in real life situations

Course Content

UNIT – I : Value Education

Significance of Universal human values, Value Education – Importance, content, Process. Self-exploration, Basic human aspirations, Right understanding, Natural acceptance.

Suggested topics for Tutorial/Practice sessions:

Learning HVLS from the Inspiring Life Sketches of great personalities:
Isaac Newton, Michael Faraday, JJ Thomson, Einstein, Madam Curie, Mahatma Gandhi, Abraham Lincoln, JF Kennedy, Martin Luther King, BR Ambedkar, Charles Darwin, Karl Marx, Helen Keller, Sam Pitroda, Mark Zuckerberg, SudhaMurty, Leonardo Davincy, Michelangelo, The eternal 3: Socrates, Plato, Aristotle, Alexander, Swami Vivekananda, Abdul Kalam, AB Vajapayee, Sergei Bubka.

UNIT – II: Harmony In Myself

Co-existence of the self and the Body, Understanding the needs of Self (I') and Body'-Sukh and Suvidha, Body as an instrument of 'I', Harmony in 'I' - Sanyam and Svasthya, correct appraisal of our Physical needs.

Suggested topics for Tutorial/Practice sessions:

Leadership through Literature: ValmikiRamayan, Vyasa MahaBharath- Bhagavad Gita, Answers of Yudhistir to Questions by Yaksha, Kaalidas- Raghu Vamsam, Abhignyana Saakuntalam and Maalavika Agnimitram, Homer- Iliad and Odyssey, Professionalism- Learning from the Jews, Buddha, The Bible- Jesus Christ, Solomon's wisdom, The Koran- Prophet Mohammad, Guru Nanak, John Milton, Shakespeare, Sigmond Freud, Robin Sharma, Ravindranath Tagore, Sadguru Jaggi Vasudev, War and Peace by Leo Tolstoy, Unto the Last by Ruskin, Social Contracts by Rousseu, If by Rudyard Kipling, The 7 Habits of highly effective people by Stephen R Covey. Art of Rhetoric by Aristotle.

UNIT – III: Harmony in the Family and Society

Family as the basic unit of human interaction, Harmony in the family, Justice, Trust, Respect, Intention vs competence, Respect is Differentiation.Extending relationship from family to society.Comprehensive human goal – identification, programs for achievement of the goal.Dimensions of Human endeavour, Harmony from family order to world family order.

Suggested topics for Tutorial/Practice sessions:

Ideal Home: Characteristics of Happy families, Personal hygiene and habits, Harmony, Health and happiness, Advantages of combined families.Vasudhaika Kutumbam- Universalism.Vilasa Vidya- Importance of hobbies, Music therapy. Influence of friends and peer groups- ideal friend, Friendship and faith, Avoiding vices, Advance Crime detection technologies, Law and legislation pertaining to students.

UNIT – IV: Harmony in the Nature and Existence

Harmony in the nature – orders in nature, existence as co-existence, co-existence of units in space, holistic perception of harmony at all levels of existence.

Suggested topics for Tutorial/Practice sessions:

Leadership through languages: Atleast 5 poems / rhymes and 10 Sentences of each among atleast 10 of the following languages: Sanskrit, Telugu, Tamil, Malayalam, Kannada, Oriya, Bengali, Hindi, Urdu, Punjabi, Maratthi, Gujarati, Latin, Greek, Chinese, Japanese, Italian, Spanish, French and German. Bionics: Technology from animals. Interpretation of Paintings.

UNIT – V: Implications of the Right Understanding

Values in different dimensions of Human living,definitiveness of ethical human conduct,development of Human consciousness ,implications of value based living. Identification of comprehensive Human goal, Humanistic Education,

humanistic constitution,humanistic universal order and its implications. Competence in professional Ethics, Holistic technologies and systems.

Suggested topics for Tutorial/Practice sessions:

Personality Traits: Ich Bin- Who am I? Know thyself. Self esteem, Sanyam: Self learning, self motivation, self control and self discipline, Thinking aloud, Team work, Discipline, Courage, Creativity, Sense of humour, Equanimity- love for animals and nature, Gratitude, Time and money management, Leadership skills, Importance of sports and games, Importance of Swimming, Writing and Public speaking skills, Quotable quotations: Those who quote only are quoted. Mpemba Effect – The Rags to riches concept. Commonalities of great personalities. Estimation of value of a person and his habits. SWOT Analysis.

Text Books

1. R.R Gaur, R.Sangal and G.P.Bagaria; "A Foundation Course in Human Values and Professional Ethics", 2011, Excel Books, New Delhi.

Reference Books

1. A N Tripathy, 2003, Human Values, New Age International Publishers.
2. KVSG Murali Krishna, Mastering LIFE SKILLS ,Environmental Protection Society, Kakinada, 2015.
3. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Note: Tutorial/Practice sessions may be conducted with reference to Many Historical aspects, having relevance to the topic of discussion. Few of such topics are suggested.

Methodology Suggested for Instruction:

- Teacher is a mentor or guide or Supervisor
- Student –Teacher interactive sessions in the class.
- Student must be made to think and express his views boldly.
- Every student has to present individual PPT about the content of the subject
- Assignments need to be submitted by students and evaluated by teacher into dedication specifying critical review.

* * *

PROFESSIONAL COMMUNICATION LAB
(Common to All Branches)

I Year – II Semester

Practical	: 4	Internal Marks	: 30
Credits	: 2	External Marks	: 70

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.

Course 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 (e.g. 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?) ;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, et al., *Strengthen Your Communication Skills*, First Edn., Maruthi Publications, Hyderabad, 2014.
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 AP.

Testing Pattern

1. Internal **30 marks**

a. Regular performance in the Communications Lab 15 marks
b. Completing the tasks in the lab manual 05 marks
c. Making a PowerPoint presentation (Pair/Group) 10 marks
(Note: A hard copy of the presentation is to be submitted)

2. External **70 marks**

a. Test of writing
A telephone conversation 10 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 15 marks

Questions at an elementary level. In other words, questions that require candidates to talk about themselves, their ambitions, , why they chose to study engineering, their strengths and weaknesses, their hobbies and interests, their personality, their perception of their leadership skills, and their key skills. Industry/job-related questions could be avoided.

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 20 marks
Time: 10-15 minutes (approx.) per group

c. Viva voce with an external examiner 15 marks

* * *

ENGINEERING CHEMISTRY LAB

I Year – II Semester

Practical	: 2	Internal Marks	: 30
Credits	: 1	External Marks	: 70

Course Objectives

- To develop the skill on chemical and instrumental methods of analysis.
- To acquire the skill in preparation of synthetic materials.

Course Outcomes

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

- analyze the Ferrous Iron, Zinc ion by volumetric method.
- evaluate the validity of Langmuir adsorption isotherm.
- operate the pH meter, conductivity meter for analyzing the water quality and obtain cell potential by the construction of an electrochemical cell.
- analyze the corrosion rate of a given metal in a given environment by gravimetric method.
- operate spectrophotometer and determine the concentration of Ferric Iron in a given solution and Ferrous Iron in cement.
- 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 Ferrous Iron in a given solution by dichrometric method.
3. Determination of Zinc ion in a given solution by EDTA method.
4. Estimation of adsorption of acetic acid by activated charcoal and examine the validity of Langmuir adsorption isotherm.
5. Construction of an electrochemical cell and determination of emf.
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. Determination of rate of corrosion of carbon steel metal in acid medium in the absence and presence of thiourea inhibitor by gravimetric method.

9. Determination of Fe(II) in cement by spectrophotometric method.
10. Determination of concentration of Ferric Iron in a given solution spectrophotometrically.
11. Preparation of Phenol - Formaldehyde resin (Bakelite).

Lab Manual:

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

* * *

APPLIED MECHANICS LAB AND BUILDING TRADE PRACTICE

I Year – II Semester

Practical	: 2	Internal Marks	: 30
Credits	: 1	External Marks	: 70

Course Objectives

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

Course Outcomes

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

- calculate axial forces in trusses, moment of force
- determine the coefficient of friction
- verify lami's theorem and polygon law
- locate the centroid for plane lamina
- 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 coefficient of friction of different surfaces
3. Calculation of centroid of the plane lamina
4. Determination of axial forces in members of a simple truss
5. Verification of lami's theorem
6. Analysis of trapezoidal trusses for different loads
7. Verification of polygon law of forces.

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

4) 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.

* * *

CONSTITUTION OF INDIA
(Common to CE, ME, IoT & IT)
I Year – II Semester

Lecture	: 2	Internal Marks	: 30
Credits	: -	External Marks	: 70

Course Objectives

- To impart knowledge on basic engineering applications.
- To enable the student to understand the importance of constitution.
- To understand the structure of Executive, Legislature and Judiciary.
- To understand Philosophy of fundamental rights and duties.
- To understand the autonomous nature of constitution bodies like Supreme Court and High Court Controller and Auditor General of India and Election Commission of India.
- To understand the Central and State relation, financial and administrative.

Course Outcomes

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

- understand history and philosophy of constitution with reference to Preamble, Fundamental Rights and Duties
- understand the concept of Unitary and Federal Government along with the role of President, Prime Minister and Judicial System.
- structure of the state government, Secretariat, Governor and Chief Minister and their functions.
- learn local administration viz. Panchayat, Block, Municipality and Corporation.
- learn about Election Commission and the process and about SC, ST, OBC and women.

Course Content

UNIT – I:

Introduction to Indian Constitution: 'Constitution' meaning of the term, Indian Constitution – Sources and Constitutional History, Features – Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT – II:

Union Government and its Administration Structure of the Indian Union: Federalism Centre – State relationship, President: Role, Power and Position. Prime Minister (PM) and Council of Ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha. The Supreme Court and High Court: Powers and Functions.

UNIT – III:

State Government and its Administration Governor – Role and Position – Chief Minister (CM) and Council of Ministers. State Secretariat: Organisation, Structure and Functions.

UNIT – IV:

A Local Administration – District's Administration Head – Role and Importance, Municipalities – Mayor and Role of Elected Representative – Chief Executive Officer (CEO) of Municipal Corporation Panchayati Raj : Functions Panchayati Raj Institution (PRI), Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Block level orgnisational Hierarchy – (Different Departments), Village level – Role of Elected and Appointed officials – Importance of grass root democracy.

UNIT – V:

Election Commission: Election Commission – Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions and Commissions for the welfare of SC/ST/OBC and Women.

Reference Books

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd., New Delhi.
2. Subash Kashyap, Indian Constitution, National Book Trust.
3. J.A. Siwach, Dynamics of Indian Government and Politics.
4. D.C. Gupta, Indian Government and Politics.
5. H.M.Sreevai. Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication).
6. J.C. Johari, Indian Government and Politics Hans.
7. J.Raj, Indian Government and Politics.
8. M.V. Pylee, Indian Constitution, Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd., New Delhi.
9. Noorani, A.G. (South Asia Human Rights Documentation Centre), Challenges to Civil Right). Challenges to Civil Rights Guarantees in India, Oxford University Press 2012.

E-Resources:

1. nptel.ac.in/courses/109104074/8.
2. nptel.ac.in/courses/109104045.
3. nptel.ac.in/courses/101104065.
4. www.hss.iitb.ac.in/en/lecture-details.
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution.

* * *

BUILDING MATERIALS AND BUILDING CONSTRUCTION

II Year – I Semester

Lecture	: 2	Internal Marks	: 30
Credits	: 2	External Marks	: 70

Course Objectives

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

Course 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 on use of lime and cement in various constructions.
- know the classification of aggregates, sieve analysis and moisture content usually required in building construction.
- learn the importance of building components and finishing's.
- evaluate importance and role of alternate materials.

Course Content

UNIT – I: Building Stones

Characteristics of good building stones, important types of building stones, their properties and stones and uses - Composition of brick-earth, manufacturing process of bricks, characteristics of good building bricks, classification and testing of bricks, special types of bricks and their uses. Types of tiles and their use in buildings.

UNIT – II: Lime and Cement

IS classification of lime and uses, flow diagram of manufacturing process of cements, chemical composition of cement, IS specifications, field and laboratory tests for cement ,different types of cements and their properties and uses.

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, IS codes for aggregates gradation.

UNIT – IV: Building Components and Finishings

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.

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

UNIT – V: Introduction to Some New Materails

Properties and applications of Galvanized Iron, Fibre-reinforced plastics, Steel, Aluminium, Glass, Gypsum, ceramics, fly ash. Ferro cement, plastics, paints, and geotextiles

Text Books

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

Reference Books

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

* * *

ELEMENTS OF MECHANICAL AND ELECTRICAL ENGINEERING

II Year – I Semester

Lecture	: 2	Tutorial	: 1	Internal Marks	: 30
Credits	: 3			External Marks	: 70

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 Induction Motor.

Course Outcomes

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

- describe different types of transmission systems and their applications
- explain the principle of operation of different machine tools and operations performed using them
- interpret 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 Induction Motor.

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: Internal Combustion Engines

Thermodynamic principles and laws, internal combustion engines - classification of IC engine, working principle , engine components, four stroke and two stroke engine, 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.

UNIT – V: DC Machines & Induction Motor

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

Principle of operation of 3-Phase induction motor – Torque equation-slip torque characteristics – applications of three phase induction motor.

Text Books

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

Reference Books

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

* * *

MECHANICS OF SOLIDS

II Year – I Semester

Lecture : 3	Tutorial : 1	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- Assess the internal properties of materials such as simple stresses, strains, thermal stresses and elastic constants.
- Derive the flexure equation and evaluate the flexural stresses and determine the principal stresses and apply the energy theorems to beams.
- Draw shear stress distribution for rectangular, circular, triangular, I, T and angle sections and application of the torsion equation

Course Outcomes

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

- explain the behaviour of the bars elastically from stress and strain relationship
- develop SF and BM diagrams for various beams carrying different types of loads
- develop the flexure equation and determination of bending stresses for various sections
- analyse the shafts by using the principle of torsion
- explain the concept of principal stresses and strains and apply the energy theorems to simple beams

Course Content

UNIT – I: Simple Stresses, Strains and Elastic Constants

Elasticity and plasticity–Types of stresses and strains–Hooke 'slaw–stress strain diagram for mild steel – Working stress – Factor of safety – Bars ofvarying sections - Lateral strain, Poisson's ratio and volumetric strain –Elastic moduli and the relationship between them -composite bars –Thermalstresses.

UNIT – II: Shear Force and Bending Moment

Definition of beam – Types of beams – Types of Supports –Concept of shear force and bending moment- Relation between S.F, B.M and rate of loading at a section of a beam, Point of contra flexure. S.F and B.M diagrams for cantilever simply supported and overhanging beams subjected to point loads, UDL and combination of this loads–Point of Contra flexure.

UNIT – III: Flexural Stresses

Theory of simple bending – Assumptions – Derivation of bending equation, Neutral axis – Determination of bending stresses – section modulus of rectangular and circular sections, I, T, angle, triangular and Channel sections.

Combined Direct and Bending Stresses: Combined direct and bending stresses, eccentric loading, core or kernel of a section – rectangular, circular sections

UNIT – IV: Shear Stresses

Derivation of formula– Shear stress distribution across various beam sections viz. Rectangular, circular, channel, I & T sections.

Torsion: Theory of pure torsion–Derivation of Torsion equation–Assumptions – Torsional moment of resistance–Power transmitted by shafts.

UNIT – V: Principal Stresses and Strains

Plane state of stress, Stresses on an inclined section of a bar under axial loading– compound stresses–Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple Shear–Mohr's circle of stresses–Principal stresses and strains.

Strain Energy: Strain energy due to axial loading, bending, Maxwell's reciprocal theorem, Castigliano's first and second theorems – Application to determinate beams.

Text Books

1. Mechanics of Materials– E.P. Popov- PHI Publications.
2. Strength of Materials by S. Ramamrutham and R.Narayan – Dhanpat Rai publications.
3. Introduction to textbook of Strength of materials by R.K. Bansal – Laxmi Publications Pvt. Ltd., New Delhi.

Reference Books

1. Strength of materials by R.K. Rajput, S. Chand & Co, New Delhi.
2. Strength of Materials by A.R.Basu, Dhanpat Rai & Co, Nai Sarah, New Delhi.
3. Mechanics of Materials –F.P. Beer and ER Johnson and JD Dewolf – Mc.Graw-hill Publications
4. Strength of Materials–Timoshenko
5. Strength of Materials by BhaviKatti.

* * *

FLUID MECHANICS

II Year – I Semester

Lecture : 2	Tutorial : 1	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

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

Course Outcomes

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

- analyze various fluid properties in the fluid flow problems and Compute hydrostatic forces on submerged bodies
- identify the fluid flows and its behavior and apply conservation laws to derive governing equations of fluid flow
- apply the Boundary layer concepts in engineering problems and impart the knowledge of flow around submerged objects.
- analyze the flow in pipes, laminar and turbulent flows, parallel plates and determine losses in pipes.
- measure flow in a tanks and canals by using various flow measuring instruments

Course Content

UNIT – I: Fluid Properties and Statics

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

Hydrostatics: Hydrostatic forces on submerged plane - horizontal, vertical and inclined surfaces – centre of pressure - Derivations and problems

UNIT – II: Fluid Dynamics

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 - Continuity equation, Velocity potential and stream function.

Fluid Kinetics: Surface and body forces Euler's equation of motion; Bernoulli's equation, Momentum principle, Applications of momentum equation- Force exerted on a pipe bend.

UNIT – III: Boundary Layer Theory

Boundary layer-concepts, prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar turbulent boundary layers - no derivations, BL in transition, separation of BL, control of BL, flow around submerged objects- Drag and Lift.

UNIT – IV: Flow Through Pipes

Laminar Flow: Reynold's experiment – Characteristics of Laminar and Turbulent flows; flow through circular pipe, flow through parallel plates.

Closed Conduit Flow: Laws of fluid friction – Darcy's equation; Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line.

UNIT – V: Measurement of Flow

Pitot tube, Venturimeter and Orifice meter, 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, R.K. Rajput, 5th edition, S.Chand & Co., 2014.
2. Fluid Mechanics and Machinery by C.S.P. Ojha, P.Berndtsson, P.N. Chandramouli, Oxford University press, 2010.
3 Fluid Mechanics including Hydraulic machines by Dr.A.K Jain, Khanna Publishers.

* * *

SURVEYING

II Year – I Semester

Lecture : 2	Tutorial : 1	Internal Marks	: 30
Credits : 3		External Marks	: 70

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

Course Outcomes

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

- explain the concepts of distance measurement using chain.
- obtain angular measurements using compass and theodolite
- illustrate the principles of levelling and develop contours from it.
- apply the principles of tachometry and trigonometric levelling to obtain angles and determine heights & distances of objects.
- identify various features of total station and design simple curves for highways.

Course Content

UNIT – I: Introduction

Surveying, Primary Divisions of Surveying, Principles, Basic Measurements, Plan and Map, Errors in surveying, Instruments for Linear Measurements.

Chain Surveying: Principle of Chain surveying, Basic definitions, Well Conditioned Triangle, Selection of survey stations & survey lines, offsets, Cross staff Survey, Obstacle in Chaining & Ranging.

UNIT – II: Compass Surveying and Theodolite

Introduction, Types of Meridian, Types of Bearings, Designation of Bearings, Prismatic Compass, Computation of angles from bearings, Magnetic Declination and Dip, Compass Traverse, Local Attraction, Correction for local attraction.

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

UNIT – III: Levelling and Contouring

Introduction, Basic Definitions, Bench Marks, Different methods of Levelling, Dumpy Level, Levelling staves, Temporary Adjustments of Level, Problems on Levelling.

Contouring, Contour Interval, Characteristics of Contours, Methods of Locating Contours, Uses of Contours.

UNIT – IV: Trignometrical Levelling and Tacheometry

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

Tachometry: Introduction, Uses, Stadia methods-fixed hair method-movable hair method, Tangential System, Principle of stadia method, Determination of vertical and horizontal distances when staff is vertical (Inclined sight) and normal

UNIT – V: Total Station and Curve Setting

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

Curve, Designation of curve, types, Elements of Simple Curve, Setting out simple curve – Linear Methods, Rankine's Method, Two Theodolite Method, Problems

Text Books

1. K R Arora, Surveying Vol – I & II, 11th edition, Standard Book House.
2. B C Punmia, Surveying Vol – I & II, 17th edition, Laxmi Publications (P) Ltd.

Reference Books

1. A M Chandra, Plane Surveying, New Age International Publishers, 3rd Edition
2. S K Roy, Fundamentals of Surveying, Prentice Hall of India Private Ltd, Eastern Economy Edition
3. T. P. Kanetkar, S.V.Kulkarni Vidyarthi Griha Prakashan, Surveying and Levelling, Anuradha Publishers, 24th edition.

* * *

ENGINEERING GEOLOGY & GEOSPATIAL APPLICATIONS

II Year – I Semester

Lecture : 2	Practice : 2	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To understand the importance of Geology for selection of site materials and design of Civil Engineering Projects.
- To know about the principles of remote sensing and to introduce working principle of GIS and its importance.
- To impart the knowledge on air-borne and space-based imaging technologies and their working principles.

Course 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.
- demonstrate the concepts of Electro Magnetic energy, spectrum and spectral signature curves.
- apply the concept of GIS Civil Engineering applications.
- interpret information from aerial photographs.

Course Content

UNIT – I: Introduction To Geology, Minerology and Petrology

Scope and disciplines involved in Engineering Geology. Formation of minerals, Crystal Geometry, Crystal System, Physical Properties and 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.

UNIT – III: Introduction to Remote Sensing

Remote Sensing – Principle - Electro-magnetic energy, spectrum - EMR interaction with atmosphere – Atmospheric Windows and its Significance – EMR interaction with Earth Surface Materials – Spectral Signature and Spectral Signature curves for water, soil and vegitation – Civil Engineering Application.

UNIT – IV: Introduction to Geographic Information System (GIS)

GIS - History of Development - Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Data Input Sources— Data Output – Raster and Vector data structures –Raster vs. vector comparison.– Civil Engineering Application.

UNIT – V: Introduction to Photogrammetry

Introduction –Classification, process of Photogrammetry, flight line, exposure station, block of photographs, flying height of a vertical photograph, overlap, side lap–Civil Engineering Application

For the Practical Part, 10 experiments, 2 per unit shall be conducted.

1. Megascopic Identification of Minerals.
2. Megascopic Identification of Rocks.
3. Study of geological structures using wooden models.
4. Demo of Resistivity Meter for geophysical measurements.
5. Geo referencing of images SOI - OSM map.
6. Supervised Classification of a satellite image.
7. Creating layers in a GIS and digitizing scanned images.
8. Adding attribute data in tables and Calculating geometry
9. Feature identification from Aerial Photographs.
10. Observing depth of field in stereo-pairs.

Text Books

1. Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2016), Laxmi Publications.
2. Remote Sensing and Image Interpretation, Thomas. M. Lillesand and Ralph. W. Kiefer, 7th Edition (2015), John Wiley and Sons.
3. Principles of Geographical Information Systems, Burrough P.A. and Rachel A. McDonell, 3rdEdition (2016), Oxford Publication.

Reference Books

1. Engineering Geology by S K Duggal, H K Pandey and N Rawal – McGraw Hill Education (India) Private Limited.
2. Remote Sensing and GIS, Basudeb Bhatta, 2nd Edition, Oxford University Press.

* * *

MECHANICS OF SOLIDS LAB

II Year – I Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

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 circular shaft.
5. To obtain the hardness of the given material by Brinnel's Hardness tester.
6. To obtain the hardness of the given material by Rockwell Hardness 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 double shear.
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.

* * *

SURVEY FIELD WORK

II Year – I Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

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

Course Outcomes

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

- carry out survey for determining linear and angular measurements
- plan for conduct of survey using various equipment

List of Field works *

*** Note:** Conduct any 12 Experiments of the following

Chain Survey

1. Conduct cross staff survey for determining area between the given points.
2. Determine the distance between two points in case of
   a) When there is a river as obstacle.
   b) When there is a building as obstacle.

Compass Survey

1. Conduct a compass survey for determining included angles between the lines in the given bounded area.
2. Determine the distance between two inaccessible points.

Levelling

1. Determination of reduced levels using Height of Instrument and Rise & Fall Methods.
2. Conduct Profile Levelling for widening of roads.
3. Conduct levelling in determination of contours.

Theodolite and Tachometry

1. Determination of Horizontal angles by Repetition and Reiteration Method.
2. Determine height of building when base is accessible and inaccessible.
3. Determine tacheometric constants.
4. Conduct curve setting by any one method of linear and angular methods.

Total Station

1. Conduct Remote elevation and remote distance measurement.
2. Determine the given bounded area in the field.
3. Stake out.

Text Books

1. Surveying Vol – I & II by K R Arora, 11th edition, Standard Book House.
2. Surveying Vol – I & II by B C Punmia, 16th edition, Laxmi Publications (P) Ltd.

Reference Books

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

* * *

LOGIC BUILDING AND BASIC CODING PRINCIPLES
(Common to CE, EEE & ME)

II Year – I Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

1. Understanding National Qualifier Test Patterns.
2. Practicing different patterns with different logics.

Frequent Patterns in NQTs: Practicing with Flow Chart —

Pseudo code and Programming in C

- To draw Right Staircase Pattern
- To draw Left Staircase Pattern
- To draw Pyramid Pattern
- To draw Inverse Pyramid Pattern
- To draw Inverse Right Staircase Pattern
- To draw Inverse Left Staircase Pattern
- To draw Pyramid Pattern like below
- To draw Interesting Pattern |
- To draw Diamond Pattern
- To draw Interesting Pattern II
- To draw Interesting Pattern III
- To draw Interesting Pattern IV
- To draw Interesting Pattern V

NUMERICAL & STATISTICAL METHODS

II Year – II Semester

Lecture : 2	Tutorial : 1	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To introduce the concepts of numerical and statistical methods for solving engineering problems.

Course Outcomes

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

- determine the solutions of algebraic and transcendental equations using numerical techniques.
- obtain interpolating polynomial for equal and unequal intervals.
- find the solutions of initial value problems using different methods.
- evaluate probabilites using statistical distributions and assess the relation using regression.
- draw the inferences for data using statistical methods.

Course Content

UNIT – I: Algebraic and Transcendental Equations

Solution of algebraic and transcendental equations –Bisection method – Method of false position – Newton-Raphson Method.

UNIT – II: Interpolation

Interpolation- Introduction – finite differences - forward, backward and central difference operators – relation between operators. Newton's formulae for interpolation and Lagrange's interpolation.

UNIT – III: Numerical Solutions of 1st Order Ordinary Differential Equations

Solutions of 1^{st} Order Ordinary Differential Equations by Taylor's series, Euler, modified Euler and fourth order Runge-Kutta methods.

UNIT – IV: Random Variables – Correlation and Regression

Review on probability [addition and multiplication rules]. Introduction to random variables (discrete and continuous), concept of expectations (mean and variance) and properties – Applications. Normal distribution and its properties(statements only). Simple Correlation and linear Regression.

UNIT – V: Sampling and Statistical Inference

Basic terminology in sampling, sampling techniques (with and without replacements). Central limit theorem - introduction to statistical inference - test for means

and proportions (Large samples); Introduction to t-test , Chi-Square test for goodness of fit and F-test (test for population variances).

Text Books

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44th edition,2018.
2. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V. S. S. N. Prasad, Probability and Statistics, S. Chand & Company Ltd, 2nd edition 2021.
3. Miller, John E. Freund, Probability and Statistics for Engineers, PHI, 9th edition, 2017.

Reference Books

1. Ravindranath.V, and Vijayalaxmi.A, A Text Book on Mathematical Methods, Himalaya Publishing House,3rd edition,2017.
2. B.V.Ramana, Engineering Mathematics, Tata McGraw Hill, New Delhi, 4th Edition, 2009.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Maitrey Printech Pvt. Ltd, Noida, 10th edition, 2010
4. S.C. Gupta & V.K. Kapoor, Fundamentals of Mathematical Statistics, S.Chand, 12th edition, 2020.

* * *

STRUCTURAL ANALYSIS

II Year – II Semester

Lecture : 3	Tutorial : 1	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- To impart the knowledge on obtaining the slopes and deflections of determinate beams and to know about the deflection of helical springs.
- To familiarize with the calculations of crippling loads in columns, struts and the resultant stresses in thin cylinders.
- To familiarize with the analysis of indeterminate beams by using various methods.

Course Outcomes

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

- calculate the slopes and deflections of determinate beams, shear modulus of spring elements
- determine the critical loads for columns of different end conditions and also to calculate the longitudinal and hoop stresses for thin cylinders
- analyze the propped cantilever beams and fixed beams subjected to point loads and UDL
- analyze the continuous beams by using the Clapeyron's theorem of three moments and slope deflection method
- determine the member forces in any determinate truss by using the method of joints or method of sections

Course Content

UNIT – I: Deflection Of Determinate Beams

Deflection and slope of a beam subjected to uniform bending moment–Relationship between slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads and U.D.Ls – Mohr's theorems - Moment area method.

Springs: Introduction–Types of springs – deflection of close coiled helical springs under axial load – springs in series and parallel.

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 formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory.

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – Changes in diameter and volume.

UNIT – III: Propped Cantilevers

Introduction to Indeterminate structures, Analysis of propped cantilevers - shear force and bending moment diagrams.

Fixed Beams: Introduction to statically indeterminate beams with U.D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - Shearforce and bending moment diagrams, effect of sinking of support.

UNIT – IV: Continuous Beams

Introduction- Clapeyron's theorem of three moments - Analysis of continuous beams with constant moment of inertia with one or both ends fixed - Continuous beams with overhang, continuous beams with different moment of inertia for different spans - Effects of sinking of supports - Shear force and bending moment diagrams.

Slope-Deflection Method: Introduction - Derivation of sloped eflection equation, Application to continuous beams with and without settlement of supports, Analysis of frames with and without sway.

UNIT – V: Analysis of Pin-Jointed Plane Frames

Determination of forces in members of trusses by using (i) Method of joints and (ii) Method of sections. Analysis of various types of cantilever and simply – supported trusses.

Text Books

1. Structural Analysis Vol. 1 and II by S S Bhavikatti–Laxmi Publications (P) Ltd., New Delhi
2. Theory of structures byDr. S. Ramamrutham and R. Narayan, Dhanpat Rai Publications.
3. Statically Indeterminate Structures byC.K Wang, McGraw-Hill Inc., US.

Reference Books

1. Theory of Structures by R.S. Khurmi, S. Chand Publications, New Delhi.
2. Theory of structures by B.C. Punmia, Laxmi Publications (P) Ltd., New Delhi.
3. Analysis of structures Vol. 1 and II by Prof. VN Vazrani, Dr. MM Ratwani and Dr. Sk. Duggal, Khanna Publishers, New Delhi.
4. Structural analysis by T.S. Thandava Moorthy, Oxford publications, New Delhi.

* * *

HYDRAULICS & HYDRAULIC MACHINES

II Year – II Semester

Lecture : 2	Tutorial : 1	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To impart knowledge on concepts and the design principles of Uniform and Non-Uniform flow in open channels.
- To understand the analysis of jet on vanes.
- To familiarize with working and analysis of hydraulic turbines and centrifugal pump.

Course Outcomes

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

- analyze and design uniform and non uniform flow open channels.
- compute the force exerted by the jet on vane under different Vane conditions.
- illustrate the functioning of various turbines and their hydraulic designs.
- describe the performance of various turbines under different operating conditions and governing of turbines.
- assess the Performance of the centrifugal pump under different working conditions.

Course Content

UNIT – I: Open Channel Flow

Type of channels – 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. 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.

UNIT – II: 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 – III: 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 – IV: Hydraulic Turbines – II

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

UNIT – V: Pumps

Introduction to pumps, Reciprocating 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. Fluid Mechanics including Hydraulic machines by A.K Jain, Khanna Publishers
2. Hydraulics and Fluid Mechanics Including Hydraulics Machines by P.N. Modi and S.M. Seth, Standard book house.

Reference Books

1. Fluid Mechanics and Hydraulic machines, R.K. Rajput, S.Chand & Co.
2. Hydraulic Machines by Banga & Sharma Khanna Publishers.
3. Flow in Open Channels by K. Subramanya, Tata McGraw Hill Publishers.
4. Fluid mechanics and Hydraulic Machines by R.K Bansal, Laxmi publications, New Delhi.

* * *

CONCRETE TECHNOLOGY

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

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

Course Outcomes

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

- learn the properties of ingredients of concrete.
- identify the suitability of different types of aggregates and Water 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, Significance, Mechanism of Hydration, models for the structure of C-S-H ,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 and surfactants.

UNIT – II: Aggregates and Water

Significance, Classification and nomenclature of aggregates, Natural mineral aggregates, Aggregate characteristics – 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. Grading curves 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 –Definition and significance, Factors affecting workability and their control– Measurement of workability by different tests- Effect of time and temperature on workability – Setting times of concrete – Segregation & bleeding, Steps in manufacture of concrete.

Special Concretes: Ready mixed concrete-Introduction, advantages and Disadvantages - Lightweight concrete - Lightweight 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,

UNIT – IV: Hardened Concrete – Testing, Elasticity, Creep & Shrinkage

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 – Flexure tests –Split tensile tests – Non-destructive testing methods - Demo on above tests

Elasticity, Creep & Shrinkage: Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Measurement of creep-Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage.

UNIT – V: Concrete Mix Design

Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by BIS method of mix design. Designing of two or three mix proportions and testing in the laboratory.

Text Books

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

Reference Books

1. Concrete Technology, M.L.Gambhir, 3rd edition Tata Mc. Graw Hill Publishers, New Delhi
2. Concrete Technology by A.R. Santha Kumar, Edition-2013, Oxford University Press, New Delhi.
3. Design of Concrete Mixes by N.Krishnam Raju,2nd edition, CBS Publishers & Distributors
4. IS 456:2016 Plain and Reinforced Concrete - Code of Practice.
5. Concrete – Microstructure, properties and materials, fourth edition, P.Kumar Mehta/ Paulo J.M. Monteiro, Mc Graw Hill Education (india) Private limited, Chennai.
6. IS 10262 - 2009. Guidelines for concrete mix design and proportioning.

* * *

PYTHON PROGRAMMING

II Year – II Semester

Lecture : 2	Practical : 2	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To introduce Scripting Language.
- To explore various problems solving approaches of computer science.
- To be familiarized with general coding techniques to solve object-oriented programming concepts.

Course Outcomes

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

- solve coding tasks related to fundamental and control statements.
- design structured programs using functions.
- differentiate mutable and immutable data types.
- understand and apply the concepts of exceptions and file handling.
- analyze the importance of object-oriented programming over structured programming.

Course Content

UNIT – I: Basics of Python Programming and Control Statements

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

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

Problem Solving: Write a Python Program

1. to compute distance between two points taking input from the user (use Pythagorean Theorem)
2. to print out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10, using a while loop,
3. to find the factorial of given number using do-while loop,
4. find the sum of all the primes below hundred.

UNIT – II: Functions and Strings

Functions-Function Definition, Call, Return Statement, Types of Argument, Recursive Functions, Modules.

Strings -Basic String Operations, String Formatting Operator, Built-in functions.

Problem Solving: Write a Python Program

1. to create a function cumulative_product to compute cumulative product of a list of numbers.
2. to create a function compute_gcd and compute_lcm of two numbers (Each function shouldn't exceed one line).
3. that accepts a string from a user and re-displays the same after removing vowels from it.
4. to create a function to reverse a given string.

UNIT – III: Tuples, Lists and Dictionaries

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

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

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

Problem Solving: Write a python program to

1. swap two values using Tuple assignments.
2. scan an email address and form a tuple of user name and domain name.
3. print sum and average of the elements present in the list.
4. form a list of first character of every word present in another list.
5. count the number of characters in the string and store them in a dictionary.
6. print maximum and minimum value in a dictionary.

UNIT – IV: Exception Handling and File Handling

Exception Handling-Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

Files-File types, File path, File operations-open, close, read, write, file positions and command line arguments.

Problem Solving: Write a python program to

1. handle division by zero exception.
2. create a user-defined exception named "ShortInputException" that raises when the input text length is less than 3.
3. print each line of a file in reverse order.
4. compute the number of characters, words and lines in a file.
5. copy contents of one file into another file.

UNIT – V: Object Oriented Programming in Python

Classes, objects, 'self' variable, Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.

Problem Solving: Write a python program to

1. create a class that stores the name and marks of students using classes. (use list to store marks in 3 subjects).
2. to create a class having instance variables and then get and set those values using getter and setter methods.
3. implement multiple inheritance.

Text Books

1. Reema Thareja, "Python Programming – Using Problem Solving Approach ", Oxford University Press, 2014 Edition.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books

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

* * *

FLUID MECHANICS & HYDRAULIC MACHINES LAB

II Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

- To impart the knowledge on flow measurement through closed conduit/tank/channel.
- To understand the working principles of various types of hydraulic machines by conducting laboratory experiments.
- To verify the principles of channel flow and to draw the performance curves for various hydraulic machines.

Course Outcomes

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

- calculate the discharge in pipes.
- measure the discharge in channels.
- calculate the various losses in pipes.
- draw the velocity diagrams due to impact of jet on vanes
- draw the performance curves for hydraulic turbines.
- draw the performance curves for hydraulic pumps.

List of Experiments

Perform any ten experiments

1. Determination of coefficient of discharge of venturimeter.
2. Determination of coefficient of discharge of orifice meter.
3. Determination of coefficient of discharge of external mouth piece.
4. Determination of coefficient of discharge of small orifice by constant head and variable head methods.
5. Determination of coefficient of discharge of triangular notch.
6. Determination of friction factor of a given pipe line.
7. Verification of Bernoulli's equation.
8. Determination of efficiency of jet on vanes
9. Determination of efficiency of Pelton wheel turbine.
10. Determination of efficiency of Francis turbine
11. Determination of efficiency of single stage centrifugal pump.
12. Determination of efficiency of reciprocating pump

Reference Book

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

* * *

CONCRETE TECHNOLOGY LAB

II Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

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 and to introduce the concepts of non-destructive testing.

Course Outcomes

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

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

List of Experiments

i. Tests on Cement

1. Normal Consistency and Fineness of Cement.(IS:4031-PART4&1)
2. Initial and Final Setting Times of Cement.(IS:4031-PART5)
3. Specific Gravity and Soundness of Cement. (IS: 4031-PART11&3).
4. Compressive Strength of Cement.(IS:4031-PART6)

ii. Tests on Fine Aggregate

5. Specific Gravity and Bulking of Sand (IS:2386-PART3)
6. Fineness Modulus and Grading of Fine aggregate (IS:383)

iii. Tests on Coarse Aggregate

7. Specific Gravity of Coarse aggregate.(IS:2386-PART3)
8. Fineness Modulus of Coarse aggregate.(IS:2386-PART1)
9. Flakiness index of coarse aggregate.(IS:2386-PART1)
10. Elongation index of coarse aggregate.(IS:2386-PART1)

iv. Tests on Fresh and Hardened Concrete

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

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

Note: Any 10 of the above experiments should be conducted

Reference Book

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

* * *

PROGRAMMING FOR CORPORATE
(Common to CE, EEE & ME)

II Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Using Python

- Introduction to Object Oriented Programming and Principles.
- Programming Constructs
- Data Structures
- Arrays, Class, Struct,
- Trees, Searching and Sorting Algorithms
- Pointers, Exception Handling,
- Utility API, Collection
- Database Connectivity
- Reflections and Serialization
- File Handling
- Database/SQL
- Web UI

Honors Degree

INTRODUCTION TO EARTHQUAKE ENGINEERING

II Year – II Semester

Lecture	: 4	Internal Marks	: 30
Credits	: 4	External Marks	: 70

Course Objectives

- To provide coherent concepts on dynamic loading, earthquake mechanism and earthquake effects.
- To introduce concepts on structural dynamics, formation of equation of motion for single and multi-degree freedom systems and obtaining natural frequencies and mode shapes
- To impart knowledge on elastic and inelastic analyses against earthquake forces.
- To familiarize on base isolation systems, seismic dampers and other special topics related to Eearthquake Engineering.

Course Outcomes

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

- gain experience in acquiring knowledge on earthquake inputs and their effects
- understand the basics of structural dynamics and to calculate frequencies and mode shapes
- explain the Earthquake design philosophy and apply the musing Seismic coefficient method and Response spectrum method
- develop knowledge on elastic & inelastic analyses and ductility requirements.
- summarize the concepts on base isolation systems, seismic dampers and other special topics related to earthquake engineering.

Course Content

UNIT - I: Dynamic Loads and Basics Of Seismology

Static loads Vs. Dynamic loads, Types of dynamic loads, Structure of Earth,Plate tectonics, E.Q. Rebound theory, Measurement of Earthquake, Seismic waves, Seismic Zones and Earthquake effects.

UNIT - II: Dynamics for Earthquake Analysis

Theory of vibrations - Simple Harmonic Motion, Equation of motion for Single Degree of Freedom (SDOF) system and Multi-Degrees of Freedom (MDOF) system - Un-damped forced vibrations of SDOF and MODF systems, frequencies and mode shapes - Orthogonality relationship

UNIT - III: Analysis of Structures Against Earthquake Forces and Ductitlity Detailing

Earthquake Design Philosophy - Seismic coefficient method and response spectrum method, provisions of IS 1893 (part I), Fundamental concepts of inelastic response analysis against earthquake forces - Push over analysis, Ductility detailing as per IS13920 code.

UNIT - IV: Base Isolation and Seismic Dampers

Concept of Base Isolation, Isolation systems and their modelling, Seismic dampers and Energy reducing meters.

UNIT - V: Special Topics

Dynamics of soils during earthquake motion, Soil liquefaction under seismic loads, Structural control & Seismic strengthening, Seismic hazard analysis.

Text Books

1. "Basics of structural Dynamics and Aseismic Design", S. R. Damodarasamy and S. Kavitha, PHI Publications, NewDelhi.
2. "Earthquake Resistant Design of Structures", S. K. Duggal, Oxford University Press, New Delhi.
3. I. S Codes: IS1893 (PartI) and IS13920.

Reference Books

1. "Earthquake Resistant Design of Structures", Pankaj Agarwal and Manish Shrikhande, PHI, 2008, NewDelhi
2. "Dynamics of Structures", Clough & Penzin.
3. "Earthquake Engineering for Structural Design", Victor Gioncu and Febericon M, Spon Press, London & NewYork.
4. SP22 (1982) Explanatory Handbook on Codes of Earthquake Engineering, BIS New Delhi.

* * *

THEORY OF STRUCTURES

III Year – I Semester

Lecture : 3	Tutorial : 1	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

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

Course Outcomes

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

- analyse three hinged and two hinged parabolic arches.
- analyse statically indeterminate beams by moment distribution method.
- analyse statically indeterminate beams by Kani's method.
- construct influence line diagrams for obtaining the absolute maximum bending moment and absolute maximum shear force against moving loads.
- apply the approximate methods for analyzing the multi storeyed frames subjected to lateral loads and to analyse a continuous beam by using the flexibility and stiffness methods.

Course Content

UNIT – I: Three Hinged Arches

Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – Effect of temperature.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Effect of temperature.

UNIT – II: Moment Distribution Method

Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames with single bay and single storey with and without sway - Substitute frame analysis by two cycles.

UNIT – III: Kani's Method

Analysis of continuous beams including settlement of supports - Single Bay, single storey portal frames with and without sway.

UNIT – IV: Influence Lines and Moving Loads

Definition of Influence Line Diagram (ILD) - Influence lines for reactions, shear forces, bending moment - Load positions for maximum SF at a section and maximum BM at a section with Single point load, UDL longer than the span and shorter than the span. Maximum SF and BM at a given section and absolute maximum S.F and absolute maximum B.M due to single concentrated load, UDL longer than the span, UDL shorter than the span, two-point loads with fixed distance between them and several point loads Influence Lines for axial force in the members of determinate Pin Jointed Truss.

UNIT – V: Lateral Load Analysis by Approximate Methods

Application to building frames by Portal and Cantilever method.

Matrix Methods: Introduction - Application to continuous beams (Maximum of two unknowns) including support settlements up to two degree using Flexibility and Stiffness methods.

Text Books

1. Vazrani & Ratwani, Analysis of structures Vol. II, 15th Edition. Khanna Publications.
2. Dr. R. Vaidyanathan &Dr. P. Perumal, Comprehensive Structural Analysis, Vol. I, 4th Edition, 2017. Laxmi publications Pvt. Ltd., New Delhi.

Reference Books

1. Structural Analysis by Pandit and Gupta, 2nd Edition, 2015. Tata Mc Graw Hill.
2. Structural Analysis by R.C. Hibbeler, 6th Edition, Pearson Publishing Company, New Delhi.
3. Analysis of Structures by S.S. Bhavikatti, Vol. II, 4th Edition, Vikas Publications, 2013.

* * *

SOIL MECHANICS

III Year – I Semester

Lecture	: 2	Tutorial	: 1	Internal Marks	: 30
Credits	: 3			External Marks	: 70

Course Objectives

- To impart knowledge on the basic and engineering properties of soils.
- To familiarize with stress distribution due to self-weight of soils and due to externally applied loads.

Course Outcomes

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

- explain the soil formation, volumetric relationships, consistency and classify the soil.
- evaluate the stresses and permeability of soil.
- explain the seepage through soils and compaction of soils.
- calculate consolidation characteristics of soils.
- determine shear parameters of soils.

Course Content

UNIT – I: Basic Properties of Soils

Soil formation – soil structure and clay mineralogy – Mass volume relationship – Phase relations – plasticity characteristics of soils – Consistency limits and Indices – Grain size distribution – I.S. soil Classification and Unified soil classification.

UNIT – II: Stresses in Soils & Permeability

Concept of effective and neutral stresses – effect of water table – Vertical stress distribution in soils – Boussinesq's equation – point load, Line load - Newmark's chart – Pressure bulb –Westergaard's equation.

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

UNIT – III: Seepage & Compaction

Seepage: Flow net– Laplace's equation –Characteristics of flow net–Uses of flow net.

Compaction: Mechanism of compaction— Standard proctor's compaction – Modified proctor's compaction – Factors affecting compaction – Field compaction methods – Compaction control.

UNIT – IV: Consolidation

Spring Analogy mechanism – Terzaghi's theory of one-dimensional consolida-

tion– Over consolidated and normally consolidated clay – Determination of void ratio at various load increments – Determination of coefficient of consolidation – pre consolidation pressure.

UNIT – V: Shear Strength

Mohr circle – Characteristics- Principal Planes and Principal stresses – Mohr - Coulomb's strength criterion – Factors affecting shear strength – Types of shear tests– Direct shear – Tri-axial compression– Drainage conditions – UCC – Vane shear.

Text Books

1. Soil Mechanics and Foundation Engineering by K.R. Arora, 7th Edition, Standard Publishers and Distributors, Delhi.
2. Basic and Applied Soil Mechanics by Gopal Rajan and Rao A.S.R., 3rd Edition, New Age International Publishers, New Delhi, 2006.
3. Principles of Soil Mechanics and Foundation Engineering by V.N.S. Murthy, 5th edition, UBS Publishers and Distributors Ltd., New Delhi, 2001.

Reference Books

1. Geotechnical Engineering by C. Venkataramaiah, 3rd Edition, New Age International (P) Ltd. Publishers, New Delhi, 2006.
2. Geotechnical Engineering by Manoj Dutta & Gulati S. K, 1st Edition, Tata McGraw-Hill Publishers New Delhi.
3. Soil Mechanics by T.W. Lambe and Whitman, 1st Edition, McGraw-Hill Publishing Company, New York.
4. Karl Terzaghi, Soil Mechanics in Engineering Practice, Read Books, 2010.

* * *

WATER AND WASTEWATER ENGINEERING

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To make the students conversant with sources, demand, quality of water, water treatment processes and its design
- To provide adequate knowledge on Pumps, conveyance, distribution of water and sewage treatment processes in primary treatment.
- To have adequate knowledge about various sewage treatment processes in secondary treatment.

Course Outcomes

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

- identifywater sources and assessdemand and quality.
- understand water treatment processes and design of various water treatment units.
- select the water pumps, conveyance, and distribution systems.
- determine characteristics of sewage and design of primary treatment units.
- understand secondary treatment processes and design of secondary treatment units.

Course Content

UNIT – I: Water Sources, Demand and Quality

Sources of water; Water demand and quality – design period, population forecasting methods, rate of demand, factors affecting rate of demand, fluctuations in rate of demand; Characteristics of water - physical, chemical and biological; Drinking water quality standards as per IS and WHO.

UNIT – II: Water Treatment

General outline of various treatment units for surface and ground water; Processes theory- aeration, settling velocity, sedimentation, coagulation, softening, filtration and disinfection; Design - design of screening, and sedimentation tank.

UNIT – III: Water Pumps, Conveyance and Distribution

Necessity of pumping; Types of pumps; Pipe appurtenances; Methods of distribution; Pressure in distribution mains; Layout of distribution system; Analysis of pressure in distribution system – equivalent pipe method.

UNIT – IV: Wastewater Primary Treatment

Characteristics of wastewater - physical, chemical, oxygen demand, biochemi-

cal oxygen demand (BOD), chemical oxygen demand (COD), Theoretical Oxygen demand (ThOD); Primary treatment processes theory;Design - design of screens, grit chambers, and sedimentation tank.

UNIT – V: Wastewater Secondary Treatment

Secondary treatment – Suspended growth process theory; Design of an activated sludge reactor, design of oxidation pond; Attached growth process theory; Design of trickling filter, septic tank.

Text Books

1. Water supply Engineering-Environmental Engineering Vol. I by S.K. Garg, Khanna Publishers, 2019.
2. Sewage Disposal and Air Pollution Engineering–Environmental Engineering Vol. II by S.K. Garg, Khanna Publishers, 2019.
3. Water Supply Engineering by Punmia B. C., Ashok Jain & Arun Jain, Laxmi Publication Pvt., Ltd., New Delhi, 2014.
4. Wastewater Engineering by Punmia B. C., Ashok Jain & Arun Jain, Laxmi Publication Pvt., Ltd., New Delhi, 2014.

Reference Books

1. Environmental Engineering by Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, McGraw Hill Inc., New York, 2017.
2. Water Works Engineering Planning, Design and Operation by Syed R. Qasim and Edward M. Motley Guang Zhu, Prentice Hall of India Learning Private Limited, New Delhi, 2016.
3. Water and Wastewater Technology by Mark J. Hammer and Mark J. Hammer Jr, Person New International Edition, 7th Edition, 2013.

* * *

Professional Elective - I

ADVANCED CONCRETE TECHNOLOGY

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To understand the structure of hydrated cement paste and mechanism of admixtures
- To familiarize with the mix design procedure for given grade of concrete.
- To impart the knowledge about durability of concrete and special concretes

Course Outcomes

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

- learn about hydrated products and properties of concrete
- know the mechanism of admixtures and their effect on concrete
- design the concrete mix by using various methods
- determine the various durability parameters
- explain the various special concretes and their uses

Course Content

UNIT – I: Cement Paste

Portland cement – chemical composition – Importance of Bogue's compounds and their reactions – formations of hydrated products – Structure of a Hydrated Cement Paste – porosity of paste and concrete – transition Zone – Elastic Modulus– Factors affecting strength and elasticity of concrete.

UNIT – II: Admixtures

Chemical Admixtures: Mechanism of chemical admixture–Plasticizers andsuper Plasticizers and their effect on concrete property in fresh and hardened state – Marsh cone test for optimum dosage of super-plasticizer – retarder – accelerator – Air-entraining admixtures – new generation super-plasticizer.

Mineral Admixtures: Fly ash–Silica fume–GGBFS and their properties

UNIT – III: Mix Design

Factors affecting mix design – design of concrete mix using admixture (fly ash) by BIS method (IS10262) and current American (ACI)/ British (BS) methods.

UNIT – IV: Durability Of Concrete

Introduction – Permeability of concrete – chemical attack – efflorescence – Corrosion in concrete – Thermal conductivity – thermal diffusivity – Alkali Aggregate Reaction – IS456 requirement for durability

UNIT – V: Special Concretes

Design and manufacture of Self compacting concrete – High performance concrete– Ultra high strength concrete – High density concrete – Ready mix concrete.

Text Books

1. M.S. Shetty, Concrete Technology theory and practice, S. Chand& Co., Seventh Edition – 2016
2. A.M. Neville, Properties of Concrete, Pearson publishers, Seventeenth edition, 2014.

Reference Books

1. P. Kumar Mehta and Paulo J.M. Monteiro, Concrete Microstructure, Properties and Materials, McGraw-Hill Education Private Limited, Fourth Edition
2. M.L. Gambhir, Concrete Technology, Tata McGraw-Hill Education Private Limited, New Delhi, Fifth edition
3. N. Krishnam Raju, Design of Concrete Mixes, CBS Publishers, 2nd Edition, & IS 456:2000 Plain and Reinforced Concrete - Code of Practice

* * *

Professional Elective - I

PROJECT PLANNING AND CONRTROL

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To define the importance of project management (PM) for construction projects.
- To identify the need of economics, management aspects and construction process.

Course Outcomes

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

- apply the principles of Organization, planning, scheduling, and monitoring.
- adopt the applications of networking techniques in planning & scheduling of simple & complex engineering projects.
- compare the alternative cash flow methods.
- determine bidding strategies.
- apprise financial management of construction equipment.

Course Content

UNIT – I: Elements of Management

Project organisation, structure of construction organisation, organisation for project management, management levels, traits of a project manager, ethical conduct of the engineer, construction organisation. Function of construction management - Planning, scheduling monitoring, construction stages.

UNIT – II: Network Techniques and Cost Model

Network Techniques: Bar charts, milestone charts, work break down structure and preparation of networks. Application of network Techniques like PERT, CPM, AON, AOA and precedence diagram in construction management.

Cost Model: Project cost, Indirect & direct project cost, slope of direct cost curve, total project cost and optimum duration, steps in time cost optimisation.

UNIT – III: Engineering Economics

Time value of money, Economic Decision making, Cash flow Diagrams, project cash flow diagrams, using cash flow diagrams, using interest tables, Present economy studies, Evaluating Alternative by Equivalence, financing of projects, economic comparison present worth method,ROR, Annual Cost and worth comparison, Effect of Taxation on comparison of alternatives, Effects of inflation on cash flow, benefit/cost criteria.

UNIT – IV: Contractors Estimation of Cost and Bidding Strategy

Estimation and bidding strategy, determining bidding price, bidding models, cash flow-based models, prevailing estimation practice, statistical/ mathematical tools in estimation, break up of mark up, labour cost estimation, plant and equipment cost estimation, dealing with uncertainties, Average range of mark up, mark up distribution.

UNIT – V: Equipment Management

Plant and equipment Acquisition, Depreciation, Methods of calculating depreciation, straight line method, sum of years method, declining balance method, accelerated depreciation method, sinking fund method, evaluating replacement alternatives, sensitivity analysis, break even analysis.

Text Books

1. Project planning and control with Pert and CPM by Dr. B.C. Punmia & K.K Khandelwal, Laxmi Publications Pvt Ltd;4th edition.
2. Construction project Management - theory and practice by Kumar Neeraj Jha, Pearson Education India, 2nd edition.
3. Construction Management and Equipment by Saurabh Kumar Soni, Katson Books, 2nd edition.

Reference Books

1. Project Management by Harvey Maylor, Mac Millan India Ltd., Delhi, Edition-2.
2. Construction Management & Planning by B. Sengupta& H. Guha, TataMcGraw – Hill Publishing Co. Ltd., New Delhi.

* * *

Professional Elective - I

AIR POLLUTION AND CONTROL

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To study sources and classification of air pollution and understand fundamentals of meteorology and stability of atmosphere
- To learn about the different air pollutants and control
- To knowthe air pollution legislation and regulations

Course Outcomes

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

- identify sources and types of air pollutants
- understand meteorological effect on air quality changes
- choose the appropriate techniques for removal of particulate pollutants
- choose the appropriate techniques for removal of gaseous pollutants
- understand air pollution legislations and regulations

Course Content

UNIT – I: Sources and Classification of Air Pollution

Definitions; Significance;Types of pollutants; Sources and impacts on plants, animals, materials; Classifications - natural and artificial, primary and secondary, point and non-point, linear and areal sources, stationary and mobile; Ambient air quality standards by World Health Organization (WHO) and Central Pollution Control Board (CPCB).

UNIT – II: Air Pollution Meteorology

Composition and structure of the atmosphere; Atmospheric dispersion- Pressure, Wind, Moisture; Meteorological factors influencing air - heat, pressure, wind forces, moisture and relative humidity; Lapse rates – Environmental Lapse rate, Adiabatic Lapse rate; Influence of terrain and meteorological phenomenon on plume behaviour and air quality; Wind rose diagrams.

UNIT – III: Particulate Matter and Control

Sources; Emission factors; Control techniques - control at sources, process changes, equipment modifications; Control Equipment - Working Principles and Operation - Settling chambers, Cyclone separators, Fabric filters, Scrubbers, Electrostatic precipitators.

UNIT – IV: Gaseous Pollutants and Control

Control of gaseous pollutants – Modification of operating conditions, modification of design conditions; Effluent gas treatment methods – Combustion- Direct flame combustion, Thermal Combustion, Catalytic Combustion; Absorption – Spray towers, Packed towers; Adsorption – Types of adsorbents, Multiple Fixed bed adsorber, Fluidized adsorber bed, Condensation – Surface Condenser, Contact Condenser; Air-fuel Ratio.

UNIT – V: Air Pollution Legislation and Regulations

The Air (Prevention and Control of Pollution) Act, 1981 - Constitution of the Board, Functions of Central and State Board, Emission Standards, Penal Provisions of the Act; Case studies – Bhopal gas Tragedy, London Smog, and Present Scenario of Delhi.

Text Books

1. Air Pollution by M.N. Rao and H.V.N. Rao, 1st Edition, McGraw Hill Education.
2. Air Pollution and Control by K.V.S.G. Murali Krishna, 1st Edition, University Science Press, Laxmi Publisher.
3. Sewage Disposal and Air Pollution Engineering, Environmental Engineering Vol. II by S.K. Garg,Khanna Publishers.

Reference Books

1. Environmental Impact Assessment Methodologies by Y. Anjaneyulu and V. Manickam, 2nd edition, B.S. Publication.
2. Environmental Engineering by Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, McGraw Hill Inc., New York, 2017.

* * *

Professional Elective - I

ADVANCED SURVEYING TECHNIQUES

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To know the significance of advanced surveying in field measurements in terms of utility and precision of data collection.
- To learn the principles of Electromagnetic distance measurement and their accuracy.
- To get introduced to the concept of Topographic, Aerial and project survey.

Course Outcomes

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

- explain the process of EDM in distance measurement and traversing.
- analyse the concept of Topographic survey.
- understand the concepts of Aerial survey.
- apply different concepts in project survey.
- outline the GPS in transportation engineering, structural engineering and land use planning.

Course Content

UNIT – I: Electromagnetic Distance Measurement (EDM)

Introduction – Electromagnetic waves – Basic definitions – distance from measurement of Transit Time – Measurement of Distance from Phase Difference – Electro-optical EDM instruments – Infrared EDM Instruments – Microwave EDM Instruments.

UNIT – II: Topographic Surveying

Scales of Maps – Planning a Topographic Survey –Methods of Establishing Horizontal Control – Establishing Vertical Control – Instruments for location of details.

UNIT – III: Aerial Survey

Aerial Photograph – Definitions – Scale of Vertical Photograph – Scale of Tilted Photograph – displacements and Errors in Aerial Photogrammetry – Procedure of Aerial Survey.

UNIT – IV: Project Surveying

Detailed surveys – Horizontal Control – Vertical Control – Survey of a Bridge – Survey of a Dam – Survey of a Tunnel – Capacity of a Reservoir.

UNIT – V: Global Positioning System

Introduction – System Design Considerations – GPS System elements – Calculation of User position – DGPS – -applications of GPS in Civil Engineering.

Text Books

1. Surveying by Duggal S.K., Vol. II,3rd Edition, Tata McGraw Hill.
2. Remote Sensing and Geographical Information Systems by M. Anji Reddy, 4th Edition B.S. Publications.
3. Surveying by Arora, K. R., Vol. III, Standard Book House, 2010.

Reference Books

1. Remote Sensing and GIS by Basudeb Bhatta,2nd Edition, Oxford University Press
2. Global Positioning System by Satheesh Gopi, Tata McGraw, 2005

* * *

GEOTECHNICAL ENGINEERING LAB

III Year – I Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

- To introduce the tests for determining the dry density of soils.
- To evaluate the engineering properties of the soil.
- To familiarize with different test procedures for obtaining shear strength of soils.

Course Outcomes

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

- calculate the discharge in pipes.
- conduct index tests and classify the soils
- determine in-situ density and compaction parameters of soils.
- determine the shear strength parameters of soils
- identify the engineering properties of the soils

List of Experiments

Perform any 10 of the following 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 Tri-axial 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 Cohesion less Soils.

15. Determination of Coefficient of Permeability of the Soil by Variable (Falling) Head method.

Reference Book

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

* * *

WATER AND WASTEWATER ENGINEERING LAB

III Year – I Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

- To analyze physical, chemical characteristics of water and wastewater.
- To determine optimum dosage of coagulant, and residual chlorine.
- To estimate organic strength of wastewater.

Course Outcomes

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

- apply the different analysis techniques for the measurement physical and chemical treatment required water.
- quantify of coagulant to remove turbidity of water.
- determine residual chlorine demand for water.
- recommend the degree of treatment required for the wastewater.
- estimate performance of biological treatment plant.

List of Experiments

Perform any 10 of the following experiments

1. Determination of pH and conductivity.
2. Determination of turbidity.
3. Determination of Acidity of water.
4. Determination of Alkalinity of Water.
5. Determination of Chlorides.
6. Determination of Hardness of water.
7. Determination of Fluorides.
8. Determination of sulphates.
9. Determination of Residual Chlorine.
10. Conducting Jar test for determining optimum dosage of coagulant.
11. Determination of Dissolved Oxygen.
12. Determination of Chemical Oxygen Demand.
13. Determination of Biochemical Oxygen Demand.
14. Determination of total suspended solids, total dissolved Solids and satiable solids.
15. Determination of total organic and inorganic solids.

Reference Book

1. Environmental Engineering Laboratory Manual by Kotaiah. B, and Kumara Swamy. N, Charotar Publishing House Pvt. Ltd., 1st Edition., 2007.
2. Standard Methods forthe examination of water and wastewater. (2012). 21st Edition,Washington; APHA.
3. Chemistry for Environmental Engineering and science by Sawyer, C.N, McCarty, P.L, and Perkin. G. F, 5th Edition, McGraw-Hill Inc., 2002.

* * *

BUILDING DRAFTING STUDIO LAB

III Year – I Semester

Lecture : 1	Practical : 2	Internal Marks	: 15
Credits : 2		External Marks	: 35

Course Objectives

- To analyze physical, chemical characteristics of water and wastewater.
- To define the role of different software that appreciates the drafting process for construction buildings.
- To familiarize with drafting commands in the software platform that support and complete the drafting of the desired building/elements.

Course Outcomes

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

- apply the drafting skills in developing the building models
- develop the building elements using drafting software's.
- plan and draft both 2D and 3D building models using the software

List of Experiments

Perform any 10 of the following experiments

The below experiments can be performed using software's such as Sketch up, Proge CAD, Auto Cad, Revit, Bentley etc.

1. Essentials and orientation of drafting tools within the software.
2. Drafting a residential building plan.
3. Drafting a public building.
4. Drafting an OHSR
5. Drafting a bridge structure
6. Draft a layout for an area that suits apartment satisfying building codes, NBA etc.
7. Draft an elevation view for a multi-story building/ apartment building.
8. Draft a 3D model for a school building.
9. Draft a 3D model for a bridge structure.
10. Draft a sectional view of a residential building.
11. Draft a 3D model for a residential building.
12. Draft a 3D model for a public building.

* * *

PROBLEMS SOLVING ENHANCEMENT
(Common to CE, EEE & ME)

III Year – I Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Number System

- Divisibility
- Numbers and Decimal Fractions
- Number System and HCF & LCM

Mensuration

- Geometry
- Shapes, Area & Perimeter

Arithmetic Ability

- Ages
- Averages
- Equations
- Probability
- Percentages
- Profit & Loss
- Work and Time
- Clocks and Calendar
- Ratios and Proportion
- Series and Progressions
- Allegations and Mixtures
- Distance , Speed and Time
- Permutations and Combinations

Honors Degree

THEORY OF ELASTICITY AND PLASTICITY

III Year – I Semester

Lecture : 3	Practical : 2	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- To determine the stress and strain relations and in Cartesian coordinate systems.
- To solve 2D Cartesian coordinate system using generalized Hooks law and Airy's stress functions.
- To determine the stress and strain relations and in polar coordinate systems.
- To solve elementary problems of axi-symetry and 3D Coordinate systems
- To understand and relate simple plasticity theory concepts.
- To correlate and apply the theory of elasticity to solve civil engineering solutions.

Course Outcomes

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

- demonstrate the application of plane stress and plane strain in a given situation.
- impart the knowledge of stress-strain relations for linearly elastic solids, and Torsion.
- demonstrate the ability to analyze the structure using plasticity.

Course Content

UNIT - I: Stress and Strain

Concept of stress at a point, stress tensor, stress on inclined plane, stress components on a rectangular parallelepiped in Cartesian coordinate system, derivation of stress equilibrium equations, transformation of stresses, stress invariants. The state of strain at a point, strain displacement relations, strain compatibility condition and stress compatibility conditions.

UNIT - II: Stress-Strain Relationship Ress and Strain

Generalized Hooke's law for Isotropic, Orthotropic, Transversely Isotropic materials, plane stress, plane strain and axisymmetric problems, Problems in 2D Cartesian coordinate system, Airy's stress function, Airy's stress function approach to 2-D problems of elasticity, simple problems of bending of beams.

UNIT - III: Polar Coordinate System

Relationship between Cartesian and Polar coordinate system, Equilibrium equations, Strain displacement relations, Stress-strain relationship, Strain-

displacement relationship for plane stress and plane strain conditions, Bending of curved bar, Stress concentration problems.

UNIT - IV: Axisymmetric Problems

Equilibrium equations, Strain displacement relations, Stress-strain relationship, Stress compatibility equations, Plane stress and Plane strain conditions. Cylinders subjected to internal and external pressure. Elementary problems of elasticity in three dimensions: Stretching of a prismatic bar by its own weight, twist of circular shafts, torsion of non-circular sections, membrane analogy, and propagation of waves in solid media, applications of finite difference equations in elasticity.

UNIT - V: Plastic Behavior and Failure Theories

Stress – strain diagram in simple tension, perfectly elastic, Rigid – Perfectly plastic, Linear work – hardening, Elastic Perfectly plastic, Elastic Linear work hardening materials. Failure theories, yield conditions, stress – space representation of yield criteria through Westergaard stress space, Tresca and Von-Mises criteria of yielding.

Text Books

1. Theory of Elasticity by S.P. Timoshenko and J.N. Goodier, 3rd Edition 2010, Tata McGraw Hill.
2. Theory of Elasticity by Sadhu Singh,4thEdition2007,Khanna Publishers.
3. Theory of Elasticity and Plasticity by H.Jane Helena 2017 edition, PHI Publishers.
4. Plasticity: Theory and Application by Alexander Mendelson,1968,The Macmillan,New York Collier-Macmillan Limited, London.

Reference Books

1. Foundations of Solid Mechanics by Y.C.Fung, 1st Edition 1977, Prentice – Hall.Inc.
2. Theory of Plasticity by J. Chakrabarty, 2008, 3rd Edition, Elsevier.
3. Advanced Mechanics of Solids by L.S Srinath, 2008, 2nd Edition, Tata McGraw Hill,.

* * *

FOUNDATION ENGINEERING

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the soil exploration techniques.
- To familiarize with lateral earth pressure.
- To impart the knowledge on load carrying capacity of shallow and deep foundations.

Course Outcomes

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

- choose suitable type of boring and generate soil investigation report.
- verify stability of slopes.
- calculate bearing capacity of shallow foundations.
- estimate the load carrying capacity for different types of piles.
- adopt proper construction and remedial measures of well foundations.

Course Content

UNIT – I: Soil Exploration

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

UNIT – II: Slope Stability

Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method - Taylor's Stability Number.

UNIT – III: Shallow Foundations

Principle of design of footing, proportioning footings for equal settlement, mat foundation - Rectangular and trapezoidal combined footings,bearing capacity– criteria for determination of bearing capacity– factors influencing bearing capacity– analytical methods to determine bearing capacity– Terzaghi, and IS code methods.

UNIT – IV: Pile Foundation

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

UNIT – V: Well Foundation

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

Text Books

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

Reference Books

1. Basic and Applied Soil Mechanics, Gopal Ranjan& ASR Rao,3rd Edition, New Age International Pvt. Ltd, New Delhi
2. Geotechnical Engineering, C. Venkataramiah,6th Edition, New age International Pvt. Ltd, (2002)
3. Foundation Analysis and Design, Joseph E. Bowles, 5th Edition, McGraw-Hill

* * *

HYDROLOGY & IRRIGATION ENGINEERING

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To study occurrence movement and distribution of water that is a prime resource for development of a civilization.
- To provide an overview and understanding of Unit Hydrograph theory and its analysis.
- To discuss the relationships between soil, water and plant and their significance in planning an irrigation system

Course Outcomes

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

- identifywater sources and assessdemand and quality.
- measure and analyse the rainfall in any given areaand develop intensity-duration-frequency curves, apply various methods for estimating precipitationlosses
- determine runoff in a catchment and prepare the unit hydrograph which in-turn determines the runoff for any given rainfall
- estimate flood flow in the river and carryout 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 pattern sand determine the quality and quantity of water required for a crop

Course Content

UNIT – I: Hydrologic Cycle and Abstractions

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.

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 – II: 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 – III: 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 – IV: Ground Water

Ground Water Occurrence: Ground water hydrologic cycle, origin of groundwater, 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 – V: 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. Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture tension, Consumptive use, estimation of consumptive use, duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies.

Text Books

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

Reference Books

1. Engineering Hydrology byK. Subramanyam, fourth edition, Tata McGraw-Hill.
2. Hydrology principles, analysis and designby H.M Raghunath, revised second edition, New Age International Publishers.

* * *

DESIGN AND DRAWING OF R C STRUCTURAL ELEMENTS

III Year – II Semester

Lecture : 2	Practical : 2	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To familiarize with the different types of design philosophies and IS:456-2000 provisions.
- To introduce the concepts of shear, torsion, bond and limit state of collapse and serviceability for analysis and design of structural elements for flexure along with detailing and drawings.
- To enable the students to learn design of different compression members and footings.

Course Outcomes

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

- explain the fundamental behaviour of RCC structures and utilize different types of design philosophies.
- analyze the beams subjected to shear, bond, torsion and serviceability.
- analyze and design the beams for flexure in limit state of collapse and serviceability.
- design the one-way and two-ways labs for flexure in limit state of collapse and serviceability.
- design the columns and footings with detailing.

Course Content

UNIT – I: 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, balanced, under-reinforced and over-reinforced sections

Limit State Design: 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: Design for 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. Design example in simply supported, detailing and Limit state design of serviceability for deflection, cracking and code provisions.

UNIT – III: Analysis and Design for Flexure

Limit state analysis and design of singly reinforced, doubly reinforced, rectangular, T beam sections: simply supported, cantilever and continuous beams-Examples with detailing.

UNIT – IV: Design of Slabs

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

UNIT – V: Design of Columns and Footings

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

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.
2. Reinforcement detailing of continuous beams
3. Detailing of one way, two way and continuous slabs
4. Reinforcement particulars of columns and footings

Final 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 ofR.C structural elements which one question is to be answered. Part B should consist of five questions and 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 : IS456 : 2000, IS 875 (Part I & II).

Reference Books

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

* * *

HIGHWAY ENGINEERING

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize with different concepts in the field of highway engineering
- To acquire design principles of highway geometric and pavements
- To understand causes and types of failures in pavements

Course Outcomes

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

- plan the alignment of highway network.
- design the highway geometric elements.
- identify the suitability of pavement materials.
- design flexible pavement and understand the various design considerations in rigid pavements.
- identify various types of pavement failures and causes.

Course Content

UNIT – I: Highway Planning and Alignment

Importance of transportation; Modes of transportation; Characteristics of road transport; scope of highway engineering; necessity of highway planning; classification of roads; Road Patterns; Highway Planning in India; highway Alignment - requirements of ideal alignment, factors controlling alignment; engineering surveys for highway location

UNIT – II: Highway Geometric Design

Design Controls and Criteria; Highway Cross Sectional Elements; Sight distance- Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontal Alignment- Superelevation, Radius of horizontal curve and Extra widening, transition curve; Vertical alignment- Gradients, Vertical curves

UNIT – III: Highway Materials

Stone Aggregate–Desirable properties of road aggregates, Tests for road aggregates; Bituminous Materials- Requirements of Bitumen, Tests on Bitumen; Marshall Method of bituminous mix design.

UNIT – IV: Highway Pavement Design

Objects and requirements of pavement, Types of pavements, Factors to be considered in design of pavement, Design of flexible pavement by C B R method, General design considerations for rigid pavements.

UNIT – V: Highway Construction and Maintenance

Highway construction- Construction of Earthen roads, WBM roads, bituminous pavements and cement concrete roads; Need for highway maintenance, General causes of pavement failures, Classification of maintenance works, Pavement failures – typical flexible pavement failures, Typical rigid pavement failures.

Text Books

1. Highway Engineering by S. K. Khanna, C. E. G. Justo and A. Veeraragavan, Revised 10th Edition, Nem Chand and Bros.
2. Traffic Engineering and Transport Planning byL. R. Kadiyali, 9th Edition, Khanna Publishers.

Reference Books

1. Transportation Engineering and Planning by C. S. Papacostas and P. D. Prevedouros, 3rd Edition. Prentice Hall of India Pvt. Ltd.
2. Transportation Engineering – An Introduction by C. Jotin Khisty and B. Kent Lall, 3rd Edition, Prentice Hall of India Pvt. Ltd.

* * *

Professional Elective - II

FINITE ELEMENT ANALYSIS

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize with the fundamentals of finite element method.
- To prepare for solving one dimensional and two-dimensional problems by FEM.
- To introduce the concepts of axi-symmetric and iso -parametric formulation.

Course 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 one-dimensional elements.
- develop the stiffness matrices for various one-dimensional elements.
- solve the problems of two dimensional by FEM.
- apply the concepts of axi-symmetric and iso-parametric formulation for solving problems.

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

concepts. Stress strain relationship matrix formulation for 3D & 2D systems, and stiffness matrix for CST element, Problems on these concepts.

UNIT – V: AXI-Symmetric & ISO-Parametric Elements

Introduction, Axi-symmetric formulation, Derivation of shape function for axi symmetric triangular element, stress –strain relationship matrix, stain & stress displacement matrices- Stiffness matrix for Axi-symmetric triangular element & Problems on these concepts. 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.

Text Books

1. Introduction to Finite Elements Methods in Engineering by Tirupati R. Chandrapatla and Ashok D. Belagundu, Pearson Publishers, Fourth Edition, 2015.
2. Finite Element Analysis by Sk. Md. Jalaludin, Anuradha Publishers, Sixth Edition, 2016.

Reference Books

1. Finite Element Analysis by S.S. Bhavikatti, New Age International Publishers, Third Edition, 2015
2. Introduction to Finite Elements Method by J.N. Reddy,McGraw Hill Publishers, Fourth Edition, 2020.

* * *

Professional Elective - II

GROUND IMPROVEMENT TECHNIQUES

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

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

Course Outcomes

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

- explain Ground Improvement Techniques and Identify suitable technique from Mechanical stabilization
- illustrate suitable method of dewatering and consolidating the soil
- explain the various physical and chemical admixture stabilization of soil
- illustrate the concepts of reinforced earth systems
- enumerate the concepts of soil confinement systems& Geosynthetic material

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.

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

UNIT – V: Soil Confinement Systems and Geosynthetics

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

Geosynthetics - types, properties and applications.

Text Books

1. Engineering Principles of Ground Modification by Hausmann M.R. (1990),1st Edition, McGraw-Hill International Edition.
2. Ground Improvement Techniques by Purushotham Raj, 2nd Edition, Laxmi Publications, New Delhi.

Reference Books

1. An introduction to Soil Reinforcement and Geosynthetics by G. L. Siva Kumar Babu, 1st Edition, Universities Press.

* * *

Professional Elective - II

WATERSHED MANAGEMENT

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the concept of watershed management and understand the watershed characteristics
- To learn the principles of soil erosion and measures to control erosion and to appreciate various water harvesting techniques
- To learn land management practices for various land use/land cover

Course Outcomes

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

- calculate watershed parameters and analyse watershed characteristics to take appropriate management action.
- quantify soil erosion and design control measures.
- suggest suitable harvesting techniques for better watershed management.
- apply suitable measures for management of Wasteland, Landslide and Land drainage.
- apply appropriate models for watershed management.

Course Content

UNIT – I: Introduction and Characteristics of Watersheds

Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT – II: Principles of Erosion

Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, binding, terracing, gully control, check dams, rock-fill dams, brushwood dam, Gabion.

UNIT – III: Water Harvesting

Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, subsurface flow harvesting, stop dams, farm ponds and dugout ponds, percolation tanks.

UNIT – IV: Wasteland, Landslide and Land Drainage Management

Introduction- Causes of Waste land- Remedial measures in Wasteland management- Landslide-Effects of Landslide- Management of Landslide-Land Drainage management.

UNIT – V: Watershed Modelling

Data of watershed for modelling, application and comparison of watershed models, model calibration and validation, advances of watershed models.

Text Books

1. Watershed Management by Das MM and M.D Saikia, PHI Learning Pvt. Ltd.
2. Watershed Management by J.V.S Murthy, Second edition, New Age International Publishers.

Reference Books

1. Rainfed Agriculture and Watershed Management by P.L. Maliwal Scientific Publishers.
2. Watershed management and applications of AI by Sandeep Samantary, Abinash Sahoo and Dillip K. Ghose CRC Press.

* * *

Professional Elective - II

SOLID WASTE MANAGEMENT

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To understand sources and characteristics and acquire an understanding reduction, storage, recycling of solid waste.
- To familiarise the different waste collection systems, transfer and transport, and study the importance of processing techniques.
- To describe different disposal methods.

Course Outcomes

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

- identify sources and characteristics of solid waste.
- understand reduction, storage and recycling of solid waste
- analyse the collection route and transfer and transport
- select suitable waste processing techniques
- design a suitable sanitary landfill for disposal of solid waste

Course Content

UNIT – I: Sources and Characteristics

Sources and types of municipal solid waste; Public health and environmentalimpacts of improper disposal of solid waste; Properties of solid waste – Physical and chemical composition, changes in composition; Factors affecting waste generation rate; Elements of integrated solid waste management; Requirements and salientfeatures of solid waste management rules (2016).

UNIT – II: Source Reduction, Waste Storage and Recycling

Waste Management Hierarchy – Reduction – source reduction, Reuse and Recycling; Storage - On-site storage methods, effect of storage, materials used for containers; Segregation of solid wastes – manual, mechanical; Public health and economicaspects of open storage; Case studies under Indian conditions; Recycling.

UNIT – III: Collection, Transfer and Transport

Collection- services, types of collection systems, factors considered for laying routes; Transfer and transport – economic comparison of transport alternatives, transfer station- selection, location, transfer means and methods; Pneumatic transport.

UNIT – IV: Processing of Wastes

Objectives of waste processing; Processing techniques – Factors considered for onsite processing equipment, Mechanical volume reduction, thermal volume reduction, manual components separation; Resource recovery from solid waste-composting-aerobic and anaerobic, Thermal processing – Combustion, Incineration, Pyrolysis; Energy Recovery Systems – Options with steam turbine generator and gas turbine generator

UNIT – V: Waste Disposal

Land disposal of solid waste- Sanitary landfills – factors considered for site selection, Land filling methods and operations – Area method, trench method; Design and operation of landfills - important factors that must be considered; Capacity of disposal site.

Text Books

1. Wastewater engineering - Treatment & Reuse by Metcalf and Eddy, TATA Mc Graw Hill.
2. Sewage Disposal and Air Pollution Engineering by S.K. Garg, Environmental Engineering Vol. II, Khanna Publishers.
3. Wastewater Engineering by Punmia B.C., Ashok Jain & Arun Jain (2014), Laxmi Publication Pvt., Ltd., New Delhi

Reference Books

1. Environmental Engineering by Peavy, H.S, Rowe, D.R., and G.Tchobanoglous, McGraw Hill Inc., New York, 2017.
2. Handbook of Solid Waste Management by Frank Kreith and George chobanoglous, McGraw-Hill, 1994.

* * *

HIGHWAY MATERIALS LAB

III Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

- To impart the knowledge of aggregate properties and develop testing skills
- To impart the knowledge of bitumen properties and develop testing skills
- To study the traffic characteristics

Course Outcomes

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

- characterize the aggregates for highway construction
- conduct tests on the suitability of bitumen
- determine the traffic characteristics of a road

List of Experiments

Perform any 10 of the following 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. Design the bituminous mix by using the Marshall Stability test.

Reference Book

1. Lab Manual prepared by Department of Civil Engineering, Gudlavalleru Engineering College.
2. Highway Engineering by S. K. Khanna, C. E. G. Justo and A. Veera Ragavan, Revised 10th Edition, Nem Chand and Bros.

* * *

STRUCTURAL ENGINEERING LAB

III Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

- To develop the drawing skills by using Software
- To introduce various concepts of non-destructive testing
- To familiarize with effect of dynamic forces on structures

Course Outcomes

Upon successful completion of the course, the 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.
- Conduct Non-destructive testing on different structural elements and evaluate various parameters.
- evaluate the effect of dynamics on structures.

List of Experiments

Perform any 10 of the following experiments

Students are required to draw using software AutoCAD or Micro station:

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 one way/ Two way slabs
6. Detailing of isolated footing

Experimental Investigations:

7. Assessment of quality of concrete by UPV
8. Measurement of Cover and bar diameter by Rebar locator
9. Evaluation of permeability of concrete-by-Concrete Permeability apparatus
10. Determination of moisture content in structural elements by moisture meter
11. Determination of crack width by crack width Microscope
12. Determination of natural frequency for a rigid/ flexible structure by Shake table Apparatus

Reference Book

1. Concrete technology by M.S. Shetty,Revised Edition, 2014, S. Chand Publications
2. Basics of Structural Dynamics and seismic Design by S.R. Damodara Swamy & Kavitha, Third Edition, 2016 Anuradha Publishers,
3. Lab Manual Prepared by Faculty of civil Engineering Dept, Gudlavalleru Engineering College

* * *

LINGUISTIC COMPETENCY BUILDING
(Common to All Branches)

III Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

- Analytical skills
- Innovative and creative thinking
- A lateral mindset
- Adaptability and flexibility
- Level-headedness
- Initiative
- Teamwork
- Influencing skills
- Preparing professional resume
- Preparing for ivrs — Communication Skills evaluation tools like = VERSANT (pearson), SWAR(Aspiring Minds) Etc.

Elementary Statistics

- Mean, Median, Mode, Standard Deviation and Variance

Data Interpretation

- Tabular Data Interpretation
- Graphical Data Interpretation
- Pie Charts Data Interpretation

Simplifications & Approximations

- Simple Arithmetic Calculations

Usage of Language - Corporate Context

- Body Language and Professional Phrases
- Corporate etiquette
- protocol to be followed in Virtual Interview
- Online Meetings and Telephonic Interviews

Honors Degree

STRUCTURAL DYNAMICS

III Year – II Semester

Lecture : 2	Practical : 2	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- To impart knowledge on degrees of freedom, dynamic loading and ability to formulate dynamic equation of motion and apply them to simple dynamic problems.
- To introduce the methodology for determining the natural frequencies and mode shapes for un-damped multi-degree freedom systems- Examples on applying up to two-degrees of freedom systems.
- To create experimental knowledge on spring-mass model, obtaining frequencies and mode shapes using shake table and demonstration of important earthquake tips.

Course Outcomes

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

- apply the concept of SHM to obtain natural frequency of SDOF using different methods.
- develop differential equation of motion for undamped single degree freedom systems and two degrees of freedom systems.
- obtain the response of single degree freedom systems to harmonic, impulse and dynamic loadings.
- determine natural frequencies and mode shapes of multi-degree freedom systems (up to two degrees of freedom systems) and verify orthogonality condition.
- gain experimental knowledge on developing mass-spring models, obtaining frequencies and mode shapes using shake table

Course Content

UNIT - I: Theory of Vibrations

Elements of vibrating system- Degrees of freedom – Lumped Mass Idealization- Simple Harmonic Motion (SHM), Critical damping, Types of damping, Single Degree un-damped and damped vibrating systems – Logarithmic decrement.

UNIT - II: Introduction to Structural Dynamics

Types of dynamic loading- formulation of equation of motion by different methods- Direct equilibrium equation using Newton's law of motion, D' Alembert Principle and principle of virtual work- Examples.

UNIT - III: Undamped and Damped Single Degree Freedom System

Formation and solution for equation of un-damped SDOF system- Equivalent stiffness of spring combinations- Springs in parallel and series, Types of damping – Viscous damping, Coulomb damping and Logarithmic decrement -Examples.

UNIT - IV: Response to Harmonic and General Dynamic Loading

Response of SDOF System to Harmonic, Impulsive and General dynamic loading – Examples.

UNIT - V: Multi Degree Freedom System

Selection of degrees of freedom- Evaluation structural properties developing mass and stiffness matrices and formulation of Multi-Degrees of Freedom (MDOF) system- Equations of motion for un-damped MDOF systems- Solution of Eigen value problem to determine natural frequencies and mode shapes- Orthogonal properties of normal modes.

Laboratory Experiments

1) To determine the natural frequencies and time periods of a building from the free vibration tests.
2) To determine the natural frequencies and time periods of a building from the forced vibration tests.
3) To assess the importance of stiffness for a multi storied building.
4) To determine the natural frequencies and time periods of a simply supported beam
5) To determine the natural frequencies and time periods of a continuous beam.
6) To assess the seismic behaviour of a water tank
7) To assess the importance of liquefaction in seismic resistant studies
8) To compare the natural frequencies of water tank with bracing and without bracing.

Text Books

1. Structural Dynamicsby Mario Paz and Leigh; CBS Publishers, 1st edition 1985.
2. Structural Dynamics and A seismic Design by S.R. Damodara swamy & S. Kavitha; PHI Learning private Ltd., New Delhi

Reference Books

1. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi
2. Dynamics of Structuresby Raymond W. Clough, Joseph Penzien; M.C. Graw Hill Book Company
3. Dynamics of Structures by Clough & Penzien, McGraw Hill, New York.

* * *

ENGINEERING ECONOMICS AND FINANCIAL ANALYSIS

IV Year – I Semester

Lecture	: 2	Internal Marks	: 30
Credits	: 2	External Marks	: 70

Course Objectives

- To familiarize with the concepts of Managerial economics and its significance in achieving business objectives.
- To acquire knowledge on basic financial management aspects and develop the skills to analyze financial performance of a business unit.

Course Outcomes

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

- apply managerial economic concepts in business decision making.
- categorize Production with respect to time and cost.
- analyze various market structures and adopt right pricing method to a product.
- establish the suitable business organization with available resources
- apply the accounting rules in determining the financial results and prepare financial statements.

Course Content

UNIT – I: Introduction to Managerial Economics

Definition, Nature and Scope of Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its exceptions - Methods of Demand forecasting.

UNIT – II: Theory of Production and Cost Analysis

Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas production function. Laws of Returns. Cost Analysis: Cost concepts & BEP Analysis.

UNIT – III: Introduction to Markets & Pricing Strategies

Market structures: Types of competition, Features of Perfect competition, Monopoly.

Pricing Strategies: Cost based pricing, Demand based pricing, Competition based pricing and Strategy based pricing.

UNIT – IV: Introduction to Business Organizations

Features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company.

UNIT – V: Financial Accountancy

Introduction to Accountancy, Types of Accounts, Journal, Ledgers, Trial Balance - proforma of final accounts.

Text Books

1. Managerial Economics and Financial Analysis by A R Aryasri, TATA McGraw Hill,2nd edition.
2. Managerial Economics &Financial Analysis by P. Vijaya Kumar, N. Appa Rao, Cengage Learning, 1st edition.

Reference Books

1. Managerial Economics by H. Craig Peterson, Sudhir K. Jain and W. Cris Lewis, Pearson Education, 4th edition.
2. Economics by Samuelson. Paul A and Nordhaus W.D., Tata McGraw Hill Publishing Company Limited, New Delhi, 19th edition.
3. Fundamentals of Financial Management by Prasanna Chandra, Tata McGraw Hill Publishing Ltd., 4th edition.

* * *

ESTIMATION, COSTING & VLUATION

IV Year – I Semester

Lecture : 2	Practical : 2	Internal Marks	: 30
Credits : 3		External Marks	: 70

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, rate analysis, contracts and valuation

Course Outcomes

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

- prepare detailed and abstract estimates for civil engineering works.
- work out rate analysis.
- estimate road work quantities and prepare bar bending schedule.
- distinguish the specifications for civil works and contracts.
- 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 methods of Estimating. Methods of estimating; Main Items of work; Deduction for openings; Degree of accuracy; Units of measurement; Detailed Estimates of Buildings – Definition and Purpose of Estimation, 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 Masonry.

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 and Bar Bending Schedule

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.

Bar Bending And Bar Requirement Schedule : Quantity estimation and bar bending schedule for RCC items like roof slab, beam, column with footing.

UNIT – IV: 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. Arbitration – Arbitrator: arbitration Act, Powers of arbitrator, qualifications of arbitrator, different kinds of arbitration.

UNIT – V: 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 I to IV.

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. B.N.Dutta, Estimating and costing in civil engineering, UBS publishers, 2016, twenty-seventh edition.
2. G.S. Birdie, Estimating and Costing, Dhanapati Rai Publishers, seventh edition.

Reference Books

1. Standard Schedule of rates and standard data book, 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. S. C. Rangwala, Valuation of Real properties, Charotar Publishing House, Anand, seventeenth edition.
4. M. Chakraborthi, Estimation, Costing Specifications & valuation in civil engineering, Monojit Chakraborti publications, twenty sixth edition.
5. National Building Code of India-2016, Bureau of Indian Standards, volume 1&2, BIS publishers, 2016.

* * *

DESIGN AND DRAWING OF STEEL STRUCTURES

IV Year – I Semester

Lecture : 2	Practical : 2	Internal Marks	: 30
Credits : 3		External Marks	: 70

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.

Course Outcomes

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

- learn behavior of various elements of steel structures on the basis of codal provisions and the concepts of Plastic Analysis.
- analyze and design 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 system.
- design laterally supported and unsupported beams, design elements of welded plate girder.
- design 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 – Concept of Plastic Analysis – Idealized stress – strain curve, Full plasticity of beam section under bending – Plastic hinges, shape factors of rectangle, circle, triangle, T, channel and I sections– load factor, Classification of cross – sections as per IS code

UNIT – II: Connections

Types of connections - Riveted, Bolted and Welded connections – Rivets and riveted connections Bolted connections -Introduction - Design of ordinary and high strength friction grip bolts.

Welded connections - 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 & Built-Up Columns

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.

Built-up Columns: Introduction - Design of built-up columns, lacing system with channel sections only.

UNIT – IV: Beams & Plate Girder

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.

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

UNIT – V: Roof Trusses

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.

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

Note:

1. IS – 800 (2007), IS 875-Part III and Steel tables are permitted to use in examination Hall.
2. Welding connection should be used from Units 3 to 5.

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

Reference Books

1. IS 800: 2007 – General Construction in Steel - Code of Practice
2. Limit State Design in Structural Steel, by M. R. Shiyekar, PHI Learning Pvt. Limited, Second Edition.
3. Design of Steel Structures- Limit State Method, by S.S. Bhavikatti, Fourth Edition, I.K. International Publishing House Pvt. Limited.

* * *

Professional Elective - III

PRESTRESSED CONCRETE STRUCTURES

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

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 and Deflection.

Course Outcomes

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

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

Course Content

UNIT – I: Introduction to Pre-Stressed 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 tension Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

UNIT – II: Analysis of Pre-Stressed 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

Types of Flexural failure-Strain compatibility method - Simplified code procedure - Design of section for the limit state of collapse in flexure (Rectangular & I-Sections)

Shear and Principal Stresses-Ultimate shear resistance – Design of Shear Reinforcement

UNIT – V: Deflections of Pre-Stressed Concrete Beams

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

Text Books

1. Prestressed Concrete byN Krishna Raju,5th edition, Tata McGraw Hill Publications.
2. Prestressed Concrete Structures by N. Rajagopalan, 2nd edition, Alpha Science International Ltd.

Reference Books

1. Fundamentals of Pre-stressed Concrete by Sinha N.C. and Roy S.K,3rd edition, S. Chand & Company limited.
2. Prestressed Concrete by S. Ramamrutham,5th edition, Dhanpat rai Publications.
3. Design of Pre-stressed concrete structures by T.Y.Lin & Ned H. Burns,3rd edition, John Wiley & Sons.
4. IS 1343 -2012 Indian standard code of practice for pre-stressed concrete.

* * *

Professional Elective - III

ADVANCED FOUNDATION ENGINEERING

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

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

Course Outcomes

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

- compute the bearing capacity of foundations under abnormal conditions.
- calculate soil settlements for cohesive and cohesionless soils using advanced methods.
- calculate the load for laterally loaded piles.
- identify suitable foundation techniques in expansive soil.
- explain various machine's foundation and design requirements.

Course Content

UNIT – I: MAT Foundation

Introduction, Common types of Mat foundations, Bearing Capacity of MAT foundation, Differential settlement of mats, Design of Mat foundation by rigid and Flexible methods.

UNIT – II: Settlement Analysis

Foundation Settlement, Evaluation of modulus of elasticity, Methods of Computing settlements, Based on Theory of Elasticity, Janbu's method, Schmertmann's Method for Settlement, Skempton& Bjerrum's method for Consolidation settlement.

UNIT – III: Laterally Loaded Piles

Negative skin friction (NSF) -settlement of pile groups in sands and clays, laterally loaded piles, Winkler's Solution, Reese and Matlock Method for Cohesionless soils, Davisson and Gill method for cohesive soils, Brom's analysis.

UNIT – IV: Foundation Practices in Expansive Soils

Expansive soils; parameters of Expansive soils; causes of moisture changes in soils; effects of swelling on buildings; preventive measures; modification of expansive soils; Design of foundations in swelling soils.

UNIT – V: Machine Foundations

Types of Machine foundations; Basic Definitions; Degree of freedom of a Block Foundation; General criteria for design of machine foundations; Free and Forced Vibrations; Vibration Isolation and Control.

Text Books

1. Principles of Foundation Engineering by BM Das, 7thEdition, Cengage Learning.
2. Soil Mechanics and Foundation Engineering by K R Arora, 7thEdition, Standard Publisher Distributors.

Reference Books

1. Soil Mechanics and Foundation Engineering by VNS Murthy, 1stEdition,CBS Publishers.
2. Foundation Engineering by P.C Varghese, 9th Edition, PHI publishing Pvt. Ltd.

* * *

Professional Elective - III

HYDRAULIC STRUCTURES

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To know the principles of design of hydraulic structures on permeable foundations.
- To familiarize with various types of dams and selection of suitable type depending on site conditions.
- To impart the knowledge on design criteria of gravity dams and modes of failure.
- To provide knowledge on various hydraulic structures such as energy dissipaters, head and cross regulators and structures involved in cross drainage works.

Course Outcomes

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

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

Course Content

UNIT – I: 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 – II: 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 – III: 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 – 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: 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 by B.C. Punmia, Pande B. Lal, Ashok Kumar Jain & Arun Kumar Jain, sixteenth edition, Laxmi publications.
2. Irrigation Water Resources and Water Power Engineering by P.N Modi tenth edition, Standard Book House.

Reference Books

1. Water resources engineering by Satyanarayana Murthy Challa, second edition, New Age International Publishers.
2. Irrigation engineering and hydraulic structures by S.K Garg,Khanna publishers.

* * *

Professional Elective - III

INDUSTRIAL WASTEWATER TREATMENT

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To know the principles of design of hydraulic structures on permeable foundations.
- To study Characteristics and primary treatment methods for industrial wastewater.
- To learn physic-chemical and biological treatment techniques.
- To understand food and material industries waste treatment.

Course Outcomes

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

- identify the characteristics Industries wastewater.
- describe the required primary treatment methods for industrial wastewater.
- illustrate the required advanced treatment methods for industrial wastewater.
- suggest food industries wastewater treatment techniques.
- propose material industries wastewater treatment techniques.

Course Content

UNIT – I: Industrial Wastewater Characteristics

Characteristics - Physical, Chemical and Biological; Differences between industrial and municipal wastewater; Difficulty to generalize industrial waste characteristics; Direct, Separate, combined treatment; Effects of industrial effluents on sewers and treatment plants.

UNIT – II: Pre and Primary Treatment

Equalization-objectives, parameters that could be treated by equalization; 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, strength reduction, recirculation of industrial waste.

UNIT – III: Advanced Treatment

Nitrification and De-nitrification by biological method; Rotating biological contactor Phosphorous removal by chemical precipitation; Heavy metal removal by chemical precipitation; Precipitation reactions; Air Stripping; Adsorption; Ion exchange.

UNIT – IV: Food Industries

Manufacturing Processes, sources of waste, characteristics and Composition of waste, and waste treatment method (Chemical or Biological or Chemical and Biological)- Dairy, Sugar, Fermentation, Brewery, Distillery, and Meat.

UNIT – V: Material Industries

Manufacturing Processes, sources of waste, characteristics and Composition of waste, and waste treatment method (Chemical or Biological or Chemical and Biological) – Paper and pulp, Tannery, Textile, Steel, Cement, Mining.

Text Books

1. Waste water Treatment by M. N. Rao and A.K. Datta, Oxford & IBH Publishing Co, Private Ltd. 3rd Edition, 2017.
2. Sewage Disposal and Air Pollution Engineering by S.K. Garg, Environmental Engineering Vol. II, Khanna Publishers.

Reference Books

1. Industrial Water Pollution Control by Eckenfelder W. Jr., 3rd ed., New York, McGrawHill., 1999.
2. Environmental Engineering by Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, McGraw Hill Inc., New York, 2017.

* * *

Professional Elective - IV

ADVANCED DESIGN OF R C STRUCTURES

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with the Designs of Flat slabs and retaining walls
- To understand the loading pattern and design procedure for silos bunkers water tanks.
- To familiarize with I.R.C loads and their application on designing the R.C Bridges.

Course Outcomes

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

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

Course Content

UNIT – I: Flat Slab

Analysis and Design of Flat slab - Direct design method - reinforcement detailing, Detailed Design of Grid Floors, Shear – beam shear and punching shear, Reinforcement detailing of flat slab.

UNIT – II: Retaining Walls

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

UNIT – III: Silos, Bunkers and Chimney

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

UNIT – IV: Bridges

Introduction to concrete bridges – standards - IRC loadings, Deck Slab Bridge - Design Concepts.

UNIT – V: 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. Krishna 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 codes.

* * *

Professional Elective - IV

CONSTRUCTION TECHNOLOGY AND PRACTICES

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To be acquainted with different construction practices used in building construction.
- To familiarize with the various construction equipment used in the construction industry.

Course Outcomes

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

- develop knowledge on principles of lean construction and concreting practices
- describe various construction equipment.
- define the role of finish equipment and aggregate production.
- choose suitable items various construction and production estimation.
- demonstrate the use of information technology in construction industry.

Course Content

UNIT – I: Construction Practices

Introduction to joints in concrete structures, Classification of joints, functional joints. Concreting under special conditions- cold weather concreting hot weather concreting, underwater concreting, concreting in alkali soils, weathering of concrete. Concreting in extreme conditions hot, cold, underwater and concreting methods

Principles of lean construction- introduction, lean principles lean construction, applications of lean thinking, level of lean construction and implementation at program level.

UNIT – II: Construction Equipment

Introduction, Cost of Equipment- Procurement Cost- Operating Cost, Types of Equipment, Earthwork Equipment, De-watering Equipment, Compaction Equipment, Pile Driving Equipment.

Trucks, Hauling, Dozers, Scrapers equipment - trucks, rigid & articulated frame rare dump trucks, tractors with bottom dump trailers, capacities of trucks and hauling equipment, truck size affects productivity, calculating truck production, production issues truck performance calculations and safety.

UNIT – III: Form Work for Construction

Introduction, materials used for Formwork, requirements off good Formwork, Economy in formwork, Indian standards, sizes of form sections, loads, tolerance of form works. formwork for styles and walls, slip forms, causes of failures of Form work, design procedure, erection of forms.

Finishing equipment- operations, time estimates, find grading production greater Form.

Aggregate production- Jack crushers gyratory crushers roll crushers, impact crushers, special aggregate processing, units surge piles, Cedars, crushing equipment selection.

UNIT – IV: Dozers, Scrapers, Cranes, Draglines & Calm Shells

Introduction, performance characteristics of dozers, Dodger production estimating, types of equipment's used land clearing production estimating. Scrapers; scraper types, operations, performance charts, production cycle camera production estimating format, operational considerations. Cranes; Major Crane types, crawler cranes, lifting capacities of cranes, tower cranes-classification, selection and operations, Rated loads for tower cranes. Draglines and clam shells ; introduction calculating drag line production, factors affecting dragline production calm shells excavators, clamshell buckets, production rates of clamshell.

UNIT – V: Information Technology in Construction Industry

introduction, information flow and communication, learning organization attributes, information technology revolution, impact on construction industry, trainers roll using IT, artificial intelligence and expert system, expert systems in construction industry, relevant case study.

Text Books

1. Construction Equipments and methods by Peurifoy. R. L, Mc Graw Hill 2011.
2. Construction Engineering and Management by Dr. S. Seetharaman, Umaesh Publications, 6th edition.
3. Construction and Foundation Engineering by Jha J and Sinha S.K., Khanna Publishers, 1993.

Reference Books

1. Construction Techniques Equipment and practice by P.Purushothama Raja, Sri Krishna Publishers, Chennai 2012
2. Building construction, by Varghese, P.C, Prentice Hall of India Pvt. Ltd., New Delhi, 2007.

* * *

Professional Elective - IV

EARTHQUAKE RESISTANT DESIGN

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the basics of earthquake & structural dynamics.
- To familiarize with damages of RC buildings due to earthquakes
- To impart the knowledge of analyzing of earthquake resistant structures and design principles of shear wall.

Course Outcomes

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

- explain the earthquake mechanism and its effects
- apply the basic concepts of structural dynamics
- assess the seismic damages of RC buildings.
- estimate earth quake loads and analyze earth quake resistant structure.
- discuss on ductility considerations while designing a structure and also on design of shear wall.

Course Content

UNIT – I: Engineering Seismology

Introduction-Theory of plate tectonics, seismic waves, earthquake size, causes and effects, seismic zoning map of India.

UNIT – II: Dynamics of Single Degree of Freedom and Multi- Degree of Freedom

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: Sesmic Damages in Rc Buildings

Introduction, Reinforced concrete building construction practices, identification of damage in RC buildings –soft storey failure, floating column, plan and mass irregularities, torsion irregularities, vertical discontinuities in load path, poor quality of construction materials, damage to structural and non-structural elements.

UNIT – IV: Earthquake Analysis

Introduction– Earthquake response analysis of single and multi-storied buildings – Use of seismic coefficient and response spectrum method.

UNIT – V: Ductility Details in Earthquake Resistant Design of RC Buildings

Introduction, Impact of Ductility, Requirements for Ductility, Assessment of Ductility-Member/ Element Ductility, Factors Effecting Ductility, Ductility detailing as Per IS13920.

Design of Shear Wall: Introduction, Description of building, determination of design lateral forces, design of shear wall as per IS 13920, Detailing of reinforcements.

Text Books

1. Earthquake Resistant Design of Structures by Pankaj Agarwal & Manish Shrikhande,1st Edition, 2015, Prentice Hall of India, New Delhi.
2. Earthquake Resistant Design of Structures by S. K. Duggal,2nd Edition, 2016, Oxford University press.

Reference Books

1. Dynamics of Structures by Clough& Penzien,Second Edition, 2016, International Edition-McGraw Hill.
2. Dynamics of Structures by A.K. Chopra, 4th Edition, 2018,Pearson Education.
3. Relevant Indian Standard codes: IS-875, IS-1893, IS-4326,IS-13920.

* * *

Professional Elective - IV

RAILWAYS, HARBOURS AND AIRPORT ENGINEERING

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the basics of earthquake & structural dynamics.
- To familiarize with various components, functions and design principles of railway track geometry
- To introduce the basic components of airport and basic runway length
- To familiarize with the classifications, requirements and components of harbours & docks

Course Outcomes

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

- identify the various components and their functions of a railway track.
- design geometrics in a railway track.
- select the area required for the construction of airports as per ICAO &FAA specifications.
- determine basic runway length.
- explain classifications and functions of elements in Harbours and Ports.

Course Content

UNIT – I: Components of Railway Engineering

Permanent way and its requirements, Railway Track Gauge, Cross Section of Permanent Way, Functions of various Components like Rails, Sleepers and Ballast, Creep of Rails - Theories related to creep.

UNIT – II: Geometric Design of Railway Track

Alignment, horizontal curves, super elevation, equilibrium cant and cant deficiency, Length of transition curves, Gradients and grade compensation.

UNIT – III: Airport Planning & Design

Airport Master plan, Airport site selection, Aircraft characteristics, Zoning laws, Airport classification, Visual aids and Air traffic control

UNIT – IV: Runway Design

Runway orientation – Wind rose diagram – Basic Runway length and corrections, Geometric elements design, Taxiway design, Main and exit taxiway, Separation clearance, Holding aprons, Typical airport layouts, Terminal building, gate position.

UNIT – V: Harbours & Ports

Classifications of Harbours**,** Classification of ports – Requirement of a good port, facilities at a major Ports, Dry & wet docks, Quays, Wharves, Jetties, Break waters, Dredging, Navigational aids.

Text Books

1. Railway Engineering by Saxena and S. P. Arora, Dhanpat Rai, Revised edition 2010.
2. Airport Engineering by S. K. Khanna, M. G Arora & S. S. Jain, Nemchand Bros, 6th edition 2012.
3. Docks and Harbour Engineering by S. P. Bindra, Dhanpathi Rai & Sons, 2012 edition.

Reference Books

1. Principles of Railway Engineering by S. C. Rangwala, Charotar Publishing House, Anand.
2. Highway, Railway, Airport and Harbour Engineering by K. P. Subramanian, Scitech Publications (India) Pvt. Limited, 2010 Edition.
3. Air Transportation Planning and Design by V. Kumar and S. Chandra, Galgotia Publications Pvt. Ltd, 1999.

* * *

Professional Elective - V

REPAIRS, RETROFITTING AND REHABILITATION OF STRUCTURES

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To impart the knowledge on maintenance, inspection and assessment of distressed concrete structures.
- To assess the damage to concrete structures using various tests and strengthen measures.
- To familiarize with durability aspects, quality of concrete causes of deterioration.
- To study the various types and properties of repair materials and various precautions during retrofitting.
- To learn various repair techniques of damaged structures and corroded structures.

Course Outcomes

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

- identify and evaluate the degree of damage in structures.
- explain the concept of Serviceability and Durability.
- apply different materials for repairing.
- understand the different techniques for repair.
- select suitable retrofitting techniques.

Course Content

UNIT – I: Assessment, Maintenance and Repair Strategies

Maintenance, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration, Visual inspection, Non-Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement.

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, Recommendations as per IS 456:2000 codal provisions.

UNIT – III: Materials for Repair

Essential parameters for repair materials, Special concretes and mortar, concrete chemicals, expansive cement, Pre-Placed aggregate Concrete, Polymer Modified Mortars and concrete, Sulphur infiltrated concrete, Premixed Cement Concrete/ Mortars, Epoxy mortars/Concretes.

UNIT – IV: Techniques for Repair and Protection Methods

Rust eliminators and polymers coating for Re-bars during repair, foamed concrete and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection.

UNIT – V: Methods for Retrofitting and Rehabilitation

Repairs to overcome low member strength - Deflection, Cracking, Chemical disruption, corrosion, fire, leakage and marine exposure, Strengthening of columns, beams and slabs through Ferrocement, RCC jacketing, Plate bonding, Fiber Wrap Technique.

Text Books

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

Reference Books

1. Concrete Technology-Theory and Practice by M.S.Shetty, Edition-2006, S. Chandand Company.
2. Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures, by Ravi Shankar. K, Krishna Moorthy T.S,Edition-2004, Allied Publishers.
3. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Edition-2004, Narosa Publishers.
4. Hand book on Repair and Rehabilitation of RCC buildings,Edition-2002, Published byCPWD, Delhi.

* * *

Professional Elective - V

PRECAST CONCRETE STRUCTURES

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To impart the knowledge on maintenance, inspection and assessment of distressed concrete structures.
- To familiarize the concept of precast concrete construction.
- To impact knowledge on transport, stability and joints in precast concrete structures.
- To impact the design aspects of various precast elements.

Course Outcomes

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

- understand the IS Codal provisions and Tolerances
- illustrate various transport and erection methods of precast concrete elements.
- verify the stability of precast concrete structures under different loading conditions.
- design various special precast elements of foundations and to observe the production methods
- understand various types of joints used in precast concrete production units.

Course Content

UNIT – I: General

Advantages of factory production – Historical Development – Codal provisions - Production Process – Tolerances.

UNIT – II: Design

Transport and erection, Fire protection, Stability of precast concrete structures - Loads on stability elements – Distribution of loads Environmental influences – Verification of structure stability.

UNIT – III: Precast Elements

Structural design of floor diaphragms, vertically stable elements load bearing elements, Floor and roof beams, columns and walls.

UNIT – IV: Special Elements

Foundations - Precast R.C facades - Design of arcade fixing and connections.

Factory Production: Production methods - Types of concrete in precast concrete construction – Strength – Self compacting concrete – Heat treatment and curing Round bars and meshes, Prestressing beds Quality control.

UNIT – V: Joints Between Precast Elements

Compression joints, Butt joints, Tension joints, Welded joints, anchoring of steel plates, dowels, Studs and cast in Channels – shear dowels, Transport fixings, shear joints – General.

Text Books

1. Precast Concrete Structures by Hubert Bachmann,Alfred Steinle, Wiley India Private Ltd., New Delhi.
2. Design and Construction of Precast Concrete Structures by D.S. Ramachandra Murthy, DIPTI press, Chennai.

Reference Books

1. Precast concrete structures by Kim Eliott,A Butter worth – Heinemann Publications, Amaton.
2. Precast Concrete: Design and Applications by Hass, AMAmaxon.com

* * *

Professional Elective - V

EARTH RETAINING STRUCTURES

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To understand the concept on stability of retaining walls.
- To impart knowledge on concepts of sheet piles, braced cuts and cofferdams.

Course Outcomes

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

- determine earth pressure on a structure using various methods
- check the stability of retaining wall.
- analyze cantilever sheet pile.
- calculate the forces in braced cuts.
- explain the stability of single wall cofferdams.

Course Content

UNIT – I: Earth Pressure Theories

Lateral Earth Pressure - Types; Rankine's Theory; Coulomb's Wedge Theory; Graphical Methods – Rehbann's, Culmann's.

UNIT – II: Retaining Walls

Retaining walls – types of Retaining - Type of Failures of Retaining Walls – Principles of Design of Retaining Wall; Stability conditions- cantilever and counter fort Retaining walls.

UNIT – III: Sheet Piles

Types of Sheet piles; Cantilever sheet piles in sands and clays; Anchored sheet piles – Free earth and fixed earth support methods – Rowe's moment reduction method.

UNIT – IV: Braced Cuts

Lateral Pressure in Braced cuts – Design principles of various components of a Braced cut – Bottom Heave of a cut in clay – Stability of Bottom of a cut in sand.

UNIT – V: Cellular Coffer Dams

Types of cofferdams and uses, cell fill; stability and design of cellular cofferdams – TVA and Cummins' methods, bearing capacity, cell settlement, practical consider in cellular cofferdam.

Text Books

1. Soil Mechanics and Foundation Engineering by K R Arora, 7thEdition, Standard Publisher Distributors.
2. Principles of Foundation Engineering by Braja M Das, 7thEdition, Cengage Learning.
3. Foundation Analysis and Design by JE Bowles, 5thEdition, Mc Graw Hill Publications.

Reference Books

1. Soil Mechanics and Foundation Engineering by VNS Murthy, 1stEdition, CBS Publishers.
2. Foundation Design by WC Teng, 13thEdition, Prentice Hall Publishers.

* * *

Professional Elective - V

DESIGN AND DRAWING OF IRRIGATION STRUCTURES

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart design concepts relating to various structures
- To familiarize in the design and drawing of hydraulic structures such as surplus weir, canal regulator, trapezoidal notch fall, tank Sluice with tower head and syphon aqueduct –Type-III.

Course Outcomes

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

- design and draw various components of Surplus weir.
- design and draw various components of Canal drop - Notch type.
- design and draw various components of Syphon aqueduct–Type-III.
- design and draw various components Canal regulator.
- design and draw various components of Tank sluice with tower head.

Design and Drawing of

1. Surplus Weir
2. Canal Drop - Notch Type
3. Canal Regulator
4. Syphon Aqueduct Type–III
5. Tank Sluice With Tower Head

Text Books

1. Water resources engineering by Satyanarayana Murthy Challa, second edition, New Age International Publishers.

Reference Books

1. Irrigation and water power engineering by B.C. Punmia, Pande B. Lal, Ashok Kumar Jain & Arun Kumar Jain, sixteenth edition, Laxmi publications
2. Irrigation engineering and hydraulic structures by S.K Garg, Khanna publishers

* * *

COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB

IV Year – I Semester

Practical	: 4	Internal Marks	: 15
Credits	: 2	External Marks	: 35

Course Objectives

- To familiarize 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.

Course 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

Perform any 10 of the following experiments

PART - A: Write any Four Programs Using C or C++

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 slab.
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.

PART - B: Analyze and Design any four of the following Elements using STAAD Pro / E-TABS

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.

PART - C: 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.

Reference Book

1. .....

* * *

Honors Degree

SEISMIC RESISTANT DESIGN OF STRUCTURES

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with the damages of RC buildings and masonry buildings due to earthquakes
- To introduce the concepts on analyzing of earthquake resistant structures
- To impart knowledge on seismic soil- structure interaction and reliability analysis

Course Outcomes

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

- estimate the earthquake loads and analyze the earthquake resistant structures.
- identify the features the damages and non-damages in masonry buildings during recent past earthquakes.
- determine the design lateral loads on masonry buildings.
- explain the concepts of seismic soil - structure interaction.
- introduce on seismic reliability analysis of structures.

Course Content

UNIT – I: Earthquake Analysis

Introduction– Earthquake response analysis of single and multi-storied buildings – Use of seismic coefficient and response spectrum method.

UNIT – II: Damages and Non-Damages In Masonary Buildings and Properties of Structural Masonary

Introduction, past Indian earthquakes, Features of damages and non damages-Bhuj earthquake, Chamoli earthquake, Bihar–Nepal earthquake, Uttarkashi earthquake -Materials for masonry construction-unit, mortar, grout, reinforcement.

UNIT – III: Masonry Buildings

Introduction, determination of design lateral loads, distribution of lateral forces, determination of rigidity of shear force, determination of direct shear force and torsional shear forces.

UNIT – IV: Seismic Soil Structure Interaction

Introduction, wave propagation through sol, one dimensional wave Propagation & Ground Response Analysis, dynamic soil structure interaction, soil –pile interaction.

UNIT – V: Seismic Reliability of Structures

Introduction, Uncertainties, Formulation of Reliability problem, methods of finding probability of failures, seismic reliability analysis.

Text Books

1. Earthquake Resistant Design of Structures by Pankaj Agarwal & Manish Shri khande, 1stEdition, 2015, Prentice Hall of India, New Delhi.
2. Seismic analysis of Structures by T.K. Datta, New Edition, 2010, John Wiley & Sons Pvt. Ltd.

Reference Books

1. Dynamics of Structures by Clough & Penzien, Second Edition,2016 International Edition-Mc. Graw Hill.
2. Dynamics of Structures by A. K. Chopra,4th Edition, 2018, Pearson Education.
3. Relevant Indian Standard codes: IS-875, IS-1893, IS-4326,IS-13920

* * *

Open Elective - I

ELEMENTS OF CIVIL ENGINEERING

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

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.

Course Outcomes

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

- familiarize with basics of civil engineering.
- carryout various civil engineering survey works.
- identify the various properties of building materials and various types of buildings.
- 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 and Leveling

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.

Leveling: Objectives and applications-terminology-Instruments,component parts of dumpy level, Types of leveling, 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, Water Supply, Sanitary and Electrical Works in Building

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

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

UNIT - V: 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. Basic Civil Engineering, Dr. B.C Punmia,Ashok.K. Jain and Arun K. Jain: Laxmi Publications,Delhi.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, ArunkumarJain, 17th Edition Publisher: Laxmi Publications ,Delhi.

Reference Books

1. Surveying and Leveling, R. Subramanian, Publisher: Oxford University.
2. Building drawing, M.G.Shah, C.M.Kale and S.Y.Patki Publisher: TataMcGraw Hill.

* * *

Open Elective - I

ENVIRONMENTAL LAWS AND POLICIES

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To equip the students to have a basic awareness on environmental and socioeconomic Factors.
- To impart the knowledge of environmental pollution problem.
- To elucidate the rules and regulations of patents and trade laws.

Course 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 Environmental Engineering.
- understand different types of infringement of Intellectual Property Rights.

Course Content

UNIT - I: Introduction

Introduction to trade and environment - International environmental laws, Right to Environment as Human Right, International Humanitarian Law and Environment, Environment and conflicts management, Famous international protocols like Kyoto.

UNIT - II: Environmental Laws

Overview of environment, Nature and eco system, Concept of laws and policies, Origin of environmental law, Introduction to environmental laws and policies, Environment and Governance, Sustainable development and environment, Understanding climate change, Carbon crediting, Carbon foot print etc.

UNIT - III: Air and Noise Pollution Control Laws

Air pollutants, Sources, classification, Combustion, Processes and pollutant emission, Effects on Health, vegetation, materials and atmosphere, Reactions of pollutants in the atmosphere and their effects-Smoke, Smog and ozone layer disturbance, Greenhouse effect. Air sampling and pollution measurement methods, Principles and instruments, Overview of air pollution control laws and their mitigation measures. Sound power, Sound intensity and sound pressure levels; Plane, Point and line sources, Multiple sources; Outdoor and indoor noise propagation;

Psychoacoustics and noise criteria, Effects of noise on health; Special noise environments: Infrasound, Ultrasound, Impulsive sound and sonic boom; Noise standards and limit values; Noise instrumentation and monitoring procedure, Noise control methods.

UNIT - IV: Water Quality Laws

Introduction to water quality laws development, calibration and verification cost: benefit analysis using models, Laws for estuary and lakes, Waste water treatment legislation; Introduction to water quality management systems and procedures, Consequence Analysis; Socioeconomic aspects, Measures of effectiveness of pollution control activities.

UNIT - V: Environmental Impact Assessment and Life Cycle Analyses

Evolution of EIA: Concepts of EIA methodologies, Screening and scoping; Rapid EIA and comprehensive EIA; General framework for environmental impact assessment, Characterization and site assessment. Environmental Risk Analysis, Definition of risk, Matrix method - Checklist method, Fault tree analysis, Environmental Audit: Cost Benefit Analysis; Life Cycle Assessment; Resource balance, Energy balance & management review; Operational control; Case studies on EIA.

Text Books

1. Kuehn, T.H., Ramsey, J.W. and Threlkeld, J.L., Thermal Environmental Engineering, 3rd Edition, Prentice Hall, 1998.
2. A Textbook of Environmental Chemistry, by O. D. Tyagi and M. Mehra
3. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, economical and Working Environment, 120th ASEE Annual Conference and Exposition.

Reference Books

1. Larry W. Canter, “Environmental Impact Assessment”, 1st edition, McGraw-Hill (international edition).
2. David P. Lawrence, “Environmental Impact Assessment - Practical Solutions to Recurrent Problems”, 1st Edition, Wiley-Interscience.
3. Advanced Air and Noise Pollution Control, Lawrence K. Wang, Norman C. Pereira, Yung-Tss Hung, 2005 Edition, Humana Press.
4. Municipal Solid Waste Management, P. Jayarami Reddy, 1st Edition, B.S. Publications.

* * *

Open Elective - I

ELECTRICAL MATERIALS

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the concepts of dielectric and ferro-magnetic materials.
- To impart knowledge on semiconductor materials, materials used in batteries and solar cells.
- To familiarize the materials required for specific electrical applications.

Course Outcomes

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

- describe the properties of liquid, gaseous and solid dielectric materials used in electrical applications.
- analyze the properties of Ferro electric, Peizo electric and Pyro electric materials.
- classify different magnetic materials and examine the effects of aging and impurities on magnets.
- elucidate various semiconductor materials and their applications in integrated circuit.
- choose appropriate material for a given electical and special purpose application.

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, applications of Ferro-electric materials.

UNIT - III: Magnetic Materials

Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, Magnetostriction, magnetically soft and hard materials, ageing of magnets, Superconductivity and its origin, Zero resistance and Meissner Effect.

UNIT - IV: Semiconductor Materials

Properties of semiconductors, Classification of Semiconductors, Silicon wafers - Wafer manufacturing process, Resistor, Fabrication processes of MOSFET on IC.

UNIT - V: Materials for Electrical Applications

Materials used for Resistors, rheostats, heaters, stranded conductors, fuses, electric contact materials, Solid Liquid and Gaseous insulating materials. Effect of moisture on insulation, Testing of Transformer oil as per ISI standards - Galvanization methods, Materials for battery and solar cells.

Text Books

1. R K Rajput: A course in Electrical Engineering Materials, Laxmi Publications. 2009.
2. David Linden, Thomas B. Reddy "The Handbook of Batteries" McGraw-Hill Hand Books 2010.
3. 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

* * *

Open Elective - I

CONTROL SYSTEMS ENGINEERING

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To equip the students with 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 methods to quantify stability of linear control systems.
- To introduce the state space analysis to continues time systems.

Course Outcomes

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

- apply the basic concepts and properties of feedback control systems for mathematical modeling of physical systems.
- explore the transfer function analysis using singal flow graph representation of control systems.
- employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.
- perform frequency domain analysis of control systems required for stability analysis.
- use the concept of 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 for physical systems.

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 graphs - Reduction is using Mason's gain formula.

UNIT - III: Time Response Analysis

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

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: 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, concept of controllability and observability.

Text Books

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International Limited Publishers, 6th edition, 2017.
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, 2015.
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.
4. Modern control systems - Richard C. Dorf and Robert H. Bishop, Pearson Prentice Hall Publications, 12th Edition, 2010.

* * *

Open Elective - I

AUTOMOTIVE ENGINEERING

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce various components and sub systems of an automobile.
- To impart knowledge on various safety systems of an automobile and emission norms.

Course Outcomes

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

- outline the various components and sub systems of an automobile.
- 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: Simple fuel supply system in petrol and diesel engines. working of simple carburettor, direct fuel injection system in diesel engine.

UNIT - II:

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

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

UNIT - III:

Ignition System: Functions, requirements, types of an ignition system, battery ignition system - components, Magneto ignition system, electronic ignition system.

Transmission system: Types and functions of the clutches- 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.

UNIT - IV:

Suspension System: Objectives of suspension system, front suspension systemrigid 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 - V:

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, 14 th edition, 2017 .
2. William H Crouse & Donald LAnglin, Automotive Mechanics, Tata Mc Graw Hill Publications, 10th edition, 2017.

Reference Books

1. R.B Gupta , Automobile Engineering, Satya Prakashan Publications, 6th edition,2016.
2. Newton steeds & Garrett, "The Motor vehicle", Society of Automotive Engineers, 13th edition,2001.
3. G.B.S. Narang, "Automobile Engineering", Khanna Publishers, 5th edition, 1995.

* * *

Open Elective - I

ELEMENTS OF MECHANICAL TRANSMISSION

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with the principles of mechanical power transmission elements.

Course Outcomes

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

- choose suitable shaft couplings for a given application.
- propose suitable transmission element for a given application.
- identify suitable power screw for motion transmission.

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.

Text Books

1. Bhandari, “Design of Machine Elements”, Tata McGraw Hill book Co.,5th Edition, 2020.
2. P.C. Sharma & D.K. Agarwal, “Machine Design”, S.K.Kataria & Sons ,13th Edition, 2018.

Reference Books

1. Sharma & Purohit, “Design of Machine Elements”, PHI, 10th Edition,2011.
2. Kannaiah, “Design of Machine Elements”, Scitech Publications, 2nd Edition, 2015.

* * *

Open Elective - I

INTRODUCTION TO EMBEDDED SYSTEMS

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the classification, characteristics, applications of embedded systems.
- To provide clear understanding about the role of firmware in correlation with hardware systems.
- To familiarize with the architecture of 8051 microcontroller.

Course Outcomes

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

- compare embedded and general computing systems.
- select the processors for an embedded system application.
- understand the architecture and instruction set of 8051 microcontroller.
- program the timers/counters and serial communication components of 8051 microcontroller.

Course Content

UNIT - I: Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT - II: Typical Embedded System: Core of the Embedded System

Elements of Embedded Systems, General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT - III: Embedded Firmware

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT - IV: Introduction to 8051 Microcontroller

Overview of 8051 microcontroller, Architecture, I/O Ports, Memory organization, Addressing modes and Instruction set of 8051, Simple programs.

UNIT - V: 8051 Real Time control

Interrupts- 8051 Interrupts, Interrupt Vector table of 8051, IE Register, IP register;Timers and Counters-Timer 0, Timer 1, TMOD Registers, TCON Register,Mode1 Programming; Serial Port- SBUF, SCON Registers, Doubling baud rate using PCON register, program for serial data transmission.

Text Books

1. K.V Shibu, "Introduction to Embedded System", TMH Education private limited, 2009.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontrollers and Embedded Systems", 2nd Edition, Pearson Education.

Reference Books

1. Kenneth. J. Ayala, Dhananjay V. Gadre, "The 8051 Microcontroller & Embedded Systems Using Assembly and C", 1st edition, Cengage learning, 2010.
2. Rajkamal," Embedded Systems" 2nd Edition, TMH, 2008.
3. Frank Vahid, Tony Givargis, "Embedded System Design", 2nd Edition, John Wiley Publishers.

* * *

Open Elective - I

FUNDAMENTALS OF COMMUNICATION SYSTEMS

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce various analog and digital modulation and demodulation techniques
- To familiarize with various multiplexing schemes and cellular telephone systems

Course Outcomes

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

- understand the concepts of basic communication system
- compare different multiplexing techniques.
- differentiate DSB-SC, SSB and frequency modulation schemes.
- distinguish ASK, PSK and FSK modulations.
- know the concepts of the cellular telephone systems

Course Content

UNIT - I: Introduction to Communication Systems

Introduction, Communication Process: Elements of communication system, Concept of Bandwidth and frequency spectrum, Sources of information: Classification of signals, Baseband and Band pass signals, Communication channels, Classification of communication systems.

UNIT - II: Basic Models of Communication

Need of modulation, Different types of modulation systems, Multiplexing, Basic Models of Communication. Primary Communication Resources, Survey of communication applications, Analog and digital signals, Conversion of analog signals to digital signals, electromagnetic spectrum (EM) Spectrum.

UNIT - III: Linear Modulation

Basics of Amplitude Modulation: Definition and Physical Appearance, Single tone an AM wave, Frequency Spectrum and Bandwidth of an AM wave, Modulation Index, Power distribution in an AM wave; Forms of an AM signal (theoretical concepts): Double Side Band-suppressed Carrier (DSB-SC), Single Side Band (SSB).

UNIT - IV: Angle Modulation

Basics of Frequency Modulation: Definition and Physical Appearance, Frequency Deviation Curve, Equation of FM wave, Frequency Deviation, Modulation Index, Deviation Ratio; Comparison of FM and AM Signals.

Phase Modulation: Definition and Physical Appearance, Equation of PM wave.

UNIT - V: Digital Transmission

Digital communication system model, advantages and disadvantages of digital communication, pulse code modulation (PCM), ASK, FSK, PSK, Basics of cellular telephone systems.

Text Books

1. Wayne Tomasi, “Electronics Communication systems”, Pearson Education, 5th edition, 2004.
2. Dr. Sanjay Sharma, "Communication Systems: Analog and Digital", Katson Books, 7th Reprint Edition, 2018.

Reference Books

1. Simon Haykin, John Wiley, “Principles of Communication Systems”, 2nd Edition, John Wiley & Sons.
2. V. Chandra Sekar, "Analog Communication", Oxford University Press, 2010.
3. Dr. Sanjay Sharma, "Digital Communications", Katson Books.
4. B.P.Lathi, “Modern Analog and Digital Communication”, 3rd Edition, Oxford reprint, 2004.

* * *

Open Elective - I

INFORMATION RETRIEVAL SYSTEMS

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce basic concepts in information retrieval.
- To familiarize with applications of information retrieval techniques in the Internet or Web environment.

Course Outcomes

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

- identify the basic theories in information retrieval systems.
- use inverted file as an index data structure to retrieve the documents from the database.
- create signature files for fast retrieval of text data.
- build PAT treesand PAT arrays for the given text document.
- use stemming algorithms to improve the performance of IR systems.

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.

Text Books

1. Frakes W.B., Ricardo Baeza-Yates, “Information Retrieval Data Structures and Algorithms”, Prentice Hall, 1992.
2. Ricardo Baeza-Yates, Bertheir Ribeiro-Neto, “Modern Information Retrieval”, Pearson Education.
3. Robert Korfhage, “Information Storage & Retrieval”, John Wiley & Sons.

Reference Books

1. Kowalski, Gerald, Mark T Maybury, “Information Retrieval Systems-Theory and Implementation”, Kluwer Academic Press, 1997.
2. Information retrieval Algorithms and Heuristics, 2nd edition, Springer.

* * *

Open Elective - I

COMPUTER GRAPHICS

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To emphasize on functionalities of various graphic systems and geometric transformations
- To familiarize on visible surface detection methods and computer animations.

Course Outcomes

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

- outline different graphical display devices and drawing algorithms.
- illustrate different 2-D geometrical transformations on graphical objects
- interpret different line and polygon clipping algorithms
- infer different 3- D transformations and viewing functions on objects.
- summarize different surface detection methods and computer animations

Course Content

UNIT - I: Introduction

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

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 and Animation

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

Animations: General computer animation, raster animation, key frame systems, Graphics programming using Open GL .

Text Books

1. Donald Hearn, M. Pauline Baker, "Computer Graphics *C* version", 2nd e edition, Pearson Education.
2. Francis S.Hill, Stephen M. Kelley, "Computer Graphics using Open GL", 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.

* * *

Open Elective - I

SYSTEM SOFTWARE

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

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

Course 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 & Linkers

Basic loader functions, design of an absolute loader, simple bootstrap loader, machine dependent loader features, relocation, loader options, program linking, algorithm and data structures for linking loader, linkage editors, dynamic linking, implementation example.

UNIT - V: Macro Processors

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

Text Books

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

Reference Books

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

2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 1972.

* * *

Open Elective - I

FREE & OPEN SOURCE SOFTWARE

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To impart the opportunities for open source software in the global market.
- To familiarize with different steps in implementing the open source.

Course 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: PHP

PHP- Introduction, Programming in web environment, variables, constants, data types, operators Statements, Arrays.

UNIT - IV: MySQL

MySQL: Introduction, Setting up account, Starting, terminating and writing your own SQL programs, Record selection Technology, Working with strings, Date and Time, Generating Summary, Working with metadata.

UNIT - V: Advanced PHP

OOP–String Manipulation, PHP and SQL database, PHP Connectivity, Debugging and error handling.

Text Books

1. M.N.Rao, “Fundamentals of Open Source Software”, PHI Learning.
2. Steve Suchring,”MySQLBible”, John Wiley, 2002

Reference Books

1. Remy Card, Eric Dumas and Frank Mevel, “The Linux Kernel Book”, Wiley Publications, 2003.

* * *

Open Elective - I

FUZZY MATHEMATICS

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

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

Course Outcomes

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

- state the need and applications of open source software.
- distinguish between crisp set and fuzzy set.
- know different operations on fuzzy relations.
- use defuzzification methods to crisp sets.
- draw inferences using fuzzy logic.
- develop membership value assignments.

Course Content

UNIT - I: Classical Sets And Fuzzy Sets

Classical sets – Operations – Properties. Fuzzy sets – Operations – Properties – membership functions - Features of the membership function.

UNIT - II: Fuzzy Relations

Fuzzy Cartesian product and composition - Fuzzy relations - Operations - Properties of fuzzy relations - Fuzzy tolerance and equivalence relations.

UNIT - III: Fuzzification And Defuzzification

Fuzzification - defuzzification to crisp set - Defuzzification to scalars (centroid method, centre of sums method, mean of maxima method).

UNIT - IV: Fuzzy Logic

Classical logic – Fuzz logic – Approximate reasoning ["if ... then" approach and "if ... then ....else" approach] – Other forms of the implication operation.

UNIT - V: Development Of Membership Functions

Membership value assignments – Inference – Rank ordering – Neural networks – Genetic algorithms – Inductive reasoning.

Text Books

1. Timothy J.Ross., Fuzzy Logic with Engineering Applications - Second Edition, Wiley Publications, 2015, 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. Zimmarman, Fuzzy set theory and its applications, 4th edition — Springer, 2013. New Delhi.
2. S.Nanda and N.R.Das "Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi.

* * *

Open Elective - II

REMOTE SENSING AND GIS

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

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.

Course 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
- list and elaborate applications of Remote Sensing and GIS 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 - Data models – Data input - measurement scales – Data Base Management Systems (DBMS).

UNIT - V: RS and GIS Applications

Land cover and land use classification, crop productivity and crop monitoring, Smart city applications, Forest fire detection using image analysis.

Text Books

1. Remote Sensing and Image Interpretation by Thomas. M. Lillesand and Ralph. W. Kiefer,7th Edition, John Wiley and Sons, 2015.
2. Remote Sensing and Geographical Information Systems by M. Anji Reddy, 4th Edition, B.S. Publications.

Reference Books

1. Remote Sensing and GIS by Basudeb Bhatta, 2nd Edition, Oxford University Press.
2. Principles of Geographical Information Systems by Burrough P.A. and Rachel A. Mc Donell,3rd Edition, Oxford Publication, 2016.

* * *

Open Elective - II

GREEN BUILDING TECHNOLOGY

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the different concepts of sustainable design and green building techniques.
- To explore the techniques available of best fit for the specific construction project.

Course Outcomes

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

- describe the concepts of sustainable design and green building techniques
- understand the energy efficiency and indoor environmental quality management
- explain the energy efficiency techniques and concepts of embodied energy
- apprise the drawings and models of their own personal green building project
- select the Indoor Environmental Quality and comfort

Course Content

UNIT - I: Introduction to Green Buildings

Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development. Green building rating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.

UNIT - II: Site Selection and Planning

Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, day lighting, ventilation, etc. Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.

UNIT - III: Energy Efficiency

Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy. Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air-conditioning systems in buildings, zero ozone

depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.

UNIT - IV: Green Building Materials

Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial waste. (d) reuse of waste and salvaged materials Waste Management: Handling of construction waste materials, separation of household waste, on-site and off-site organic waste management.

UNIT - V: Occupant Comfort and Wellbeing

Daylighting, air ventilation,exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc. Suggested.

Text Books

1. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
2. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
3. Alternative building materials and technologies by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao, New Age International, New Delhi.

Reference Books

1. Non-Conventional Energy Resources by G. D. Rai, Khanna Publishers.
2. Sustainable Building Design Manual, Vol.1 and 2, TERI, New Delhi 2004.
3. Green Building Fundamentals by Mike Montoya, Pearson, USA, 2010.
4. Sustainable Construction – Green Building Design and delivery by Charles J. Kibert, John Wiley &Sons, New York, 2008.
5. Sustainable Construction and Design by Regina Leffers, Pearson/ Prentice Hall, USA, 2009.

* * *

Open Elective - II

MODELING AND SIMULATION OF ENGINEERING SYSTEMS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

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

Course Outcomes

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

- create, modify and work with variables and its related operations
- develop MATLAB program to solve real time engineering problems.
- solve and visualize the dynamic performance of engineering systems through MATLAB plotting features.
- compute and analyze the numerical data of a physical system using advanced features in MATLAB.
- analyze the performance of physical system using toolboxes and GUI.

Course Content

UNIT - I: Introduction to MATLAB

Getting Started, MATLAB as language, MATLAB windows-Direct and Indirect windows, and Functions of Windows, MATLAB Environment, File Types, Inputting and Outputting methods.

UNIT - II: Variables, Scripts and Functions

Making Variables, Manipulating Variables, Vectorization, Scripts, , creating and working with scripts, Basic Functions, creating and working with function files, Flow Control-if, for, while and switch cases, Signal routing-break, continue and return, examples with engineering applications.

UNIT - III: Plotting

Basic Plotting, 2D Plotting – line, bar, area; 3D plotting-mesh and surface; plotting types - Multiple plotting, Sub plotting; Line styles, examples with engineering applications.

UNIT - IV: Solving Equations and Curve Fitting

Linear Algebra, Polynomials, Optimization, Differentiation / Integration, Differential Equations, Probability and Statistics, Data Structures, Images and Animation, Debugging, examples with engineering applications.

UNIT - V: Toolboxes and GUIs

Introduction to Neural networks, Fuzzy logic, Control systems, Symbolic Math, Simulink, File I/O, Graphical User Interfaces, examples with engineering applications.

Text Books

1. Getting started with MATLAB-A quick introduction for scientists and engineers, Rudra Pratap, Oxford University Press, January, 2010.
2. MATLAB and SIMULINK for Engineers, Agam Kumar Tyagi, Oxford University Press, 2012.

Reference Books

1. Introduction to MATLAB, Spencer, R.L. and Ware, M, Brigham Young University, available online accessed, May, 2008.
2. An introduction to MATLAB, David F. Griffiths, The University of Dundee, available online, accessed, October 2012.
3. MATLAB an introduction with applications, Amos Gilat, Wiley publications, January 2012.

* * *

Open Elective - II

POWER SYSTEMS ENGINEERING

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the working of various types of power plants and layout of substations.
- To familiarize the concepts of corona, insulators and various tariff methods.

Course Outcomes

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

- describe the operation of thermal power station.
- illustrate the operation of hydro power plants.
- identify various components and their role in the operation of nuclear power plant
- distinguish various bus bar arrangements and insulators used in substation
- analyze the phenomenon of corona and describe various tariff methods.

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: Hydro Power stations

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

UNIT - III: 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 - IV: Air insulated substations

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

UNIT - V: Corona and Tariff Methods

Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss.

Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods.

Text Books

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. A Textbook of Power System Engineering by Er.R k Rajput, Laxmi Publications ,2nd Edition, 2015.

Reference Books

1. Principles of Power Systems by V.K Mehta and Rohit Mehta S.Chand& Company Ltd.New Delhi 2004.
2. Generation Distribution and Utilization of Electrical Energy by C.L.Wadhawa New age International (P) Limited, Publishers 3rd Edition 2011.
3. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2008.

* * *

Open Elective - II

RENEWABLE ENERGY SOURCES

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart knowledge on renewable sources of energy and techniques used in exploiting solar, wind, biomass, geothermal and ocean sources of energy.
- To introduce direct energy conversion systems such as thermo electric, MHD and Fuel Cells.

Course Outcomes

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

- classify various types of renewable sources of energy and illustrate the principles of solar radiation.
- illustrate various solar energy storage methods and applications.
- describe the techniques of exploiting wind, biomass and geothermal energies in power generation.
- illustrate the methods of tapping ocean thermal in power generation
- describe the working of various direct energy conversion systems and their applications.

Course Content

UNIT - I:

Introduction: Energy Sources and their availability, role and potential of renewable source.

Solar Radiation: Structure of the sun, the solar constant, sun-earth relationships, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation, solar radiation geometry, Numerical problems on solar radiation.

UNIT - II:

Solar Energy Storage and Collectors: Different methods - sensible, latent heat and stratified storage, solar ponds. solar collectors- flat plate, concentric collectors.

Applications of Solar Energy: Solar heating/cooling technique, solar distillation, drying, photovoltaic energy conversion, solar central power tower concept and solar chimney.

UNIT - III:

Wind Energy: Sources and potentials, horizontal and vertical axis wind turbines, Betz criteria.

Bio-Mass Energy: 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: Requirements of OTEC, classifications of OTEC, Environmental impacts of OTEC.

UNIT - V:

Direct Energy Conversion: Need for DEC, limitations, principles of DEC. Thermo electric Power – See-beck, Peltier, joule, Thomson effects, Thermo-electric Power generators, applications.

MHD power Generation: Principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, advantages and disadvantages of MHD power generator, applications.

Fuel cells: Principles, types of fuel cells.

Text Books

1. Tiwari and Ghosal, "Renewable Energy Resources: Basic Principles and Applications", Narosa.
2. B.H.Khan "Non – conventional Energy Resources", Tata McGraw Hill education Pvt. Ltd.
3. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons.

Reference Books

1. Twidell & Weir, "Renewable Energy Sources ", Routledge (Taylor &Francis Group).
2. SP Sukhatme, "Solar Energy: Principles of thermal collection and storage". Tata McGraw Hill.

* * *

Open Elective - II

VENTURE DEVELOPMENT

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize the learner with the concepts of venture development

Course Outcomes

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

- explain the significance of entrepreneurship for economic development.
- distinguish among micro, small, and medium enterprises.
- discuss the role of various agencies to raise the capital.
- apply marketing strategies for a given situation.
- analyse contemporary issues in entrepreneurship.

Course Content

UNIT - I: Entrepreneurship and Entrepreneur

Introduction; characteristics of an entrepreneur, types of entrepreneurs, entrepreneurship in India, women entrepreneurship, rural entrepreneurship.

UNIT - II: Small Scale Industries in India

Concept and definition of micro, small, and medium enterprises, scope and trends of small enterprises in India, role of government in promoting ssi in india, problems of entrepreneurs, planning for setting up an industry, agencies for supporting the process, the businesses planning processes.

UNIT - III: Institutional Finance to Entrepreneur

Small Industries Development Bank of India (SIDBI), export-import Bank, Andhra Pradesh State Trading Corporation (APSTC), Integrated Rural Development Programme (IRDP), Export Credit Guarantee Corporation (ECGC).

UNIT - IV: Entrepreneurial Strategies

Management of small industries- small entreprises and marketing strategies- product life cycle-marketing activities, channels of distribution- market research-marketing problems of small scale industries.

UNIT - V: Contemporary Issues in Entrepreneurship

Introduction- ecological entrepreurship, legal issues, international business opportunities- risk management strategies, diversification strategies , and bankruptcy, social and ethical responsibility of entrepreneurs.

Text Books

1. Robert D.Hisrich, Mathew J. Manimala, Michael P.Peters, A.Shepherd, "Entrepreneurship" , McGraw Hill Education, 2016 .
2. P.Narayana Reddy, "Entrepreneurship - Text and Cases", Cengage Learning, 2011.

Reference Books

1. G.G. Meredith, R.E.Nelson and P.A. Neek, "The Practice of Entrepreneurship", ILO, 1982.
2. David H.Holt, "Entrepreneurship New venture Creation", PHI Learning Limited.
3. MadhuriLall, ShikhaSahai, "Entrepreneurship", Excel Books, Second Edition.

* * *

Open Elective - II

AUTOMOTIVE ELECTRONICS

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

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

Course Outcomes

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

- describe the fundamentals of automotive technology.
- differentiatedigital andanalog systems.
- classify various 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, theautomobile physical configuration, evolution of electronics in the automobile, surveyof major automotive systems.

UNIT - II: Automotive Micro-Computer System

Microcomputer fundamentals-digital versusanalog computers, basic computer block diagram, microcomputer operations,CPU registers, accumulator registers, condition code register-branching;microprocessor architecture, memory-ROM, RAM; I/O parallel interface, digitalto 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, conceptof an electronic engine control system, engine functions and control, electronicfuel control configuration, electronic ignition with sensors.

UNIT - IV: Sensors and Actuators

Basic sensor arrangement; types of sensors such as oxygen sensors,crank angle position sensors, fuel metering/vehicle speed sensors and detonation sensors, flow sensors, throttle position sensors, solenoids,actuators – fuel metering actuator, fuel injector, and ignitionactuator.

UNIT - V: Electronic Vehicle Management System

Cruise control system, antilock braking system, electronic suspension system,electronic steering control, safety: air bags, collisionavoidance radar warning system with block diagram, low tire pressure warningsystem.

Sensor multiplexing, control signal multiplexing with blockdiagram, automotive internal navigation system, GPS navigation system, Distributed Control Area Network example - a network of embedded systems in automobile.

Text Books

1. William B. Ribbens, "Understanding Automotive Electronics", 6th Edition SAMS/ElsevierPublishing.
2. Raj Kamal, "Embedded Systems - Architecture, Programming and Design", 3rd Edition, McGraw-Hill Education.
3. Robert Bosch Gambh, "Automotive Electrics Automotive Electronics Systems and Components", 5th edition, John Wiley& Sons Ltd., 2007.

Reference Books

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

* * *

Open Elective - II

INTRODUCTION TO SIGNAL PROCESSING

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with the basic concepts and operation on signals.
- To introduce various transform 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.
- compute Fourier analysis on the signals.
- applyvarious sampling techniques on continuous time signals.
- analyzecontinuous time signals using Fourier and Laplace transforms.

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

Trigonometric and exponential Fourier series, relationship between trigonometric and exponential Fourier series, convergence of Fourier series, symmetry conditions-even and odd, complex Fourier spectrum.

UNIT - III: Fourier Transform

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

UNIT - IV: Sampling

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

UNIT - V: Laplace Transform

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

Text Books

1. B.P.Lathi, “Signals, Systems &Communications”, BS Publications, 2003.
2. A.V. Oppenheim, A.S. Willsky and S.H.Nawab, “Signals and Systems”, 2nd EditionPHI.

Reference Books

1. Simon Haykin and Van Veen, “Signals &Systems”, 2nd edition, Wiley Publishers.
2. Michel J. Robert , “Fundamentals of Signals and Systems”, International Edition, Tata McGraw-Hill, 2008
3. C.L.Philips, J.M. Parr and Eve A. Riskin, “Signals, Systems and Transforms”, 3rd Edition, Pearson Education, 2004.

* * *

Open Elective - II

NETWORK PROGRAMMING

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the basics of network Technologies.
- To impart in-depth knowledge in socket creation and client-server communication in TCP and UDP.

Course Outcomes

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

- analyze the requirements of a networked programming environment and identify the issues to be solved.
- interpret the basic network technologies and protocols usage by common internet application.
- develop client-server communication using TCP for communicating processes exist in the different systems.
- apply theoretical principles and use appropriate functions for establishing client-server communication.
- develop client-server communication using UDP protocols by writing socket programming.

Course Content

UNIT - I: Introduction to Network Programming

OSI model, UNIX standards, TCP and UDP and TCP connection establishment and termination, port numbers, TCP port numbers and concurrent servers, buffer sizes and limitation, protocol usage by common internet application.

UNIT - II: Sockets

Address structures, value–result arguments, byte ordering and manipulation functions. Elementary TCP sockets–socket, connect, bind, listen, accept, fork function, concurrent servers.

UNIT - III: TCP Client-Server

Introduction, TCP echo server functions, normal startup, termination, POSIX signal handling, termination of server process, crashing and rebooting of server host, shutdown of server host.

UNIT - IV: I/O Multiplexing and Socket Options

I/O models, select function, poll function, TCP echo server, getsockopt and setsockopt functions.

UNIT - V: Elementary UDP Sockets

Introduction, UDP echo server function, lost datagrams, UDP example, lack of flow control with UDP.

Text Books

1. W.Richard Stevens, Bill Fenner, Andrew M. Rudoff, "UNIX Network Programming: The Sockets Networking API", Volume 1, 3rd edition, Addison-Wesley.
2. W. Richard Stevens, "UNIX Network Programming", 1st edition, PHI.

Reference Books

1. Graham Glass, King Ables, "UNIX for Programmers and Users", 3rd edition, Pearson Education.
2. Marc. J. Rochkind, "Advanced UNIX Programming", 2nd edition, Pearson Education.

* * *

Open Elective - II

SOCIAL NETWORK ANALYSIS

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To provide students with essential knowledge of network analysis applicable to real world data, with examples from today's most popular social networks.

Course Outcomes

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

- demonstrate social network analysis and measures.
- analyze random graph models and navigate social networks data
- apply the network topology and Visualization tools.
- analyze the experiment with small world models and clustering models.
- compare the application driven virtual communities from social network Structure.

Course Content

UNIT - I: Graphs

Graphs as models of Networks, Paths and Connectivity, Distance and Breadth-First Search, The Strength of Weak Ties, Structual Holes, Betweenness measure, Homophily, Affiliation, Structural Balance.

UNIT - II: Link Analysis and Web Search

Web as Directed Graph, Searching the Web, Link Analysis Using Hubs and Authorities, Page Rank, Applying Link Analysis in Modern Web Search.

UNIT - III: Cascading Behavior in Networks

Power Laws, Rich-Get-Richer Phenomenon, Diffusion, Cascading Behavior, Cascades and Clusters, Role of Weak Ties.

UNIT - IV: Small World Phenomenon

Six Degrees of Separation, Structure and Randomness, Decentralized search, Empirical Analysis and Generalized Models.

UNIT - V: Basics of Game Theory

Games, Reasoning about behavior in games, Best Responses and Dominant Strategies, Nash Equilibrium, Multiple Equilibria, Mixed Strategies.

Text Books

1. D. Easley and J. Kleinberg, Networks, Crowds and Markets: Reasoning about a highly connected world-2010.
2. Tanmoy Chakraborthy, Social Network Analysis, Wiley.

Reference Books

1. Social Network Analysis: Methods and Applications (Structural Analysis in the Social Sciences) by Stanley Wasserman, Katherine Faust, 1994.

* * *

Open Elective - II

CYBER SECURITY

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To expose the multiple cyber security technologies, processes, and procedures.
- To analyze the threats, vulnerabilities and risks present in these environments.
- To develop appropriate strategies to mitigate potential cyber security problems.

Course Outcomes

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

- demonstrate the fundamentals of cyber crimes and information security systems.
- analyze and resolve security vulnerabilities in networks and computer systems to secure an it infrastructure.
- develop a security architecture for an organization which can handle mobile, wireless devices and related security issues.
- use the cybercrime tools and methods in solving real world problems
- analyze web and internet security threats and find the solutions

Course Content

UNIT - I:

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT - II:

Cyber offenses: Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT - III:

Cybercrime-Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Authentication Service Security, Attacks on Mobile/Cell Phones,

Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT - IV:

Tools and Methods Used in Cybercrime: Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft (IDTheft).

UNIT - V:

Web and Network Security: Introduction, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Overview of Vulnerability Scanning, Scanning for Web vulnerabilities, Firewalls, Packet Filters, How a firewall protects a network.

Text Books

1. Nina Godbole and SunitBelpure ¯ Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives , 1st Edition Publication Wiley, 2011.
2. Mike Shema, ¯Anti-Hacker Tool Kit (Indian Edition) ,1st Edition Publication Mc Graw Hill.

Reference Books

1. Mark Rhodes, Ousley, Information Security, 1st Edition ,MGH, 2013.

* * *

Open Elective - II

E-COMMERCE

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the basic concepts of E-Commerce.
- To gain the knowledge on various Mercantile Process models.
- To identify the concepts of E-Payment Systems and Web Marketing Strategies.

Course Outcomes

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

- outline the fundamentals in E-Commerce Frame work and Concepts.
- describe various Mercantile Process models for Consumers and Merchants.
- analyze Electronic Data Interchange (EDI) problems to perform e-transactions.
- categorize and classify various E-Payment systems used in online transaction procesing.
- distinguish various web marketing Strategies to improve customer relationship and marketing.

Course Content

UNIT - I: Electronic Commerce Framework

Introduction, Electronic Commerce Framework, Anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT - II: Consumer Oriented Electronic Commerce

Consumer Oriented Applications, Mercantile process models, Mercantile models from the consumer's perspective, Mercantile models from the merchant's perspective.

UNIT - III: Inter and Intra Organizational Commerce

Inter Organizational Commerce-EDI, EDI implementation, Value Added Networks, Intra Organizational Commerce -Work flow automation and coordination, Supply chain management.

UNIT - IV: Payment Systems for Electronic Commerce

Online Payment basics, payment cards, Electronic Cash, Electronic Wallets, Stored-Value Cards, Internet Technologies and the Banking Industry.

UNIT - V: Marketing on the Web

Web Marketing Strategies, Communicating with Different Market Segments, Advertising on The Web, E-Mail Marketing, Technology enabled Customer Relationship Management. Search engine Positioning and Domain Names.

Text Books

1. Kalakota, Winston , Frontiers of electronic commerce , Pearson, 2nd Edition, 2012.
2. Gary P.Schneider Thomson , Electronic Commerce, 7th Edition, 2012

Reference Books

1. S.Jaiswal ,E-Commerce, Galgotia publications.
2. Efrain Turbon, Jae Lee, David King ,E-Commerce, H.Michael Chang.

* * *

Open Elective - II

INTELLIGENT SYSTEMS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To understand the fine structure or deeper origin of knowledge
- To generate intelligent behavior on the basis of statistical evidence.

Course Outcomes

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

- demonstrate Data representation and Logical operations.
- analyze backward reasoning and solving problems by reduction.
- learning of Verification and Validation of Rule Bases .
- explain the architecture of real time expert systems.
- define Quantitative simulation.

Course Content

UNIT - I: Knowledge Representation

Data and knowledge: Data representation and data items in traditional databases, Data representation and data items in relational databases. Rules: Logical operations, Syntax and semantics of rules, Data log rule sets, the dependence graph of data log rule sets, objects.

UNIT - II: Rule Based Systems

Solving problems by reasoning: The structure of the knowledge base, the reasoning algorithm, Conflict resolution, Explanation of the reasoning.

Forward reasoning: The method of forward reasoning, a simple case study of forward reasoning, backward reasoning: Solving problems by reduction, the method of backward reasoning, a simple case study of backward reasoning, Bidirectional reasoning.

UNIT - III: Verification and Validation of Rule Bases

Contradiction freeness: The notion of contradiction freeness, Testing contradiction freeness, The search problem of contradiction freeness .Completeness: The notion of completeness, Testing Completeness, The search problem of completeness. Decomposition of knowledge bases: Strict decomposition, Heuristic decomposition.

UNIT - IV: Real-Time Expert Systems

The architecture of real-time expert systems: The real-time subsystem, The intelligent subsystem Synchronization and communication between real-time and in-

telligent subsystems: Synchronization and communication primitives, Priority handling and time-out. Data exchange between the real-time and the intelligent subsystems: Loose data exchange, the blackboard architecture. Software engineering of real- time expert systems: The software lifecycle of real time expert systems, Special steps and tool, An Example of A Real-Time expert System.

UNIT - V: Qualitative Reasoning

Sign and interval calculus, Qualitative simulation: Constraint type qualitative differential equations, The solution of QDEs: the qualitative simulation algorithm: Initial data for the simulation, Steps of the simulation algorithm, Simulation results. Qualitative physics, Signed directed graph (SDG) models.

Text Books

1. Intelligent Control Systems-An Introduction with Examples by Katalin M. Hangos, RozáliaLakner ,MiklósGerzson, Kluwer Academic Publishers.
2. Intelligent Systems and Control: Principles and Applications Paperback – 12 Nov 2009 by Laxmidhar Behera, Indrani Kar by OXFORD.

Reference Books

1. Intelligent Systems and Technologies Methods and Applications by Springer publications.
2. Intelligent Systems - Modeling, Optimization and Control, by Yung C. Shin and Chengying Xu, CRC Press, Taylor & Francis Group, 2009.

* * *

Open Elective - II

RECOMMENDER SYSTEMS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To learn basic techniques for building recommender Systems.
- To automate a variety of choice-making strategies with the goal of providing affordable, personal, and high-quality recommendations.

Course Outcomes

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

- identify the importance of Recommender Systems.
- model Recommender System by using Content-based Filtering technique.
- build Recommender System by Collaborative Filtering technique.
- design Recommender System by Hybrid approaches.
- evaluate Recommender Systems.

Course Content

UNIT - I: Introduction

Introduction, Recommender Systems Function, Data and Knowledge Sources, Recommendation Techniques, Application and Evaluation, Challenges.

UNIT - II: Content-based Filtering

High level architecture of content-based systems, Content representation and content similarity, Similarity-based retrieval, Other text classification methods, Comparative evaluation, Limitations.

UNIT - III: Collaborative Filtering

User-based nearest neighbor recommendation, Item-based nearest neighbor recommendation, About ratings, Further model-based and preprocessing-based approaches, Recent practical approaches and systems.

UNIT - IV: Hybrid Approaches

Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade, Meta-level.

UNIT - V: Evaluating Recommender System

Introduction, General properties of evaluation research, Evaluation designs: Accuracy, Coverage, confidence, novelty, diversity, scalability, serendipity, Evaluation on historical datasets.

Text Books

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st edition.
2. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st edition.

Reference Books

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer (2016), 1st edition.
2. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st edition.

* * *

Open Elective - II

INTRODUCTION TO IoT ARCHITECTURE

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart the basic characteristics and different technologies with the IoT.
- To familiarize with architectures, enabling technologies and design methodologies of IoT.

Course Outcomes

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

- demonstrate the concepts of IoT and its characteristics.
- make use of the design methodologies of IoT.
- compare IoT and M2M.
- outline different technologies used in IoT.
- explain the case studies on IoT.

Course Content

UNIT - I: Internet of Things Concepts

Introduction to Internet of Things, Block diagram of IoT, characteristics of IoT, architectural view of IoT, Physical Design of IoT, Logical Design of IoT.

UNIT - II: IoT Design Templates & Design Methodology

IoT Enabling Technologies, IoT levels, Development Templates, Developing Internet of Things: Introduction, IoT Design Methodology.

UNIT - III: IoT and M2M

M2M, Differences between IoT and M2M, SDN and NFV for IoT, Software defined Networking, Network Function Virtualization.

UNIT - IV: IoT Technologies

Basic building blocks of IoT, Introduction to cloud storage models, Role of Machine learning, Artificial Intelligence and Data Science in IoT, Categories of ML, Applications of ML, Tools in ML, Requirement of Data analytics in IoT.

UNIT - V: Case Studies

Case studies on Domain specific IoT's, Home Automation, cities, environment, Agriculture and health monitoring and energy, Health and fitness monitoring.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On-Approach”, Arshdeep & Vijay Madisetti Publishers, 2014.
2. V.K.Jain, “Data science and Analytics”, Khanna Publishing, 2018.
3. Rajkamal, Internet of Things Architecture & Design Principles”, Mc.Grawhill

Reference Books

1. Vlasios Tsiatsis Stamatis Karnouskos Jan Holler David Boyle Catherine Mulligan, “InternetofThings”, Academic Press, 2018.
2. Daniel Kellmereit, “The Silent Intelligence: The Internet of Things”, Lightning Source Inc., 2014.

* * *

Open Elective - II

INTRODUCTION TO SMART SENSORS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the fundamentals of smart sensors and provides interfacing with embedded hardware.
- To gain knowledge of the latest developments in measurement and sensors expose with the various types of smart sensors.

Course Outcomes

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

- classify different types of smart sensor for iot applications
- apply signal conditioning circuit for sensor interface to digital computer.
- gain the knowledge required for interfacing the smart sensor
- demonstrate the various packaging types of smart sensor

Course Content

UNIT - I: Sensor Devices

Piezoresistive pressure sensor, Piezoresistive Accelerometer, Capacitive Sensing-Accelerometer and Microphone, Resonant Sensor and Vibratory Gyroscope Nano Sensors.

UNIT - II: Interfacing Sensor Information and MCU

Amplification and Signal Conditioning- Integrated Signal Conditioning- Digital conversion- MCU Control MCUs for Sensor Interface- Techniques and System Considerations- Sensor Integration.

UNIT - III: Control Techniques and Standards

Control of Sensors using - State Machines, Fuzzy Logic, Neural Networks, adaptive Control.

UNIT - IV: Communication for Smart Sensor

Wireless Data Communications- RF Sensing- Telemetry- Automotive Protocols-Industrial Networks, Home Automation- MCU Protocols.

UNIT - V: Packaging, Testing and Reliability Implications of Smart Sensors

Semiconductor Packaging- Hybrid Packaging- Packaging for Monolithic Sensors-Reliability Implications Testing Smart Sensors- HVAC Sensor Chip.

Text Books

1. Randy Frank, “Understanding Smart Sensors”, Artech House, Second Edition, 2011Boston.
2. Minhang Bao, “Analysis and design principles of MEMS devices”, Elsevier Publications, 2005,USA.

Reference Books

1. Nadim Maluf and Kirt Williams, “An Introduction to Micro Electro Mechanical Systems Engineering”, Second Edition, Artech House Publishers, June 2004, USA.
2. Gabriel M. Rebeiz, “RF MEMS: Theory, Design, and Technology”, Wiley-Inter science; 1st edition, 2002,UK

* * *

Open Elective - III

BASICS OF ENVIRONMENTAL ENGINEERING

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To understand the basic of water borne diseases,drinking water standards and treatment of wastewater and disposal
- To expose the students to understand to treatment of wastewater and disposal
- To learn the basics of air pollution and effects, noise pollution and solid waste disposal

Course Outcomes

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

- demonstrate water sources, water borne diseases, water treatment and potable water standards
- understand basicsof wastewater treatment and disposal methods
- identity air pollution sources and understand air pollution effects
- identity noise pollution sources and understand noise pollution effects
- understand sources and basic principles of solid waste

Course Content

UNIT - I: Water

Sources of water; Availability of fresh water; Water borne diseases; Brief explanation on ground and surface water treatment; Potable water standards as per IS and WHO standards; Water conservation; Role of public health engineering department in the prevention of the water borne diseases.

UNIT - II: Wastewater

Wastewater sources; Sewage characteristics; Brief explanation on treatment of sewage; Disposal of treated wastewater; Practise on reuse of treated wastewater; Effects of wastewater without treatment disposal in streams, on land

UNIT - III: Air Pollution Sources and Effects

Layers of atmosphere; Sources and classification of air pollutants – Man made, Natural sources; Type of air pollutants; Pollution due to automobiles; Effect of air pollution on health, vegetation and materials; Global warming; Worst environmental disasters caused by humans.

UNIT - IV: Noise Pollution

Sources of noise pollution - plane, point and line sources, multiple sources; Effect of noise pollution on humans; Control of noise pollution; Outdoor and indoor noise propagation; Intensity of noise pollution; Noise pollution permissible limits as per CPCB and WHO

UNIT - V: Solid Waste

Sources of solid waste – classification solid waste - Basic principles of Solid Waste storage, collection, transportation, processing and Disposal.

Text Books

1. Water supply Engineering – Environmental Engineering (Vol. I) by S.K. Garg (2019)– Khanna Publishers.
2. Sewage Disposal and Air Pollution Engineering – Environmental Engineering (Vol. II)S.K. Garg (2019) – Khanna Publishers.
3. Water Supply Engineering by Punmia B.C., Ashok Jain & Arun Jain (2014), Laxmi Publication Pvt., Ltd., New Delhi
4. Wastewater Engineering by Punmia B.C., Ashok Jain & Arun Jain (2014), Laxmi Publication Pvt., Ltd., New Delhi

Reference Books

1. Environmental Engineering by Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, McGraw Hill Inc., New York, 2017.
2. Handbook of Solid Waste Management by Frank Kreith and George Tchobanoglous, McGraw-Hill, 1994.

* * *

Open Elective - III

DISASTER PREPAREDNESS, PLANNING AND MANAGEMENT

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To provide an exposure to disasters, their significance and types.
- To impart the knowledge on different approaches of disaster preparedness.

Course Outcomes

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

- analyse the concepts, terminologies and developments in thefield of disaster and disaster management.
- differentiate the types of disasters, causes and their impact on environment and society.
- explain the process of risk and vulnerability.
- assess different types of disaster preparedness.
- explain the role of technology in disaster management.

Course Content

UNIT - I: Disaster and Disaster Management

Introduction, Disaster, Hazard – Classification of hazard, Magnitude of disasters, Vulnerability – Categorization of vulnerabilities, Coping Capacity, Risk – Disaster risk management, Risk formula, Disaster Management – Monitoring and evaluation, Disaster management cycle.

UNIT - II: Disasters Classification

Introduction, Types of disasters, Natural disasters - Earthquakes, Cyclones, Flood, Drought, Landslides, Avalanches, Manmade disasters – Chemical disaster, Industrial wastes, Hazardous wastes, Radioactivity, Traffic disasters.

UNIT - III: Risk and Vulnerability

Building codes and land use planning, social vulnerability, Macroeconomic management and sustainable development, environmental vulnerability, climate change risk rendition, financial management of disasterrelated losses.

UNIT - IV: Disaster Preparedness

Introduction, Components of preparedness, Formulation of preparedness plan, Types of disaster preparedness, Principles of preparedness, Problems associated with preparedness.

UNIT - V: Role of Technology in Disaster Management

Disaster management for infra structures, Mitigation program for earthquakes, Geospatial information in agricultural drought assessment, Multimedia technology in disaster risk management training, Transformable indigenous knowledge in disaster reduction.

Text Books

1. Disaster Management – Global Challenges and Local Solutions, by Rajib shah & R R Krishnamurthy, Universities press, 2009.
2. Disaster management,M.M. Sulphey, PHI Learning Pvt. Ltd, 2016.

Reference Books

1. Disaster Science & Management by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazard by S. Vaidyanathan, CBS Publishers& Distributors Pvt. Ltd.
3. Disaster Management - Future Challenges and Opportunities by Jagbir Singh I K International Publishing House Pvt. Ltd, 2007.

* * *

Open Elective - III

PRINCIPLES OF SPECIAL ELECTRIC MACHINES

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize the students with the constructional details, operating principles, theory of torque production, and characteristics of various special electrical machines.
- To expose the students to different control practices associated with various special electrical machines and applications of special electrical machines.

Course Outcomes

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

- describe the constructional and operating principles, control schemes and applications of various types of Stepper Motors.
- explain the constructional details, working principles, control practices and applications of Switched Reluctance Motors.
- analyze the speed-torque characteristics, construction and principle of operation, control techniques and applications of Permanent Magnet Brushless D.C. Motors.
- acquire the knowledge of operating principles, constructional details and applications of Servomotors and Tachometers.
- compare the constructional details, principle of operation and applications of various single phase special electrical machines.

Course Content

UNIT - I: Stepper Motors

Constructional features – Types – Variable Reluctance and Permanent Magnet motors – Principle of operation – Dynamic Characteristics –Closed loop control of Stepper Motor – Applications.

UNIT - II: Switched Reluctance Motors

Constructional features – Principle of operation – Torque Equation – Torque Speed characteristics –Closed loop control of SRM – Applications.

UNIT - III: Permanent Magnet Brushless D.C. Motors

Constructional features – Principle of operation – EMF equations – Torque and Speed characteristics – control of PMBLDC motor –Applications.

UNIT - IV: Servomotors and Tachometers

Servomotor – Types – Constructional features – Principle of Operation – Characteristics – Applications of Servomotors – AC Tachometers – Schematic diagram – Operating Principle.

UNIT - V: Single Phase Special Electrical Machines

AC series Motor – Repulsion Motor – Reluctance Motor - Hysteresis Motor – Constructional features, Principle of Operation, Characteristics and Applications of the above motors.

Text Books

1. Special Electrical Machines by E.G.Janardanan, PHI Learning Pvt Ltd, Delhi, 2014.
2. Principles of Special Electrical Machines by J.Gnanavadivel, Dr.S.Muralidharan and J.Karthikeyan, Anuradha Publications, Chennai, 2013.

Reference Books

1. Stepping Motors and their Microprocessor Controls by Takashi Kenjo, Clarendon Press, 1984.
2. Special Electrical Machines by K.Venkata Ratnam, University press, New Delhi, 2009.
3. Basic Electrical Engineering by C.L.Wadhwa, New Age
4. International (P) Limited Publishers, New Delhi, 2007.
5. Principles of Electrical Machines by V.K.Mehta andRohit
5. Mehta, S.Chand Publishing,New Delhi, 2014.
6. Stepping Motors: A Guide to Modern theory and practice by P.P.Acarnley, Peter Peregrines, London, 2002.
7. Brushless Permanent Magnet & Reluctance Motor Drives by T.J.E. Miller, Clarenden press, Oxford, 1989.

* * *

Open Elective - III

ELECTRICAL INSTRUMENTATION

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize various types of signals, their representation and measurements using CRO.
- To impart knowledge on construction, operation and working principles of digital measuring instruments and Transducers.

Course Outcomes

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

- analyze various types of signals, and errors in digital instruments.
- measure various parameters like amplitude, phase and frequency of a signal using CRO.
- select a suitable transducer working on electrical principles to measure non electrical quantities.
- select a suitable transducer working on non-electrical principles to measure physical parameters.
- analyse the operation of various digital meters.

Course Content

UNIT - I: Signals and their Representation

Measuring Systems, Performance Characteristics, – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors – Statistical analysis of random errors. Signal and their representation – Standard test, periodic, aperiodic, modulated signal – Sampled data pulse modulation and pulse code modulation.

UNIT - II: Cathode Ray Oscilloscope

Basic operation of Oscilloscope Cathode ray oscilloscope – Cathode ray tube – Time base generator – Horizantal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns.

UNIT - III: Transducers

Classification of transducers – Characteristics and choice of transducers – Principle operation of resistor, inductor, and capacitor transducers – LVDT – Strain gauge and its principle of operation – Gauge factor– Thermistors – Thermocouples– Piezo electric transducers -– Pyro transducer – Hall sensor.

UNIT - IV: Measurement of Non–Electrical Quantities

Velocity – Angular Velocity – Acceleration – Force – Torque – Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

UNIT - V: Digital Voltmeters

Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Micro-processor-based ramp type – DVM digital frequency meter – Digital phase angle meter – Q Meter.

Text Books

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Higher Education 4thEdition, 2018.
2. Electrical & Electronic Measurement & Instruments,A.K.Sawhney and Puneet Sawhney, Dhanpat Rai & Co., Pvt. Ltd., 18th edition, 2010.

Reference Books

1. Measurement and Instrumentation: Theory and Application, Alan S.Morris and Reza Langari, S. Netherlands: Elsevier Science, 2nd edition,2015.
2. Measurement Systems: Application and Design. Doebelin, E., Japan: McGraw – Hill Higher Education, 4th edition, 2003.
3. Modern Electronic Instrumentation and Measurement Techniques. Cooper,W. D., Helfrick, A. D.India: Pearson Education. 1st edition, 2005.
4. Transducers and Instrumentation. by D. V. S.MURTY, India, PHI Learning 2nd edition, 2010.

* * *

Open Elective - III

GREEN ENGINEERING

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

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

Course 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.
- create sustainable products, facilities, processes and infrastructure.
- assess the life cycle of a product to evaluate its impact on energy and materials use.
- analyze technological systems.

Course Content

UNIT - I: Introduction

Humanity and technology, the concept of sustainability, quantifying sustainability.

UNIT - II: Frame Work for Green Engineering

Industrial ecology, 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

Systems analysis, industrial ecosystems, material flow analysis, energy and industrial ecology, air quality impacts, carbon cycles and energy balance, water quality impacts.

Text Books

1. T E Graedel, Braden R Allenby, “Industrial Ecology and Sustainable Engineering”, Prentice Hall, 2010.

2. David T. Allen, David R Shonnard, “Sustainable Engineering Concepts, Design and Case Studies”, Prentice Hall, 2012.

Reference Books

1. Bradley A. Striebig, Adebayo A. Ogundipe, Maria Papadakis, “Engineering Applications in Sustainable Design and Development”, Cengage Learning, 2016.
2. Anastas, Paul T, Zimmerman, Julie B, “Innovations in Green Chemistry and Green Engineering”, Springer, First Edition, 2013.
3. Daniel A. Vallero, Chris Brasier, “Sustainable Design: The Science of Sustainability and Green Engineering”, Wiley, First Edition, 2008.

* * *

Open Elective - III

3D PRINTING TECHNOLOGIES

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To present the various 3D printing technologies for manufacturing.

Course Outcomes

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

- explain the fundamental principles of Rapid prototyping.
- explain the RP processes and analyze their process parameters.
- select appropriate 3D printing technique for a given application.

Course Content

UNIT - I:

Introduction: Brief description on design process**,** Prototyping fundamentals, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process.

Rapid Prototyping Data Formats: STL Format, STL File Problems, consequence of building valid and invalid tessellated models, STL file repairs: generic solutions, other translators, newly proposed formats- AMF Files Format.

UNIT - II:

Liquid-Based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages, case studies.

Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT - III:

Solid-Based Rapid Prototyping Systems: Laminated object manufacturing (LOM) – models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Fused deposition modeling (FDM) – models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT - IV:

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. three dimensional printing (3DP): models and

specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT - V:

RP Applications: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis.

Text Books

1. Ian Gibson, et.al., "Additive Manufacturing Technologies – 3D Printing, Rapid Prototyping and Direct Digital Manufacturing", Springer Publications, 2nd Edition, 2015.
2. Chua C.K., Leong K.F. and LIM C.S, "Rapid prototyping: Principles and Applications", World Scientific publications, 2010.

Reference Books

1. D.T. Pham and S.S. Dimov, "Rapid Manufacturing – The Technologies and Applications of Rapid Prototyping and Rapid Tooling", Springer Publications, 2001.
2. Andreas Gebhardt, Jan – Steffen Hotter, "Additive Manufacturing – 3D Printing for Prototyping and Manufacturing", Hanser Publishers, Munich, 2016.
3. Zimmers&P.Groover, "CAD/CAM", Pearson Education, 1st Edition, 2003.

* * *

Open Elective - III

ASSISTIVE TECHNOLOGIES

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce different assistive technology devices.
- To familiarize with the concepts of enhancing speech communication and Independent Living.

Course Outcomes

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

- identify the adaptation framework connected with assistive technologies.
- demonstrate various types of assessments for assistive technologies.
- explore the processes to enhance speech communication.
- describe the process to enhance mobility and information access.
- analyze the technology aspects needed for independent living.

Course Content

UNIT - I: Introduction to Assistive Technology and Adaptation Framework

Definition and historical overview of assistive technology, multidisciplinary nature of service provision, introduction to adaptations framework, selecting specific characteristics, evaluation of effectiveness of adaptations.

UNIT - II: Assistive Technology Assessments

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

UNIT - III: 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 - IV: 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 - V: 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, Bacon, “Assistive Technology for People with Disabilities”, 2nd Edition, Psycho Educational Services.

Reference Books

1. Marion A. Herash, 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. MachielVanderloss, “Design and use of Assistive Technology”, Springer Publications, 2010.
3. Eckehard Fozzy Moritz, “Assistive Technologies for the Interaction of the Elderly”, Springer Publications, 2014.

* * *

Open Elective - III

INTRODUCTION TO BIO-MEDICAL ENGINEERING

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the basics of biological concepts and relate it to engineering.
- To familiarize with physiology of cardio-vascular system, respiratory system and the elements of Patient Care Monitoring.
- To impart the knowledge on the diagnostic techniques and shocking hazards.

Course Outcomes

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

- demonstrate the novel theory related to human body and various components in cardio vascular system.
- relate the concept of electrode theory and transduction principles to bio-medical instrumentation.
- analyze the operation of measuring the cardio-vascular and respiratory systems by knowing its inner organization.
- outline the patient care monitoring.
- apply the fundamental principles & techniques of diagnosis and demonstrate shocking hazards related to biomedical instrumentation.

Course Content

UNIT - I: Introduction to Bio-Medical Instrumentation and Electro-Cardiography

Man instrumentation system-introduction & components, physiological system of the body, sources of bio-electric potentials, resting & action potentials,The heart & cardiovascular system, Electro-Cardiography, Electro-Cardiogram(ECG),Electro-Encephalogram(EEG).

UNIT - II: Electrodes& Transducers

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

UNIT - III: Measurements of Cardio-Vascular & Respiratory Systems

Blood pressure measurement, pulse sensors, the physiology of the respiratory system, tests & instrumentation for the mechanics of breathing, respiration sensors, respiratory therapy equipment.

UNIT - IV: Patient Care & Monitoring

Elements of intensive care monitoring, patient monitoring displays, diagnosis,organization of the hospital for patient care monitoring, pace-makers, defibrillators.

UNIT - V: Diagnostic Techniques &Shocking Hazards

Principles of ultrasonic measurement, Ultrasonic Imaging, Ultrasonic Diagnosis, X-Ray &CT Scan, MRI,shock hazards & prevention, physiological effects & electrical equipment, methods of accident prevention

Text Books

1. Onkar N. Pandey, Rakeshkumar, "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 EquipmentTechnology", 4th Edition, Pearson Publications.
2. Khandapur, "Handbook of Bio-Medical Instrumentation", 2nd Edition, Tata McGrawHill.

* * *

Open Elective - III

DEVOPS

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with precise knowledge of tools to architect effective pipelines by selecting tools suitable for specific scenarios.

Course Outcomes

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

- explain fundamentals and advance concepts of Agile and DevOps.
- describe Usage of multiple tools for unit functions in a DevOps pipeline.
- illustrate various types of version control systems, continuous integration tools.
- elaborate on various tools to orchestrate, deployment, infrastructure management.
- outline Devops and Cloud work together.

Course Content

UNIT - I: The World without DevOps and Agile Methodology and DevOps

Introduction- Problem Case Definition, Benefits of fixing Application Development Challenges, DevOps Adoption Approach through Assessment.

Agile Methodology and DevOps - Before Agile-Waterfall, Agile Development, What is DevOps, DevOps Importance and Benefits, Devops Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing.

UNIT - II: Tool Suits

Introduction, Atlassian Tools - Key Features, where can Atlassian be Best Utilized, Pros and cons of Atlassian, Phabricator - Key Features, where can Phabricator be Best Utilized, Pros and cons of Phabricator.

UNIT - III: Orchestration

Introduction, Jenkins- Features, Example of Reference Architecture. Ansible - Key Features, Pros and Cons, Example of Reference Architecture, Bamboo- Key Features, Pros and Cons, Example of Reference Architecture.

UNIT - IV: Application Lifecycle Management and Deployment and Infrastructure Management

Introduction, JIRA - Key Features, Pros and Cons, Example of Reference Architecture, Chef - Key Features, Pros and Cons, Example of Reference Architecture.

UNIT - V: DevOps with Cloud

Introduction, DevOps and Cloud Adoption- Benefits of using DevOps along with Cloud, Few best practices for DevOps in the Cloud. AWS- Reasons for selecting AWS for DevOps. Features of AWS, AWS tools and services for Orchestrating DevOps Capability, Pros and Cons.

Text Books

1. Deepak Gaikwad, Viral Thakkar, DevOps Tools, from Practitioner's viewpoint, 1st edition, Wiley.
2. Jez Humble and David Farley, Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, 1st edition, 2010.

Reference Books

1. Jenkins and Kubernetes, Pierluigi Rit, Pro DevOps with Google Cloud Platform With Docker, Apress.

* * *

Open Elective - III

OBJECT ORIENTED ANALYSIS AND DESIGN

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To get familiar with the Object Oriented Analysis and Design in software development, develop UML structural and behavioral models of an application.
- To describe and choose an appropriate Design Pattern to refine the model.

Course Outcomes

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

- apply the object oriented analysis and designs in software development and familiar with the UML concepts.
- develop static conceptual models of the system.
- create dynamic behavioral models of the system to meet user needs.
- design object oriented architecture models.

Course Content

UNIT - I: Introduction to UML

Importance of modeling, principles of modeling, object oriented modeling, Conceptual model of the UML, Architecture of UML.

UNIT - II: Structural Modelling

Structural Modeling:Classes, Relationships: Dependency, Generalization, Realization and Association- advanced features of association, Class diagrams, Interfaces and Packages, Object Diagrams.

UNIT - III: Behavioral Modelling

Behavioral Modeling: Use case, Use case Diagrams, Interactions, Interaction Diagrams- Sequence diagram, Collaboration diagrams.

UNIT - IV: Advanced Behavioral Modelling

Activity diagrams, Common modeling techniques of Activity diagram.
Advanced Behavioral Modeling: Events and signals, state machines, state chart diagrams.

UNIT - V: Architectural Modelling

Architectural Modeling: Components, Component diagrams, Deployment, Deployment diagrams.

Text Books

1. "The Unified Modeling Language User Guide", Booch, James Rumbaugh, Ivar Jacobson, Pearson Education 13th Edition,2004.
2. "Fundamentals of Object Oriented Design in UML", Meilir Page-Jones, Pearson Education.

Reference Books

1. "Object Oriented Analysis and Design with Applications", Grady Booch, Pearson Education Asia, 2nd Edition.
2. "Object-Oriented Systems Ananlysis And Design Using UML", Simon Bennett, Steve McRobb and Ray Farmer , TATA McGrawHill, 2nd Edition.

* * *

Open Elective - III

SCRIPTING LANGUAGES

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

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

Course Outcomes

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

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

Course Content

UNIT - I: jQuery

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

UNIT - II: JSON

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

UNIT - III: PERL

Basic Syntax, Perl Language Elements: Variables, Operators, Control Flow Statements, Arrays, Hashes, Subroutines, Packages and Modules, File Handling and Operations on Files, Retrieving Documents from the Web using Perl LWP.

UNIT - IV: Ruby

Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, classes, Iterators.

UNIT - V: AJAX A New Approach

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

Text Books

1. Kogent , HTML 5 Black Book, 2nd Edition, Dreamtech Press
2. Dave Thomas, Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide, 4th Edition, Pragmatic Bookshelf.

Reference Books

1. Randal L. Schwartz Brian D. Foy, Tom Phoenix, Learning Perl, 6th edition, O'REILLY Publications.

* * *

Open Elective - III

FUNDAMENTALS OF SOFTWARE PROJECT MANAGEMENT

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

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

Course Outcomes

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

- interpret various necessary rudiments of software project management.
- apply improvement strategies to see the inline growth in economic concerns of the project.
- develop project plans that address real time management challenges.
- design efficient work break down structures that meet real time deadlines of a project.
- use software metrics to measure the quality of software projects and to gain insights of management issues related to the project.

Course Content

UNIT - I: Introduction to Software Project Management

Introduction, project definition, software project vs other types of project, activities covered by software project management, ways to categorize software projects, project as a system, management definition, problems with software projects , management control, stakeholders, requirement specification.

UNIT - II: 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 - III: The Old Way and The New

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 - IV: Checkpoints of the Process

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

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

UNIT - V: Project Organizations and Responsibilities

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

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations.

Text Books

1. Bob Hughes , Software Project Management, 4th edition, Mike Cotterell, TMH.
2. Walker Royce, Software Project Management, Pearson Education, 2005.

Reference Books

1. Joel Henry , Software Project Management, Pearson Education.
2. Pankaj Jalote , Software Project Management in practice, Pearson Education, 2005.

* * *

Open Elective - III

WEB MINING

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart machine learning techniques to mine the web and other information networks like social networks and social media.
- To introduce search, retrieval, classification and recommendation methods.

Course Outcomes

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

- describe classic and recent developments in information retrieval, web search and web mining.
- apply Page Rank and HITS algorithm for social network data analysis.
- differentiate Universal, Focused and Topical crawlers in internet.
- analyze complex information and social networks using Information Integration techniques.
- discover sentiment from social media data using opinion mining and web usage mining.

Course Content

UNIT - I: Information Retrieval and Web Search

Basic concepts of information retrieval, IR models, text and web page preprocessing, inverted index and its compression, web search, meta-search.

UNIT - II: Link Analysis

Social network analysis, page rank algorithm, HITS algorithm, community discovery.

UNIT - III: Web Crawling

Crawler algorithm, implementation issues, universal crawlers, focused crawlers, topical crawlers.

UNIT - IV: Information Integration

Schema matching, pre-processing, schema level match, domain and instance level match, 1: m match, integration of web query interfaces.

UNIT - V: Opining and Web Usage Mining

Opining Mining - Sentiment classification, feature based opinion mining, comparative sentence and relation mining, opinion search.

Web Usage Mining - Data collection, data modelling for web usage mining, discovery and analysis.

Text Books

1. Bing Liu, “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data”, Springer Science & Business Media.
2. Charu C. Aggarwal, “Social Network Data Analytics”, Springer Science & Business Media.

Reference Books

1. GuandongXu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, Springer Science & Business Media.

* * *

Open Elective - III

AI CHATBOTS

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To learn how artificial intelligence powers chatbots, get an overview of the bot ecosystem and bot anatomy, and study different types of bots and use cases.
- To identify best practices for defining a chatbot use case and use a rapid prototyping framework to develop a use case for a personalized chatbot.

Course Outcomes

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

- develop an in-depth understanding of conversation design, including onboarding, flows, utterances, entities, and personality.
- design, build, test, and iterate a fully-functional, interactive chatbot using acommercial platform.
- deploy the finished chatbot for public use and interaction.

Course Content

UNIT - I: Introduction

Benefits from Chatbots for a Business,A Customer-Centric Approach in Financial Services, Chatbots in the Insurance Industry, Conversational Chatbot Landscape, Identifying the Sources of Data: Chatbot Conversations, Training Chatbots for Conversations, Personal Data in Chatbots, Introduction to the General Data Protection Regulation (GDPR).

UNIT - II: Chatbot Development Essentials

Customer Service-Centric Chatbots, Chatbot Development Approaches, Rules-Based Approach, AI-Based Approach, Conversational Flow, Key Terms in Chatbots, Utterance, Intent, Entity, Channel, Human Takeover, Use Case: 24x7 Insurance Agent

UNIT - III: Building a Chatbot Solution

Business Considerations, Chatbots Vs Apps, Growth of Messenger Applications, Direct Contact Vs Chat, Business Benefits of Chatbots, Success Metrics, Customer Satisfaction Index, Completion Rate, Bounce Rate, Managing Risks in Chatbots Service, Generic Solution Architecture for Private Chatbots.

UNIT - IV: Natural Language Processing, Understanding, and Generation

Chatbot Architecture, Popular Open Source NLP and NLU Tools, Natural Language Processing, Natural Language Understanding, Natural Language Generation, Applications.

UNIT - V: Introduction to Microsoft Bot, RASA, and GoogleDialogflow

Microsoft Bot Framework, Introduction to QnA Maker, Introduction to LUIS, Introduction to RASA, RASA Core, RASA NLU, Introduction to Dialogflow.

Chatbot Integration Mechanism: Integration with Third-Party APIs, Connecting to an Enterprise Data Store, Integration Module.

Text Books

1. Abhishek Singh, Karthik Ramasubramanian, ShreyShivam, "Building an Enterprise Chatbot: Work with Protected Enterprise Data Using Open Source Frameworks",ISBN 978-1-4842-5034-1, Apress,2019.

Reference Books

1. Janarthanam and Srini, Hands-on chatbots and conversational UI development: Build chatbots and voice user interfaces with C (1 ed.), Packt Publishing Ltd, 2017. ISBN 978-1788294669.
2. Galitsky, Boris., Developing Enterprise Chatbots (1 ed.), Springer International Publishing, 2019. ISBN 978-303004298
3. Kelly III, John E. and Steve Hamm, Smart machines: IBM's Watson and the era of cognitive computing (1 ed.), Columbia University Press, 2013. ISBN 978- 0231168564.
4. Abhishek Singh, Karthik Ramasubramanian and ShreyShivam, Building an Enterprise Chatbot (1 ed.), Springer, 2019. ISBN 978-1484250334.

* * *

Open Elective - III

TRENDS IN IoT

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the advanced concepts in IoT
- To familiarize the digital transformation in various fields with the advent of IoT

Course Outcomes

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

- demonstrate the advantages of edge computing.
- describe the concepts of various technologies in IoT.
- analyze the digital transformation in IoT and future marketing.
- summarize the trust issues in IoT.

Course Content

UNIT - I: Edge Computing

Introduction, Edge Computing Architecture, Background Essentials: IoT Devices, Networking Architecture, Network Management and Control.

UNIT - II: IoT Ecosystems and Technologies

Introduction, support for IoT Ecosystem creation, spurring innovation in lead markets, outlook IoT vision, IoT strategic Research and Innovation Directions, IoT smart environments and applications, IoT and related future technologies.

UNIT - III: IoT and Digital Transformation

IoT Standardization, IoT security, IoT enabling the Digital Transformation of Industry, Case study - Farming Food and IoT: where we are going and challenges.

UNIT - IV: IoT in Future Marketing

Introduction, EU Initiatives and IoT Platforms for Digital Manufacturing, Digital Factory Automation, IoT Applications for Manufacturing.

UNIT - V: Trust in IoT

The need for evaluating trust in IoT, Trust management in IoT, Trust for devices, Trust for IoT services, consent and trust in personal data sharing, using trust in authorization

Text Books

1. Edge computing: Fundamentals, Advances and Applications, K.Anitha Kumari, G.Sudha Sada sivam, D.Dharani, M.Niranjamurthy, CRC Press,Taylor Francis Group,2022
2. Digitising the Industry Internet of Things Connecting the Physical, Digital and Virtual Worlds, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publisher series.

Reference Books

1. Alasdair Gilchrist, “Industry 4.0: The Industrial Internet of Things”,Apress 2016.
2. Vijay Madisetti, Arshdeep Bahga,” Internet of Things A Hands-On- Approach”, 2014.

* * *

Open Elective - III

ACADEMIC COMMUNICATION

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

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.

* * *