R G M COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
NANDYAL-518501, KURNOOL DIST., A.P., INDIA

DEPARTMENT OF
CIVIL ENGINEERING (CE)

RGM-R-2019

(ESTD-1995)

B.TECH SYLLABUS 2019

Applicable for students admitted into
B.Tech (Regular) from 2019-20
B.Tech (Lateral Entry Scheme) from 2020-21
Regulations, Course Structure & Detailed Syllabus

(Affiliated to J.N.T.U.A, Anantapuramu)

ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI

B.Tech. (Regular) from 2019-20 and B.Tech. (Lateral Entry Scheme) from 2020-21

For pursuing four year Bachelor Degree Program (under graduate) of study in Engineering (B.Tech.), Two year Master (post graduate) Degree of study in Engineering (M.Tech.), Two year Master (post graduate) degree of study in Business Administration (MBA), Three-year Master (post graduate) Degree of study in Computer Applications (MCA) offered by Rajeev Gandhi Memorial College of Engineering and Technology, Nandyal -518501 under Autonomous status and herein referred to as RGMCET (Autonomous).

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2019-20 onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for Rajeev Gandhi Memorial College of Engineering and Technology (Autonomous).

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation. As and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, Rajeev Gandhi Memorial College of Engineering and Technology shall be the Chairman, Academic Council.

The candidate seeking admission into the first year of study of four year B.Tech degree Program should have:

- **i)** Passed either Intermediate Public Examination (IPE) conducted by the Board of Intermediate Education, Andhra Pradesh with Mathematics, Physics and Chemistry as optional subjects (or any equivalent examination certified by Board of Intermediate Education) or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or any equivalent examination certified by State Board of Technical Education) for admission.
- **ii)** Secured a rank in the EAMCET examination conducted by AP State Council for Higher Education (APSCHE) for allotment of a seat by the Convener, EAMCET, for admission.

Admission Procedure:

As per the norms of A.P. State Council of Higher Education (APSCHE), Government of Andhra Pradesh, admissions are made to the first year of Four year B.Tech. Degree program as follows:-

- **a)** As per the norms of Government of Andhra Pradesh, A-Category (based on the rank obtained in EAMCET) seats will be filled by the Convener, EAMCET.
- **b)** As per the norms of Government of Andhra Pradesh, B-Category seats will be filled by the management.

Admission to the Second year of Four year B.Tech. Degree Program in Engineering:

- **i)** Candidates qualified in ECET and admitted by the Convener, ECET, in such cases for admission, when needed permission from the statutory bodies is to be obtained.
- **ii)** 10% of the sanctioned strength in each program of study (of RGMCET) shall be filled by the Convener, ECET as lateral entry.

List of Programs offered

1. B.Tech – Regular & Lateral Entry
2. M.Tech – Regular
3. MBA – Regular
4. MCA – Regular

Academic Regulations for 2019 B. Tech. (Regular)

(Effective for the students admitted into the I year from the Academic Year 2019-2020)

The B.Tech. Degree be conferred by the Jawaharlal Nehru Technological University Anantapur, Anantapuramu, students who are admitted to the program and fulfill all the requirements for the award of the Degree as specified below:

1.0 Award of B.Tech. Degree

1.1 The student will be declared eligible for the award of the B. Tech. degree if he fulfils the following academic regulations:

1.2 Pursued a course of study for not less than prescribed course work duration and not more than double the prescribed course work duration.

1.3 Registered for 160 credits and secured 160 credits with compulsory subjects as listed in Table-1.

Table 1: Compulsory Subjects

S.No	SUBJECT PARTICULARS
1	All the subjects offered in B.Tech course / MOOCs
2	Mandatory Learning Courses [Environmental Science, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge]
3	All practical subjects
4	All Skill Development Courses/ value added courses
5	Mini projects
6	Comprehensive Viva-Voce
7	Seminar
8	Internship
9	Extra Academic Activities-EAA
10	Life Science
11	Project work Phase-I
12	Project Work Phase-II

2.0 Forfeit of seat

Students, who fail to fulfill all the academic requirements for the award of the degree within **eight academic years** from the year of their admission, shall forfeit their seat in B.Tech, course.

3.0 Courses of study

The following courses of study are offered at present as specializations for the B.Tech. Course: and any other course as approved by the authorities of the University from time to time.

1. **Civil Engineering**
2. **Computer Science and Engineering**
3. **Electrical and Electronics Engineering**
4. **Electronics and Communication Engineering**
5. **Mechanical Engineering**

Table 2: Credits

Subject	Semester			
	Periods/ Week	Credits	Internal Marks (IM)	External Marks (EM)
Theory	2+1*	03	30	70
English Theory	2+1*	02	30	70
Life Science	02	02	30	70
Mandatory Learning Courses	03	00	00	00
Mini project/ Practical	03	1.5	25	50
Drawing	03	03	30	70
Skill Development Courses/Value Added Course	1+2*	0.5**	30	70
Comprehensive Viva (CV)	--	0.5	00	50
Extra Academic Activities	02	00	00	00
Seminar		0.5	50	00
Internship		1.0	00	Certificate from Internship Agency
Project Phase-I		1.0	25	00
Project Phase-II	--	08	25	100

* Tutorial

** [Skill Development / value Added Courses credits will not be considered for the award of division.

However, all these courses have to be cleared through internal evaluation by scoring minimum of 40% marks. The credits obtained in Skill development courses will be taken in to account for the award of degree.]

Note:- Mandatory Learning Courses /EAA will not carry any credits but attendance requirements of 75% should be fulfilled otherwise they have to reregister to fulfill academic requirements.

4.0 Distribution and Weightage of Marks

4.1 The performance of the student in each semester shall be evaluated subject –wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition, mini-project, Comprehensive Viva-Voce (CV) shall be evaluated for 50 marks each and the project work shall be evaluated for 150 marks.

4.2 For theory subjects, the distribution shall be 30 marks for Internal Evaluation (20 marks for internal test and 10 marks for assignment or field work/group task/Online test) and 70 marks for the End-Examination.

4.3 During the semester there shall be 2 tests for theory subjects. In each Internal test there shall be one compulsory (short answers) question and 3 descriptive questions are to be answered. The duration of internal test will be for 2hours. First test to be conducted in 3 units and second test to be conducted in the remaining 3 units of each subject. For awarding of 20 Internal marks the performance of the student in two Internal examinations conducted one in the middle of the semester and the other towards the end of the semester giving a weight age of 0.75 for the better score and 0.25 for the other score will be considered. There shall be two assignments in each subject (problem based/ field work/group task/Online test) for award of 10 marks so

that internal component (marks) will be 30 marks (20 marks for internal test+10 marks for assignments / field work/group task).

Table 3: Units for Internal Tests

Semester
3 Units First Internal test
3 Units Second Internal test

4.4 In the case of Skill Development Courses, two Internal examinations shall be conducted one in the middle of the semester and the other at the end of the semester for 30 marks and the marks scored by the student in these exams with a weight age of 0.75 for better score and 0.25 for the other score will be awarded as Internal marks for 30. For the remaining 70 marks an end examination will be conducted along with other theory examinations. However skill development courses/Value added courses, end examination will be evaluated internally.

4.5 No makeup test for internal examination or assignments/group tasks will be conducted in any subject or practical. The student, who is absent for any test shall be deemed to have scored zero marks in that subject.

4.6 Open and Professional Electives will commence from 3rd year Second semester onwards. The open elective offered in 3-2 semester will be based on self-study/MOOCs. All the students have to opt for the MOOCs (Self Study) and should acquire the required credits. If the student fails to opt for MOOCs, (Under unavoidable circumstances) he/she has to write two internal tests besides the end examination conducted by the institute (Elective offered in place of MOOCs by the Dept.) like other subjects. However, he/she has to obtain the certificate from the organization in which he has registered. Any MOOCs course selected by the student should be of more than 45 hours duration /12 weeks course with minimum of 3 credits and also from the reputed organization. Attendance of the student who has opted for MOOCs will be taken from the remaining subjects and labs only in that semester while finalizing the attendance for fulfilling the minimum requirements of attendance for promotion to the next semester. Attendance will not be recorded for MOOCs.

{Massive open online Courses (MOOCs') B.Tech students can avail the facility of earning up to a maximum of 5% credits of their degree requirements through MOOCs. MOOC courses eligible for this purpose are the courses offered by NPTEL/ SWAYAM/EDX/Course by any other reputed organisation approved by the department only. The student shall obtain prior approval of the Head of the Department before registering for MOOC's. MOOC courses can be taken in lieu of Elective courses such as Open Electives & Professional Electives (pertaining to their branch only) and Employability Enhancement Courses. No Core, Lab or Project Course can be dropped in lieu of MOOC. The student shall submit course Title, institute which offered MOOC, Examination system and Credits of the Course, duration of course - After deciding on the MOOC and a course which is approved as its equivalent in the curriculum a student can enrol for it and clear it any time as per his/her convenience and obtain the assessment certificate.

If the assessment certificate is submitted

(i) Before the commencement of the semester in which the equivalent course is offered, the student will be exempted from attending the regular class work and internal assessment exams of the equivalent subject.

(ii) During the semester the student is permitted to withdraw from the remaining part of the course work and internal assessment tests.

(iii) After the semester is over but before the results of that semester are declared the student can request for considering his performance in the MOOC in lieu of its equivalent.

The student shall submit to the HOD the original certificate issued by MOOC authorities along with a photocopy of the same. The original will be returned after verification and verification shall be certified by the Head of the Department on the photocopy which shall be kept in records. An equivalent Grade corresponding to grade/marks awarded by MOOC agency shall be determined by a committee consisting of Principal, Controller of Examinations, Dean Student affairs and HoD concerned. This equivalent Grade shall be shown in the grade sheet and accounted in the SGPA and CGPA calculations.

4.7 Gap Year – Concept of student Entrepreneur in Residence shall be introduced and the outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I/II/III year to pursue full time entrepreneurship. This period may be extended for another one year (two years in total) and this period would not be counted for the maximum duration for completion of graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and committee shall decide on permitting the student for having the Gap Year. The committee consists of Principal as Chairman and all HODs as members.

4.8 In the open electives offered from III year II Sem onwards Student has to select the subjects among the list of open elective subjects by the other departments (inter - department). Student has to clear the subject as per norms to get the required credits. At least minimum of 40 students should register for any open elective; otherwise that open elective will not be offered.

4.9 Out of the professional electives offered from III Year II Semester onwards again one Professional elective in IV Year I Sem will be a MOOCs (Self Study) and the student has to acquire the required credits to clear the subject as specified in 4.6.

4.10 The institute would like to offer **Honours** and **Minor** as optional feature of the B. Tech program aimed at providing additional learning opportunities for academically motivated and bright students. In order to earn Honours or Minor, student has to earn a minimum of 20 extra credits. For this in addition to the regular subjects, a student has to pursue (Self-study/MOOCs) five additional subjects from 3-1 semester onwards and acquire the required credits. The Minor is indicated by separate CGPA and is reflected in the degree certificate as for example, B.Tech in ECE with Minor in Artificial Intelligence. Each department shall offer at least one Minor and also Honours. The student has to select the subjects which are not studied in their regular course and student should have cleared all the subjects up to and including 2-1 semester with above 8.5 CGPA (for SC/ST students 8.0 CGPA) to become eligible for registration for Honours/Minor. GPA and CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor/Honours discipline registration active else Minor/Honours registration will be cancelled. The breakup of the credits are 5 subjects which carry 15 credits @3 credits per subject and project work carries 5 credits. The evaluation pattern of subjects and project work will be similar to methods followed in regular course evaluation. No attendance minimum will be considered for Honours/Minor. Not more than two subjects are allowed for registration in any semester for Honours/ Minor. The student is eligible to receive B.Tech with Honours if he acquires the required additional credits in the same discipline in which he is pursuing his B.Tech degree. If the students acquire the additional credits from other disciplines then he is eligible to

receive B.Tech along with Minor degree in the specified area. Minimum strength for offering Minor/Honours in a discipline is considered as One-Fifth (20% of the class) of the class size and Maximum size would size would be Four-Fifth of Class size (i.e 80% of the class).

4.11 Extra - Academic Activity (EAA)

Each of the following activities carries 0 credits and every student is required to register for **two** activities during second year of study (one in each semester) which is mandatory.

a) ***NSS/NCC***
b) ***Games and Sports***
c) ***Yoga/Meditation***
d) ***Extension Activities***
e) ***Literary/ Cultural Activities***

Any other which may be offered in future.

The activities shall be carried out in the allotted hours. The activities will be monitored by the respective faculty in charge, senior faculty member of the department and the Department HOD. Grades will be awarded on the basis of participation, attendance, performance and behavior. Grades shall be entered in the marks statement as GOOD, SATISFACTORY and UNSATISFACTORY and shall not be counted towards CGPA calculation. If any student gets an Unsatisfactory Grade, he/she has to repeat the activity in the immediate subsequent year.

4.12 The student has an option of going for internship in IV year, II Sem in a reputed organization (The finalization of the internship organization will be as per college guidelines (HOD, two Senior faculty members of the department and same will be recommended to the Principal for approval). In case any student opted for internship he need not attend the classes however he has to write internal and external examination of subjects when ever conducted in that semester and acquire the required credits. The project work in the final semester may be carried out during the internship and same may be submitted for evaluation. Student has to acquire 01 credit by going for internship (minimum of Two weeks) / carrying out internal project work/ study project report on any industry/ attending workshop in reputed institutions for two weeks. Certificate from the organization has to be submitted to this effect attested by Head of the Department and internship incharge to the academic section before the commencement of 3-2 semester. Student is expected to carry out the activities mentioned here during the summer break before the commencement of 3-1 semester.

4.13 The medium of instruction for all Course work, Examination, Seminar Presentations, Project Reports and all academic activities shall be English.

5.0 Question Paper Pattern

5.1 Each Internal Test question paper shall contain 5 questions, of which the First question is compulsory and three questions are to be answered from the remaining four. Compulsory question carries 5 marks (It contains 5 questions of one marks - no choice in first question). The remaining 3 questions carry 5 marks each. Each question shall have a,b,c.... parts.

5.2 The End Examination question paper will have 7 questions and students have to answer5 questions. However, the first question is compulsory and it consists of 7 short answer questions, each carrying 2 marks. The next 4 questions are to be answered from the remaining 6 questions and each carries 14 marks. Each 14 marks question shall have a, b, c .. parts. Evaluation of answer scripts shall be done by either

Internal or External examiners appointed by the Principal. A minimum of 50% of subjects will be evaluated by external examiners.

5.3 For practical subjects, there shall be a continuous evaluation during the semester for 25 internal marks and End Examination carries 50 marks. Of the 25 marks for Internal, 15 marks shall be awarded for day-to-day work, 5 marks to be awarded by conducting an internal laboratory test and 05 marks will be allotted for any creativity/ innovation/ additional learning in lab beyond prescribed set of experiments etc. The End Examination shall be conducted by the teacher concerned and an external Examiner from other institutions.

5.4 For the subject having design and/or drawing, (such as Engineering Graphics, Machine Drawing etc.) and estimation, the distribution shall be 30 marks for Internal evaluation (15marks for day-to-day work and 5 marks for Internal tests and 10 marks for assignments) and 70 marks for End Examination. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests.

5.5 The Engineering drawing, wherever offered is to be treated as a theory subject. Evaluation method adopted for theory subjects shall be followed here as well.

5.6 There shall be two Mini-Projects, in collaboration with an industry/EPICS (Engineering Projects In Community Services) (wherever is possible) of their specialization, to be taken up during the vacation (data collection, components etc.) after II year II Semester and III Year II Semester examination and implementation/ simulation shall be carried out in III year I Semester and IV Year I Semester during lab classes. Implementation or fabrication/simulation of mini projects will be treated as laboratory. However, the mini project and its report shall be evaluated in III year I Semester and IV Year I Semester. The mini project shall be submitted in the report form and should be presented before the committee, which shall be evaluated for 50 marks. The committee consists of an external Examiner, Head of the Department and the supervisor of mini project. There shall be 25 internal marks for mini project which will be awarded based on the performance and involvement of the student during mini project period.

5.7 There shall be comprehensive Viva-Voce examination at the end of each semester. CV Examination shall be conducted by the committee consisting of Senior faculty (based on the recommendation of HOD), an external Examiner from other institutions and HOD and evaluated for 50 marks.

5.8 The project topic should be approved by Internal Department Committee (IDC). Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation (25 marks for Phase-I and 25 marks for Phase-II) and 100 marks for the End Semester Examination. The evaluation of project work phase-I shall be conducted at the end of the IV year I semester and Phase-II shall be conducted at the end of the IV year II semester. The project viva voce examination will be conducted by the committee consisting of an external Examiner from other institute, Head of the Department and the supervisor of the project. The Internal evaluation for 50 marks shall be on the basis of two seminars (25 marks for Phase-I and 25 marks for Phase-II) given by each student on the topic of the project. The Internal evaluation of the project work for 50 marks shall be conducted by the committee consisting of head of the Department or his nominee, senior faculty member and the supervisor of project.

5.9 For all practical/mini project/main project/CV etc. the HOD of the concerned dept. shall submit a panel of 4 external examiners from different institutes and one will be

selected by the Chief Superintendent of the Examination for conducting of end examination.

5.10 Revaluation of End Examination Scripts: Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee. Procedure for Revaluation: The script will be revaluated by an examiner appointed by the Principal. The maximum of revaluation and regular end examination grade will be awarded for that subject. Student can apply for revaluation in a subject only once.

Table4: Distribution of weightages for examination and evaluation

Sl. No.	Nature of subject	Marks	Type of examination and mode of assessment		Scheme of Examination
1	Theory	70	End Examination. Both internal and external Evaluation (at least a minimum of 50% subjects will be sent for external evaluation)		End Examination in theory subjects will be for 70 marks.
		30	20	Internal Examinations (Internal evaluation)	These 20 marks are awarded to the students based on the performance in two (per semester) Internal examinations with a weightage of 0.75 for better score and 0.25 for the other score.
			10	Assignments/Field work/Group task/Online Test (Objective Type) (Internal evaluation)	Average of two assignments /Field work/group task in a semester each evaluated for 10 marks.
2	Practical	50	End lab examination (External evaluation)		This End Examination in practical subjects will be for a maximum of 50 marks.
		25	15	Internal evaluation	Day-to-day performance in lab experiments and record.
			05	Internal evaluation	Internal lab examination at the end of year/semester
			05	Internal evaluation	05 marks will be allotted for any creativity/ innovation/ additional learning in lab beyond prescribed set of experiments etc.
3	Mini Project	50	End Examination (External evaluation)		This End Examination in mini project will be for a maximum of 50 marks.
		25	Internal evaluation		Day-to-day performance in executing mini project.

4	Comprehensive Viva-Voce(CV)	50	External evaluation		This end viva voce examinations in all the subjects for 50 marks.
5	Project work	100	External evaluation		This end viva voce in project work for 100 marks
		50	Internal evaluation 25 marks for Phase-I 25 Marks for Phase-II		These 50 marks will be based on the performance of the student in the project reviews apart from attendance and regularity(25 marks for Phase-I and 25 marks for Phase-II)
6	Skill Development Courses/ Value Added Course/ Mock interviews and Group Discussion	30	Internal evaluation		These 30 marks are awarded to the students based on the performance of two Internal examinations with a weight age of 0.75 for better score and 0.25 for the other score.
		70	Internal Evaluation		Based on the performance in the end examination.
7	Internship/Internal Project/Study Report/Work shop	00	-		Certificate form Internship Agency
8	Life Science	70	External Evaluation		End Examination in theory subjects will be for 70 marks.
		30	20	Internal Examinations (Internal evaluation)	These 20 marks are awarded to the students based on the performance in two (per semester) Internal examinations with a weightage of 0.75 for better score and 0.25 for the other score.
			10	Assignments/Field work/Group task/Online Test (Objective Type) (Internal evaluation)	Average of two assignments /Field work/group task in a semester each evaluated for 10 marks.
9	EAA	00	Internal evaluation		Based on performance and committee report.
10	Mandatory Learning Courses	00	Internal evaluation		No examinations. Attendance minimum is required

6.0 Attendance Requirements:

6.1 The student shall be eligible to appear for End examinations of the semester if he acquires a minimum of 75% of attendance in aggregate of all the subjects of that semester.

6.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted by the College Academic Committee.

6.3 The student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. They may seek re-admission for that semester when offered next.

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

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

6.6 The stipulated fee shall be payable towards condonation of shortage of attendance.

7.0 Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item No.6.0.

7.1 The student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or CV or drawing subject or Skill Development Coursesor project if he secures not less than 35% of marks in the End Examination and he has to score minimum of 40% marks from internal and external exam marks put together to clear the subject.

7.2 The student shall be promoted from II to III year only if he fulfils the academic requirement of securing a minimum of 40.5 credits out of 81 credits from all the exams conducted up to and including II year II semester regular examinations irrespective of whether the candidate takes the examination or not.

7.3 The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 61.5 credits out of 123 credits from all the exams conducted up to and including III year II semester regular examinations, whether the candidate takes the examinations or not.

Table 5: Promotion rules

Promotion from	Total credits to register	Minimum credits to obtain for promotion
II yr to III yr	81	40.5
III yr to IV yr	123	61.5

7.4 The student shall register and put up minimum attendance in all 160 credits and earn 160 credits. Grades obtained in 157 credits (excluding the credits obtained in Skill Development Courses/Value added courses) shall be considered for the calculation of CGPA.

7.5 Students who fail to earn 160 credits as indicated in the course structure in Table-1 within eight academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission shall stand cancelled.

8.0 Course pattern:

8.1 The entire course of study is of four academic years. Each academic year consists of two semesters

8.2 The student is eligible to appear for the End Examination in a subject, but absent at it or has failed in the End Examination may appear for that subject at the supplementary examination.

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Table: 6: Course pattern

Year	Semester	No. of Subjects		No. of Skill Development Courses	Number of Labs		Total credits	
First Year	First	CE/ME/CSE 05 {CE-I-HSMC LAC-BSC MEC/AC-BSC PEE/EM/BEM-ESC PPS-I-ESC	ECE/EEE 05 {CE-I-HSMC LAC-BSC AP-BSC ED-ESC PPS-I-ESC}	00	CE/ME/CSE EC lab-BSC PPS-I Lab-ESC DEL Lab-HSMC CV-I	ECE/ EEE EP Lab-BSC PPS-I Lab-ESC EW&ITW-LC CV-I	4X3=12 1x2=02 3X1.5=4.5 1x0.5=0.5	19
	Second	05 {CE-II-HSMC OPDEVC-BSC AP/EP-BSC ED-ESC PPS-II-ESC}	05 {CE-II-HSMC OPDEVC-BSC MEC-BSC NA/BEE-ESC PPS-II-ESC}	00	EP lab-BSC PPS-II Lab-ESC EW&ITW-LC CV-II	EC lab-BSC PPS-II Lab-ESC DEL Lab-HSMC CV-II	4X3=12 1x2=02 3X1.5=4.5 1x0.5=0.5	19
Second Year	First	BSC Life Science Four Subjects	BSC Life Science Four Subjects	01	Subjects Life Science Labs CV (Comprehensive Viva)-III SDC/VAC EAA		5X3=15 1x2=2.0 3x1.5=4.5 1X0.5=0.5 1x0.5=0.5 No Credits	22.5
	Second	MC-I/MC-2/MC-3 Five Subjects SDC/VAC	MC-I/MC-2/MC-3 Five Subjects SDC/VAC	01	Subjects Labs CV (Comprehensive Viva)-IV SDC/VAC Mandatory Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition) Mandatory Course-3 (Constitution of India) EAA		5X3=15 3X1.5=4.5 1X0.5=0.5 1x0.5=0.5 No Credits No Credits	20.5
Third Year	First	Five Subjects SDC/VAC MC-I/MC-2/MC-3	Five Subjects SDC/VAC MC-I/MC-2/MC-3	01	Subjects(05S) Labs SDC/VAC CV (Comprehensive Viva)-V Mandatory Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition)		5X3=15 3X1.5=4.5 1x0.5=0.5 1X0.5=0.5 No Credits	20.5
	Second	03S + OEC1(MOOCs) + PEC1 MC-I/MC-2/MC-3	03S + OEC1(MOOCs) + PEC1 MC-I/MC-2/MC-3	01	Subjects(03S, OEC1, PEC1) Labs Mini Project-1(EPICS) SDC/VAC CV (Comprehensive Viva)-VI Internship Mandatory Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition) Mandatory Course-3 (Constitution of India)		5X3=15 2x1.5=3.0 1x1.5=1.5 1X.5=0.5 1X0.5=0.5 1x1.0=1.0 No Credits	21.5
Fourth Year	First	1S+PEC2+PEC3/(MOOCs)+PEC4+OEC2		01	Subjects (01S, PEC2, PEC3, PEC4, OEC2) Labs SDC/VAC CV (Comprehensive Viva)-VII Project Phase 1 Mini project-2 (EPICS)		5X3=15 2X1.5=03 1X0.5=0.5 1X0.5=0.5 1x1.0=1.0 1X1.5=1.5	21.5
	Second	PEC5 + OEC3		01	Subjects (PEC5, OEC3) SDC/VAC CV (Comprehensive Viva)-VIII Seminar Project Phase-2/Internship		2X3=06 1X0.5=0.5 1X0.5=0.5 1x.5=0.5 1X8=08	15.5
							GRAND TOTAL	**160**
MC-1 (Environmental Studies), MC-2 (Indian Heritage, Culture Tradition), MC-3 (Constitution of India)								

9.0 Transitory Regulations:

Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone this course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered subject to section 2.0 and they continue to be in the academic regulations in which they were readmitted.

10.0With-holding of results:

If the candidate has any dues not paid to the Institute or if any case of indiscipline of malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

11.0Award of Class:

After the student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree he shall be placed in one of the following four classes:

Table 7: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	CGPA secured from 157 Credits (Excluding the credits obtained in Skill Development Courses)
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 and < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 and < 6.5	
Pass Class	Below 50% but not less than 40%	Pass	≥ 4 and < 5.5	

12.0 **Grading*:***

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student falls.

Table 8: Conversion into Grades and Grade points assigned

Range in which the % of marks in the subject fall	Grade	Grade point Assigned	Performance
90 to 100	O	10	Out standing
80 to 89.9	A^+	09	Excellent
70 to 79.9	A	08	Very Good
60 to 69.9	B^+	07	Good
50 to 59.9	B	06	Above Average
45 to 49.9	C	05	Average
40 to 44.9	P	04	Pass
<40	F	00	Fail
Ab	AB	00	Fail

12.1 Requirement for clearing any subject: The students have to obtain a minimum of 35% in End Examination and they have to score minimum of 40% marks from

Internal and external exam marks put together to clear the subject. Otherwise they will be awarded fail grade.

12.2 F is considered as a fail grade indicating that the student has to reappear for the end supplementary examination in that subject and obtain a non-fail grade for clearing that subject.

12.3 In case of skill development/ value added course / soft skill subjects, as there is no end exam, all 100 marks are for internal assessment only. Student has to score 40% in these courses to complete the subject which will be evaluated internally. Marks obtained in these courses shall not be considered for award of Division.

12.4 To become eligible for the award of degree the student must obtain a minimum CGPA of 4.0

13.0 Supplementary Examinations:

Apart from the regular End Examinations, the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day. For eighth semester, special (Advance) supplementary examinations will be conducted in second week following the results publication date of regular examination of eighth semester only.

14.0 Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

The Grade Point Average (GPA) for each semester and Cumulative Grade Point Average (CGPA) up to any semester is calculated as follows:

i) Semester Grade Point Average will be computed as follows:

$$GPA = \frac{\sum_1^n C_j \times GP_j}{\sum_1^n C_j}$$

Where, n is the number of subjects in that semester. C_j is Credits for the subjects. GP_j is the grade point obtained for the subject and the summation is over all the subjects in that semester.

ii) A Cumulative Grade Point Average (CGPA) will be computed for every student at the end of each semester. The CGPA would give the cumulative performance of the student from the first semester up to the end of the semester to which it refers to and is calculated as follows:

$$CGPA = \frac{\sum_1^m GPA_j \times TC_j}{\sum_1^m TC_j}$$

Where 'm' is the number of semester under consideration. TC_j the total number of credits for a j^{th} semester and GPA_j is the Grade Point Average of the j^{th} semester. Both GPA and CGPA will be rounded off to the second digit after decimal and recorded as such.

While computing the GPA / CGPA, the subjects in which the student is awarded zero grade points will also be included.

For any academic/employment purpose the following formulae shall be used for conversion of CGPA to % of marks. % of marks = (CGPA –0.5) x 10.

15.0 Grade Sheet:

A grade sheet (Memorandum) will be issued to each student indicating his performance in all subjects of that semester in the form of grades and also indicating the GPA and CGPA.

16.0 Award of Degree

After having admitted into the program, B.Tech degree shall be conferred on a student who has satisfied the following conditions.

(i) The student joining with Intermediate qualification must have, after admission into the Regular B.Tech programme of the college, pursued a regular course of study for not less than four academic years and not more than eight academic years.
(ii) The student joining under lateral entry scheme with diploma qualification must have, after admission into III Semester B.Tech, pursued a regular course of study for not less than three academic years and not more than six academic years.
(iii) The student must have satisfied the minimum academic requirements in appropriate branch of engineering in each semester of the program, herein after prescribed.
(iv) Students must register for all the courses and earn the credits specified
(v) Students who fail to fulfil all the academic requirements for the award of degree within the specified period from the year of their admission shall forfeit their seat in B.Tech course and their admission stands cancelled.
(vi) The student shall successfully complete non-credit courses like EAA/MC/Internship.
(vii) The student has no dues to the institution, library, hostels etc.
(viii) The student has no disciplinary action pending against him/her.

The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on recommendations by the Academic council of RGMCET (Autonomous) basing on the eligibility as in clause 6.0 and 7.0.

17.0 Transcripts:

After successful completion of prerequisite credits for the award of degree, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

18.0 Rules of Discipline:

18.1 Any attempt by any student to influence the teachers, Examiners, faculty and staff of Examination section for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.

18.2 When the student absents himself, he is treated as to have appeared and obtained zero marks in that subject(s) and grading is done accordingly.

18.3 When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).

18.4 When the student's answer book is confiscated for any kind of attempted or suspected malpractice, the decision of the Chief Superintendent is final.

19.0 Minimum Instruction Days:

The minimum instruction days for each semester shall be 95 clear instruction days excluding the days allotted for tests/examinations and preparation holidays declared if any.

20.0 Amendment of Regulations:

The college may, from time to time, revise, amend or change the regulations, scheme of examinations and syllabi. However the academic regulations of any student will be same throughout the course of study in which the student has been admitted. However students will continue to be in the academic regulations in which they were readmitted.

21.0 Transfers

There shall be no branch transfers after the completion of admission process.

22.0 General:

22.1 The Academic Regulations should be read as a whole for the purpose of any interpretation.

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

22.3 The Institute may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institute.

22.4 Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

Academic Regulations for B.Tech.

(Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2020-2021 onwards)

1.0 The students have to acquire a minimum of 122 credits out of 122 from II to IV year of B.Tech. Program (Regular) for the award of the degree.

2.0 Students, who fail to fulfil the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

3.0 The same attendance regulations are to be adopted as that of B. Tech. (Regular).

4.0 Promotion Rule:

The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 42.5 credits out of 85 credits from all the exams conducted up to and including III year II semester regular examinations, whether the candidate takes the examinations or not.

5.0 Award of Class:

After the student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes: The marks obtained in the best 119 credits will be considered for the calculation of percentage and award of class.

Table 1: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	CGPA secured from 119 Credits (Excluding the credits obtained in Skill Development Courses)
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	
First Class	Below 70% but not less than 60%	First Class	$6.5 and < 7.5$	
Second Class	Below 60% but not less than 50%	Second Class	$\geq 5.5 \; and \; < 6.5$	
Pass Class	Below 50% but not less than 40%	Pass	$\geq 4 \; and \; < 5.5$	

6.0 All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

I B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory /Practical		Internal	External	Total
Theory								
A0001191	Communicative English - I	1	1	0	2	30	70	100
A0002191	Linear Algebra and Calculus	2	1	0	3	30	70	100
A0003191	Applied Chemistry	2	1	0	3	30	70	100
A0101191	Engineering Mechanics	2	1	0	3	30	70	100
A0501191	Programming for Problem Solving - I	2	1	0	3	30	70	100
Practicals								
A0091191	Engineering Chemistry Lab	0	0	3	1.5	25	50	75
A0591191	Programming for Problem Solving – I Lab	0	0	3	1.5	25	50	75
A0092191	Digital English Language Lab	0	0	3	1.5	25	50	75
A0093191	Comprehensive Viva - I	0	0	0	0.5	0	50	50
	Contact Periods / Week	**9**	**5**	**9**	**19**	**225**	**550**	**775**

I B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory /Practical		Internal	External	Total
Theory								
A0006192	Communicative English - II	1	1	0	2	30	70	100
A0007192	Ordinary, Partial Differential Equations and Vector Calculus	2	1	0	3	30	70	100
A0008192	Engineering Physics	2	1	0	3	30	70	100
A0301191	Engineering Drawing	2	1	0	3	30	70	100
A0502192	Programming for Problem Solving - II	2	1	0	3	30	70	100
Practicals								
A0094191	Engineering Physics Lab	0	0	3	1.5	25	50	75
A0593192	Programming for Problem Solving – II Lab	0	0	3	1.5	25	50	75
A0592191	Engineering Workshop and IT Workshop	0	0	3	1.5	25	50	75
A0095192	Comprehensive Viva - II	0	0	0	0.5	0	50	50
	Contact Periods / Week	**9**	**5**	**9**	**19**	**225**	**550**	**775**

II B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory / Practical		Internal	External	Total
Theory								
A0009193	Numerical Methods and Probability Theory	2	1	0	3	30	70	100
A0204193	Basic Electrical and Electronics Engineering	2	1	0	3	30	70	100
A0503193	Python Programming	2	1	0	3	30	70	100
A0102193	Strength of Materials-I	2	1	0	3	30	70	100
A0103193	Fluid Mechanics	2	1	0	3	30	70	100
Life Sciences								
A0010193	Biology for Engineers	2	0	0	2	30	70	100
Skill Development Course								
A0011193	Aptitude, Arithmetic, Reasoning and Comprehension	1	2	0	0.5	30	70	100
Practicals								
A0191193	Strength of Materials Lab	0	0	3	1.5	25	50	75
A0291193	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5	25	50	75
A0594193	Python Programming Lab	0	0	3	1.5	25	50	75
A0096193	Comprehensive Viva - III	0	0	0	0.5	0	50	50
	Contact Periods / Week	**13**	**7**	**9**	**22.5**	**285**	**690**	**975**

II B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory/ Practical		Internal	External	Total
Theory								
A0104194	Surveying	2	1	0	3	30	70	100
A0105194	Building Technology	2	1	0	3	30	70	100
A0106194	Strength of Materials - II	2	1	0	3	30	70	100
A0107194	Hydraulics and Hydraulic Machines	2	1	0	3	30	70	100
A0108194	Structural Analysis	2	1	0	3	30	70	100
Mandatory Learning Course								
A0015194	Environmental Science	2	0	0	0	0	0	0
Skill Development Course								
A0016194	Design Thinking for Innovations	1	2	0	0.5	30	70	100
Practicals								
A0192194	Surveying Lab	0	0	3	1.5	25	50	75
A0193194	Fluid Mechanics, Hydraulics and Hydraulic Machines Lab	0	0	3	1.5	25	50	75
A0194194	Building Planning & Drawing Lab	0	0	3	1.5	25	50	75
A0097194	Comprehensive Viva - IV	0	0	0	0.5	0	50	50
	Contact Periods / Week	13	7	9	20.5	255	620	875

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT CIVIL ENGINEERING

III B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory/ Practical		Internal	External	Total
Theory								
A0109195	Concrete Technology	2	1	0	3	30	70	100
A0110195	Design of Reinforced Concrete Structural Elements	2	1	0	3	30	70	100
A0111195	Hydrology and Water Resources Engineering	2	1	0	3	30	70	100
A0112195	Environmental Engineering	2	1	0	3	30	70	100
A0113195	Geotechnical Engineering	2	1	0	3	30	70	100
Skill Development Course								
A0014195	Construction technology and project management	1	2	0	0.5	30	70	100
Mandatory Learning Course								
A0017194	Indian Heritage and Culture	2	0	0	0	0	0	0
Practicals								
A0195195	Concrete Technology Lab	0	0	3	1.5	25	50	75
A0196195	Geotechnical Engineering Lab	0	0	3	1.5	25	50	75
A0197195	Computer Aided Design Lab - I	0	0	3	1.5	25	50	75
A0098195	Comprehensive Viva - V	0	0	0	0.5	0	50	50
	Contact Periods / Week	**13**	**7**	**9**	**20.5**	**255**	**620**	**875**

III B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory/ Practical		Internal	External	Total
Theory								
A0115196	Design of Steel Structural Elements	2	1	0	3	30	70	100
A0116196	Estimating Costing and Valuation	2	1	0	3	30	70	100
A0117196	Transportation Engineering	2	1	0	3	30	70	100
Open Elective-I/MOOCs		2	1	0	3	30	70	100
A0118196	Pre Stressed Concrete							
A0119196	Global Warming and Climate change							
A0120196	Experimental Stress Analysis							
A0121196	Rehabilitation of Structures							
Professional Elective-I		2	1	0	3	30	70	100
A0122196	Advanced Geotechnical Engineering							
A0123196	Bridge Engineering							
A0124196	Environmental Pollution and Control							
A0125196	Advanced Structural Analysis							
Skill Development Course								
A0518196	Object Oriented Programming Through JAVA	1	2	0	0.5	30	70	100
Mandatory Learning Course								
A0018194	Constitution of India	2	0	0	0	0	0	0
Practicals								
A0198196	Computer Aided Design Lab - II	0	0	3	1.5	25	50	75
A0199196	Environmental Engineering Lab	0	0	3	1.5	25	50	75
A0082196	Mini Project - I	0	0	3	1.5	25	50	75
A0099196	Internship	0	0	0	1	0	0	0
A0081196	Comprehensive Viva - VI	0	0	0	0.5	0	50	50
	Contact Periods / Week	**13**	**7**	**9**	**21.5**	**255**	**620**	**875**

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT CIVIL ENGINEERING

IV B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory/ Practical		Internal	External	Total
Theory								
A0024197	Managerial Economics and Financial Analysis	2	1	0	3	30	70	100
Open Elective-II/MOOCs		2	1	0	3	30	70	100
A0126197	Geoinformatics							
A0127197	Building Information Modelling							
A0128197	Railways, Docks and Harbour Engineering							
A0129197	Earthquake Resistant Design							
Professional Elective-II		2	1	0	3	30	70	100
A0130197	Finite Element Methods in Civil Engineering							
A0131197	Hydraulic Structures							
A0132197	Water Resources System Planning and Management							
A0133197	Advanced Structural Design							
Professional Elective-III		2	1	0	3	30	70	100
A0134197	Maintenance and Repair of Buildings							
A0148197	Soil Dynamics and Machine Foundations							
A0149197	Advanced Land Measurement Techniques							
A0150197	Ground Water Development and Management							
Professional Elective-IV		2	1	0	3	30	70	100
A0135197	Pavement Analysis and Design							
A0136197	Traffic Engineering							
A0137197	Fire Safety Engineering Design of Structures							
A0138197	Road Safety Audit							
Skill Development Course								
A0139197	Numerical Methods in Civil Engineering	1	2	0	0.5	30	70	100
Practicals								
A0198197	Transportation Engineering Lab	0	0	3	1.5	25	50	75
A0199197	Geographical Information Systems Lab	0	0	3	1.5	25	50	75
A0084197	Mini Project-II [Epics]	0	0	3	1.5	25	50	75
A0085197	Comprehensive Viva-VII	0	0	0	0.5	0	50	50
A0083197	Project Phase-I	0	0	0	1	25	0	25
	Contact Periods / Week	**11**	**7**	**9**	**21.5**	**280**	**620**	**900**

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT CIVIL ENGINEERING

IV B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory/ Practical		Internal	External	Total
Professional Elective-V								
A0140198	Design and Drawing of Irrigation Structures	2	1	0	3	30	70	100
A0141198	Open Channel Hydraulics							
A0142198	Industrial Waste and Waste Water Management							
A0151198	Smart Cities							
Open Elective-III								
A0143198	Environmental Impact Assessment and Management	2	1	0	3	30	70	100
A0144198	Watershed Management							
A0145198	Ground Improvement Techniques							
A0146198	Construction Methods and Equipment							
Skill Development Course								
A0147198	Green Buildings	1	2	0	0.5	30	70	100
A0088198	Comprehensive Viva-VIII	0	0	0	0.5	0	50	50
A0086198	Seminar	0	0	0	0.5	50	0	50
A0087198	Project Phase-II /Internship	0	0	0	8	25	100	125
Contact Periods / Week		**5**	**4**	**0**	**15.5**	**165**	**360**	**525**

I B.Tech, I-Sem (CE)

L	T	C
1	1	2

(A0001191) COMMUNICATIVE ENGLISH- I

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- Communicative English-I is prescribed to make students communicate their thoughts, opinions and ideas freely and in real life situations. It has been framed with basics of English usage covering LSRW (Listening, Reading, Speaking and Writing Skills) with suitable practice versions. Further, this course is designed to update the learner in relevant English skills to face campus recruitments and other competitive exams.

COURSE OUTCOMES:

- Develop speaking, reading skills by prescribed lesson. Understand basic grammar principles.
- Write effective letters for job application and complaints, Enhance reading comprehension.
- Comprehend English speech sound system, stress and Intonation, Understand the usage of Vocabulary.
- Enhance reading comprehension, Vocabulary, Speaking, Grammar.
- Acquire knowledge in writing skills, learn Grammar usage and interpret the poem.

MAPPING WITH COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	3	-	-	-	-	1
CO2	-	-	-	-	-	2	3	-	-	-	-	1
CO3	-	-	-	-	-	3	2	-	-	-	-	1
CO4	-	-	-	-	-	3	2	-	-	-	-	1
CO5	-	-	-	-	-	2	3	-	-	-	-	1

UNIT-1

Speaking - Describing Home Towns - Hobbies - Reading-Essay - My Vision for India by APJ. Abdul Kalam, (http://www.studypage.in) Essay Writing Practice- Remedial Grammar - Practice - Standard Abbreviations & Acronyms

UNIT-2

Writing - Principles of Punctuation-Prewriting Techniques - Letter formats - Formal letter - Writing - Practice - Techniques of Spelling -Reading Comprehension Skills - Practice

UNIT-3

Listening& Speaking - Introduction to English Pronunciation - Minimal Pairs Practice - Words with complex pronunciation - Movie Analysis - Discussion-Grammar & Vocabulary - Concord - Idioms & Phrases- Practice

UNIT-4

Reading - Skimming and Scanning - What is a Drone: Main Features & Applications of Today's Drones by Jack Brown - Vocabulary -Computer Terminology - Phrasal Verbs - Speaking - Current Affairs - Discussions -Grammar & Usage - Articles & Prepositions- Practice.

UNIT-5

Writing: Structure of Paragraph Writing - Cause and Effect - Compare and Contrast -Practice - Techniques - Report writing - Official Reports - Business Reports - Practice -Grammar & Usage - Conditional sentences- IF Poem by Rudyard Kipling.

UNIT-6

Listening & Speaking - Indian English Variants - Difference between British and American English - Listening comprehensions - Test - Remedial Grammar- Correction of Sentences - Sentence Completions - Movie Analysis - Debate

REFERENCE TEXT BOOKS:

1) English Language & Communication Skills for Engineers (AICTE Syllabus**)** by Sanjay Kumar & Pushpa Latha, Oxford University Press, 2018
2) Practical English Usage by Michael Swan, Oxford University Press.
3) The Definitive Guide to IELTS Academic Writing, Oxford University Press, 2019.

I B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0002191) LINEAR ALGEBRA & CALCULUS

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- The essential tool of matrices and linear algebra in a comprehensive manner.
- The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- To deal with functions of several variables that are essential in most branches of engineering.
- Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
- The mathematical tools needed in evaluating multiple integrals and their usage

COURSE OUTCOMES:

After completion of the course the student will be able to:

- Understand the use of matrices and linear system of equations in solving problems such as Network analysis, encoding and decoding in Cryptography and Quantum mechanics problems.
- Apply the concept of Gamma and Beta functions linear digital signal processing, discrete Fourier transform, digital filters and Oscillatory theory in engineering.
- Analyze differential and integral calculus to solve improper integrals and its applications in many engineering disciplines.
- Determine the process to evaluate double and triple integrals and understand its usage to find surface area and volumes of various bodies in engineering.
- Identify the applications of advanced calculus & Linear algebra in electro-magnetic theory and in telecommunication engineering.

MAPPING WITH COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	1	-	2	-	-	-	-	-	-	-	-
CO3	1	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	3	-	-	-	-	-	-	-	-
CO5	1	3	-	-	-	-	-	-	-	-	-	-

UNIT-1

Matrices: Elementary row transformations – Rank – Echelon form, Normal form – Solutions of Linear System of Homogenous and Non-Homogeneous equations.

UNIT-2

Eigen Values, Eigen vectors – Properties; Cayley – Hamilton Theorem (without proof) – Inverse and Power of a matrix by Cayley – Hamilton theorem.

UNIT-3

Quadratic forms: Linear Transformation – Reduction of quadratic form to canonical form and their nature.

UNIT-4

Mean value theorems: Rolle's Theorem – Lagrange's Mean Value Theorem – (excluding proof). Taylor's and Maclaurin's Series for e^x, sinx, cosx and log $(1 + x)$.

Functions of several variables – Jacobian – Maxima and Minima of functions of two variables - Lagrange's method of Multipliers with three variables only.

UNIT-5

Special functions: Gamma function – Properties – Beta function – properties – Relation between Gamma and Beta functions – Evaluation of Integrals using Gamma & Beta functions.

UNIT-6

Multiple integrals: – Evaluation of Double integrals (Cartesian and Polar) – Change of Variables – Change of order of Integration – Evaluation of triple integrals.

TEXT BOOKS/REFERENCES:

1) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
5) T.K.V. Iyengar, B. Krishna Gandhi and Others, Mathematical Methods, S. Chand & Company.
6) T.K.V. Iyengar, B. Krishna Gandhi and Others, A Text Book of Engineering Mathematics, Vol – 1, S. Chand & Company.
7) S.R.K. Iyengar and R.K. Jain, Advanced Engineering Mathematics, Narosa publishing.

I B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0003191) APPLIED CHEMISTRY

(For branches CE & Mech)

COURSE OBJECTIVES:

- To familiarize applied chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

COURSE OUTCOMES:

At the end of the course, the students will be able to

- Demonstrate the corrosion prevention methods and factors affecting corrosion (L2)
- Explain the preparation, properties, and applications of thermoplastics & thermo settings & elastomers(L2)
- Explain calorific values, octane and cetanenumber (L2)
- Explain the setting and hardening of cement (L2)
- Summarize the application of adsorption and nanomaterials (L2)

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	1	-	-	-	1	1	-	-	1
CO2	-	1	2	1	-	1	1	-	-	-	-	-
CO3	1	-	-	2	-	-	1	1	-	-	-	-
CO4	1	3	-	1	2	1	-	1	-	-	-	1
CO5	1	1	-	1	2	-	-	1	1	-	-	1
Course	1	-	1	-	1	-	-	-	1	-	-	-

UNIT-1

Water Technology: (12 Hours)

Introduction – Types of water, Soft and hard water, hardness of water, Estimation of hardness of water by EDTA Method and Numerical problems on hardness, Water Softening methods - zeolite and ion-exchange processes - desalination of brackish water - reverse osmosis (RO) - Boiler troubles - scale and sludge, Boiler Corrosion, Caustic Embrittlement, Priming and foaming – Analysis of water – Alkalinity, Dissolved oxygen by Winkler's method - specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards

Learning outcomes: The student will be able to

- List the differences between hardness and hard water(L1)
- List the differences between temporary and permanent hardness of water(L1)
- Explain the principles of reverse osmosis(L1)
- Comparing the quality of drinking water with BIS and WHO standards(L2)
- Illustrate the problems associated with hard water for production of steam(L2)
- Explain the working principles of different softening methods(L2)
- Understanding the problems due to presence of alkalinity and dissolved oxygen (L3)

UNIT-2

Electrochemistry and Applications: (10 Hours)

Types of Conductance – Conductance, Specific conductance, Equivalent Conductance and molar conductance. Determination of equivalent conductance by Wheatstone bridge method, concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), Numerical Problems on conductance. Nernst equation, cell potential calculations, Electrodes – concepts, reference electrodes (Standard hydrogen electrode and Calomel electrode) photovoltaic cell – working and applications.

Learning Outcomes: At the end of this unit, the students will be able to

- Apply Nernst equation for calculating electrode and cell potentials (L3)
- Applications of Conductometric titrations (L2)
- Solve problems based on conductance and cell potential (L3)
- Learning about the concept of electrodes (L2)

UNIT-3

Corrosion: (12 Hours)

Definition - Severity of the Problem

Types of Corrosion: Direct chemical attack type of corrosion, electrochemical type of corrosion and their mechanism, other types of corrosion: Galvanic, pitting, concentration cell type corrosion and water line corrosion. Factors affecting the rate of the corrosion, Proper design and material selection, Cathodic protection against corrosion, Use of inhibitors, Metallic Coatings, Hot dipping method (Galvanization, Tinning).

Learning Outcomes: At the end of this unit, the students will be able to

- Apply pilling Bed-worth rule for corrosion and corrosion prevention (L3)
- Understanding and analysing the severity problem of corrosion(L3)
- Demonstrates the corrosion prevention methods and factors affecting the corrosion(L2)
- Learning the principles of protection against corrosion methodologies (L2)

UNIT-4

Advanced Engineering Materials: (8 Hours)

Refractories- Classification, Properties and its Applications, Reasons for failure of the refractory materials.

Lubricants- Classification, Functions of lubricants, Mechanism of lubrication (fluid-film lubrication), Properties of lubricating oils (viscosity, viscosity index, saponification number, oiliness, flash and fire points, emulsification, carbon residue, mechanical stability and aniline point).

Learning Outcomes: At the end of this unit, the students will be able to

- Identify the factors affecting the refractory material(L3)
- Illustrate the functions and properties of lubricants (L2)
- Identifying the constituents of Portland cement (L3)
- Enumerate the reactions at setting and hardening of cement.

UNIT-5

Surface Chemistry and Applications: (9 **Hours**)

Introduction to surface chemistry, Adsorption- Types of adsorptions, Adsorption of gases on solids and its applications, Adsorption isotherm-Langmuir adsorption isotherm theory and postulates, Nanomaterials: Introduction and applications of nanomaterials in catalysis, medicine, sensors.

Learning Outcomes: At the end of this unit, the students will be able to

- Outline the preparation of nanomaterials and metal oxides (L2)
- Understanding and analyzing the concept of adsorption(L1)
- Identify the application of nanomaterials in medicine, sensors and catalysis (L2)

UNIT-6

Polymers and Fuel Chemistry: (12 Hours)

Polymers: Classification of polymers, functionality, chain growth and step growth polymerization, Copolymerization with specific examples and mechanisms of additional polymerization.

*Plastics***:** Thermoplastics: Preparation, properties and applications of PVC and Teflon.

Thermosets: Bakelite and Urea-formaldehyde.

Fuels –Types of fuels, calorific value, numerical problems based on calorific value; Analysis of coal-Proximate and Ultimate analysis.
Liquid Fuels: Extraction of petroleum, knocking, Octane and Cetanenumber.
Flue gas: Analysis by Orsat's apparatus.

Learning Outcomes: At the end of this unit, the students will be able to

- Explain different types of polymers and their applications (L2)
- Solve the numerical problems based on Calorific value(L3)
- Significance of flue gas analysis
- Explain calorific value and its significance(L2)
- Octane and cetane ratings of fules

TEXT BOOKS:

1) Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2) Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:

1) K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016
2) H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
3) D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman,1992.
4) K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry Pearson India Education Services Pvt. Ltd
5) Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

I B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0101191) ENGINEERING MECHANICS

COURSE OBJECTIVES:

- To provide basic concepts of forces, resultants and their applications on regular bodies to the engineering students.

COURSE OUTCOMES:

After the completion of the course the students will be able to:

- To provide the knowledge on different types of force systems and to find the resultant of the force system.
- To be able to analyze truss and find forces in all the members.
- Understand dry friction and apply to solve problems.
- Understand Centroid and area moment of inertia and find Centroid and moment of inertia of given body.
- To be able to solve problems relating to Kinematics and Kinetics.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									
CO2	3	2	1									
CO3	3	2	1									
CO4	3	2	1									
CO5	3	2	1									

UNIT-1 INTRODUCTION (10 Hours)

Laws of Mechanics, Derived laws, Units, Characteristics of a Force, System of Forces, Resultant of Coplanar Concurrent Force System, Coplanar Non-concurrent Force System, Concurrent Force System in Space, Equilibrium of Body subjected to Concurrent Force System, Non-concurrent Force System.

UNIT-2 ANALYSIS OF PERFECT FRAMES (10 Hours)

Introduction, Perfect, Deficit and Redundant Trusses, Assumptions, Nature of Forces in Members, Methods of Analysis, Method of Joints, Method of Sections.

UNIT-3 FRICTION (10 Hours)

Introduction, Types of Friction, Static, Dynamic & Limiting Friction, Coefficient of Friction, Angle of Repose, Cone Friction, Equilibrium of body lying on inclined surface – problems. Screw jack and its application problems.

UNIT-4 CENTROID AND CENTER OF GRAVITY (10 Hours)

Centroid, Centre of Gravity, Difference between Centroid & Centre of Gravity, Centroid of simple figures: Rectangle, Triangle, Semi & Quarter circle. Centroid of composite figures - T Section, I Section, Angle Section, Hollow Section. Centre of Gravity of Bodies: Cone, Solid Hemisphere. Centre of Gravity of Composite figures using Pappu's theorem. (Simple problems).

UNIT-5 MOMENT OF INERTIA (10 Hours)

Area Moment of Inertia: Definition of Moment of inertia, Parallel & Perpendicular axis Theorem, Polar moment of inertia, product of inertia, Moment of Inertia of simple and composite figures.

UNIT-6 DYNAMICS (10 Hours)

Kinematics: Rectilinear and curvilinear motion – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equation of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

TEXT BOOKS

1) Engineering Mechanics: Statics and Dynamics by Ferdinand Leon Singer. Harper and Row Publications.
2) Engineering Mechanics by S.S. Bhavikatti. New age International Publications.

REFERENCES

1) Engineering Mechanics by R. K. Bhansal, Lakshmi Publications.
2) A Text Book of Engineering Mechanics by R.S. Khurmi. S. Chand Publications.
3) Engineering Mechanics by Basudeb Bhattacharyya. Oxford Publications.

I B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0501191) PROGRAMMING FOR PROBLEM SOLVING-I

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- To make students aware about fundamentals of computer programming.
- To provide exposure on C programming language
- To provide exposure on various C programming concepts like arrays, functions, pointers, Structures etc.
- To develop solutions for various problems by using C programming language.

COURSE OUTCOMES:

At the end of this course, the student would be able to

- Design algorithms and flowcharts for real world applications
- Know the usage of various operators in Program development
- Design programs involving decision and iteration structures.
- Apply the concepts code reusability using Functions
- Analyse the concepts of Arrays and Strings for real world problems.
- Able to apply the pointers in programs

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	2	-	-	-	2	1	-	-
CO2	2	-	-	-	2	-	-	-	-	-	-	-
CO3	3	2	3	2	-	2	-	-	2	-	-	-
CO4	3	-	2	-	-	-	-	-	3	-	-	-
CO5	-	3	3	-	-	2	-	-	-	-	2	-
CO6	-	-	3	-	-	-	2	-	-	-	-	-

UNIT-1

Problem Solving Using Computers: Introduction, Algorithms, Flowcharts and pseudo code.

Overview of C Language: Introduction, Salient Features of C Language, Structure of a "C" Program.

C Language Preliminaries: Keywords and Identifiers, Constants, Variables, Data Types, and Input Output Statements with suitable illustrative "C" Programs.

UNIT-2

Operators: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative C Programs.

UNIT-3

Statements in C:Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, Switch-Statement and goto statement with suitable illustrative C Programs.

Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs, break, continue statements.

UNIT-4

Arrays: Definition, Importance of an array in C language, One-Dimensional Arrays, Two-Dimensional Arrays, Example programs on the topics mentioned above.

Strings: Introduction to Strings, String I/O, String Operations with and without built-in functions (strlen( ), strcmp( ), strcat( ),strcpy( ), and strrev( )) Example Programs on the topics mentioned above

UNIT-5

Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return vs. exit( ), Parameter Passing mechanisms, Call-by-Value, Recursion, Storage Classes, preprocessor directives

UNIT-6

Pointers: Pointer variable and its importance, Pointer variable declaration, initialization of pointer variables, how to access a value from a memory location through it‘s pointer variable. Arithmetic operations on pointer variables, Scale factor length. Pointers and functions - pointers as function arguments (i.e., call-by-reference), Pointers and Arrays, Pointers and Strings, Generic Pointers.

TEXT BOOKS:

1) B.A.Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016
2) Pradip Dey and Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition 2011.

REFERENCE BOOKS:

1) Byron Gottfried, “Programming with C”, Schaum’s Outlines, 2nd Edition, TATA McGraw-Hill.
2) M.T.Somashekara, “Problem Solving Using C”, PHI, 2nd Edition 2009.
3) A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press
4) Rajaraman V., "The Fundamentals of Computers", 4th Edition, Prentice Hall of India, 2006.
5) R S Bichker, "Programming in C", University Press, 2012.

I B.Tech, I-Sem (CE) P C
3 1.5

(A0091191) ENGINEERING CHEMISTRY LAB

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVE:

- Verify the fundamental concepts with experiments

COURSE OUTCOMES:

At the end of the course, the students will be able to

- Learning the analytical skills while doing the experiments (L3)
- Learning the quality of water and its significance (L2)
- Importance of the Conductometric titrations while determine the strength of weak acids a coloured solution (L3)
- Analyse the IR and UV-Visible Spectra of some organic compounds (L3)

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	1	1	-	1	-	-	-	-	1	-	-	1
2	-	2	1	-	2	1	1	1	-	-	1	-
3	-	1	-	-	1	-	1	-	1	-	-	1
4	1	3	2	1	2	-	1	-	-	-	1	1
Course	1	2	1	-	2	1	-	-	1	1		1

LIST OF EXPERIMENTS:

1) Preparation of standard $K_2Cr_2O_7$ solution
2) Estimation of Hardness of Water by using Standard EDTA solution
3) Estimation of Copper by using Standard EDTA solution
4) Estimation of Magnesium by using Standard EDTA solution
5) Estimation of dissolved oxygen by Winkler's method
6) Determination of Strength of given Hydrochloric Acid against standard sodium hydroxide solution by Conductometric titrations
7) Determination of Strength of given Acetic Acid against standard sodium hydroxide solution by Conductometric titrations
8) Determination of strength of mixture of acids against standard sodium hydroxide solution by conductometric method.
9) Verification of Beer-Lambert's law
10) Determine the strength of Cu(II) ion by colorimeter
11) Determination of total alkalinity of water
12) Preparation of a simple polymer
13) Thin layer chromatography
14) Identification of simple organic compounds by IR and UV-Visible Spectroscopy
15) HPLC method in separation of liquid mixtures

I B.Tech, I-Sem (CE) P C
3 1.5

(A0591191) PROGRAMMING FOR PROBLEM SOLVING LAB -I

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OUTCOMES:

- To learn about different types of operators
- To learn how decision making is done during programming
- To learn about various simple constructs used for programming
- To learn to define functions and call them with appropriate parameters
- To understand the usage of string libraries to do common string operations
- To understand pointer referencing and pointer dereferencing

COURSE OUTCOMES:

At the end of this course, the student would be able to

- Apply the specification of syntax rules for numerical constants and variables, data types
- Know the Usage of various operators and other C constructs
- Design programs on decision and control constructs
- Develop programs on code reusability using functions
- Implement various concepts of arrays and strings

MAPPING OF COs & POs:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	2	-	-	-	-	-	-	-
CO2	2	-	-	-	3	-	-	-	-	-	-	-
CO3	-	3	3	-	-	-	-	-	-	-	-	-
CO4	3	-	2	-	-	-	-	-	-	1	2	-
CO5	-	2	-	-	2	-	2	-	-	-	-	1

RECOMMENDED SYSTEMS /SOFTWARE REQUREMENTS:

- Intel based desktop PC with ANSI C Compiler and Supporting Editors

Write a C program to demonstrate the various operators used in C language.

Exercise-1

a) Write a C program to find the roots of a quadratic equation.
b) Write a C program to find both the largest and smallest number in a list of integers.

Exercise-2

a) Write a C program, which takes two integer operands and one operator from the user, performs the specified operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
b) Write a C Program to find the reverse of a given number.

Exercise-3

a) Write a C program to find the sum of individual digits of a positive integer.
b) Write a C program to generate the first ‘n’ terms of the Fibonacci sequence.
[**Note:** A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.]
c) Write a C program to generate all the prime numbers between 1 and n, where ‘n’ value is given by the user.
[**Note:** Develop each of the above programs by using different loop constructs supported by C language. (i.e., while, do while and for Loops)]

Exercise-4

a) Write a C Program to mask the most significant digit of the given number.
b) Write a program which Prints the following pattern

```
0
111
22222
3333333
444444444
```

Exercise-5

a) Write a C program to find all the even numbers in the given one dimensional array.
b) Write a C program to print the elements of an array in reverse order.
c) Write a C program to construct a pyramid of numbers.

Exercise-6

Write a C program to perform the following operations:

a) Addition of Two Matrices
b) Multiplication of Two Matrices
   [Note: Use functions to implement the above specified operations]

Exercise-7

Write C programs that use both recursive and non-recursive functions

a) To find the factorial of a given integer.
b) To find the GCD (greatest common divisor) of two given integers.

Exercise-8

a) Write a C Program to solve the Towers of Hanoi problem by using recursive function.
b) Write a C Program to demonstrate the various storage classes, which are supported by the C language. [i.e., automatic, external, static and register]

Exercise-9

a) Write a C Program to demonstrate that, how to pass an entire array as an argument to a function with a suitable example.
b) Write a C Program to perform various operations on given two strings using string handling functions.

Exercise-10

a) Write a C Program to perform various arithmetic operations on pointer variables.
b) Write a C Program to demonstrate the following parameter passing mechanisms:
   i) Call-by-value
   ii) Call-by-reference

Exercise-11

a) Write a C program that uses functions to perform the following operations:
   i). To insert a sub-string in to a given main string from the specified position.
   ii). To delete '**n**' Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not.

Exercise-12

a) Write a C program that displays the position or index in the string 'S' where the string 'T' begins, or – 1 if 'S' doesn't contain 'T'.
b) Write a C program to count the lines, words and characters in a given text.

REFERENCE BOOKS

1) Programming in C, Pradeep Dey, Manas Ghosh, Oxford Heigher Education
2) The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
3) Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
4) Computer Basics and C Programming, V. Raja Raman, PHI Publications.

I B.Tech, I-Sem (CE) P C
3 1.5

(A0092191) DIGITAL ENGLISH LANGUAGE LAB

(For Branches: CE, EEE, Mech, ECE & CSE)

The Digital English Language Lab focuses on the production and practice of sounds of language and equips students with the use of English and vocabulary in everyday situations and contexts.

COURSE OBJECTIVES:

- To facilitate the students to use language effectively in everyday social conversations
- To expose the students to the blend of self-instructional and modes of language learning teacher assisted through digital lab
- To improve the fluency and intelligibility of student in spoken English and neutralize their mother tongue influences
- To help the students to participate in group discussions, to face interviews and shape the individual language learning.

COURSE OUTCOMES:

- Social interactions, greetings, self-introductions and group talk
- Improving standard pronunciation patterns and neutralize the mother tongue impact
- Developing communication through listening, reading, speaking and writing activities
- Enhancing vocabulary and grammar to develop professional language
- Improving life skills through GD and role plays practices

MAPPING OF COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	1	1	2	2	3	-	2
CO2	1	-	-	-	-	2	1	2	2	3	-	2
CO3	1	-	-	-	-	2	1	2	2	3	-	2
CO4	1	-	-	-	-	2	1	2	2	3	-	2
CO5	1	-	-	-	-	2	1	2	2	3	-	2

Digital English Language Lab consists of two parts:

1) CALL (Lab): Computer Assisted Language Learning
2) ICS (Lab): Interactivity Communication Skills

Exercise-1

Introduction to Phonetics - Speech Sounds - Vowels - Phonetic Transcription - CALL Lab - Ice Breaking Activity - Self Introductions (SWOT) - Social Interactions - Pair work - ICS Lab

Exercise-2

Diphthongs - Consonants - Phonetic Transcription - CALL Lab - Just A Minute (JAM) - ICS Lab

Exercise-3

Listening Comprehension (audio) - IELTS Testing Exercises - CALL Lab - Speaking Activity - Group talk - ICS Lab

Exercise-4

Vocabulary Building - Synonyms & Antonyms - Analogy - Testing Exercises - CALL Lab - Narration of a Story/Event/ Describing an Object - ICS Lab

Exercise-5

Situational Dialogues - CALL Lab - Role Play - ICS Lab

Exercise-6

Pronunciation Evaluation Testing Exercises through EPD - CALL Lab - Group Discussion - ICS Lab - Any student-based activities

Course Outcomes:

Student will able to learn:

- ❖ Will understand the spoken skills from CALL and ICS
- ❖ Will know the variations in accent of native and non-native speakers of English and achieve accent neutralization
- ❖ Will develop the reading & listening comprehension skills

PRESCRIBED SOFTWARE:

- K-VAN Solutions (licensed software)
  - ➢ Advance Communication Skills Lab
  - ➢ English Language Communication Skills Lab
- Cambridge Advanced Learners' English Dictionary with CD
- IELTS Academic Preparation and Practice with CD

BOOKS SUGGESTED FOR DELL: (CENTRAL LIBRARY)

1) Skill Pro – A Course in Communication Skills and Soft Skills by Prof. K. Sumakiran et.al, EMESCO.
2) Skill Pro-I Foundation Course - 4 - by Dr. G. Gulam Tariq et.al, Maruthi Publications.
3) Strengthen Your Steps – A Multimodal Course in Communication skills by Dr. M. Hari Prasad et.al
4) English Pronouncing Dictionary Daniel Jones Current Edition with CD
5) English Dictionary for Advanced Learners, (with CD) International edn. Macmillan 2009.

I B.Tech, II-Sem (CE)

L	T	C
1	1	2

(A0006192) COMMUNICATIVE ENGLISH- II

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- The course Communicative English - II is an extension of Communicative English - I. This will provide inputs in business vocabulary to introduce Communicative style in writing and speaking to expose students to professional scenario. This will led students to write letters in professional contexts. Communicative English -II enhances the students' communication skills in terms of LSRW Skills.

COURSE OUTCOMES:

- Develop communicative competence by enunciating words and learn Language games.
- Build the habit of reading skills and enhance styles of writing.
- Interpret different accents and modulations through active listening and improvisation of writing skills.
- Write clear and coherent passages.
- Improve the ability to speak effectively in English in real life situations and understanding of Team Dynamics.

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	3	-	-	-	1	2
CO2	-	-	-	-	-	3	2	-	2	-	3	1
CO3	-	-	-	-	-	2	3	-	2	-	1	1
CO4	-	-	-	-	-	2	3	-	2	-	1	1
CO5	-	-	-	-	-	2	3	-	2	-	2	1

UNIT-1

a) Speaking - News Paper Reading - Narrating a Story/ Event
b) Vocabulary Development: Root Words-Homonyms-Homophones-Wordlists - Quizzes -Language Games – Puzzles

UNIT-2

a) Reading Comprehension-Life is a Pizza by Richard Templar from Rules of Life - Vocabulary on Eateries, Food & Travel
b) Business Writing - Memorandums - Letters - Style & Formats - E-mail Writing - Practice

UNIT-3

a) Listening & Speaking - TED Talks - Listening Comprehension- Practice - Tests
b) Writing - Proposals - Technical Paper Writing- Practice – Movie Analysis

UNIT-4

a) Writing - Gadget Reviews - Technical Jargon - Resume Writing - Practice
b) Précis Writing - Techniques of Writing the Précis- Sample Analysis-Practice.

UNIT-5

a) Speaking - Seeking Information - Preferences - Likes & Dislikes - Cross - Cultural Communication
b) Satya Nadella: When empathy is good for business https://www.morningfuture.com - Team Dynamics Activity

UNIT-6

a) Listening & Writing - Movie/Short Film/Documentary Analysis
b) Info Graphics- Techniques - Practice from IELTS Videos

REFERENCE TEXT BOOKS:

1) Word Power Made Easy by Norman Lewis, Goyal Publications
2) Group Dynamics for Teams 3rdEd. By Levi, Daniel. Sage Publications India Pvt.Ltd. New Delhi, 2011.
3) Business English Essentials by Henderson, Greta Lafollette & Price R Voiles 7th Edition. Glencoe/McGraw Hill.
4) On Writing Well by William Zinsser, Harper Perennial Press, 2016

I B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0007192) ORDINARY, PARTIAL DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- The effective mathematical tools for the solutions of differential equations that model physical processes.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering
- To familiarize the concepts in vector calculus like gradient, divergent and curl, as well as, divergent theorems.

COURSE OUTCOMES:

After completion of the course the student will be able to:

- Obtain the knowledge of first and higher order differential equations and its use in solving Circuit analysis, heat transfer problems in engineering.
- Analyze solving higher order linear differential equations with variable coefficients and its applications.
- Understand about formation and solution of partial differential equations and importance in thermodynamics, continuum mechanics and fluid mechanics.
- Understand about vector differentiation and its applications in Electromagnetic theory.
- Apply the concept of vector integration to solve many problems in field theory, Electromagnetic theory and transmission lines.

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-	-
CO3	1	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	3	-	-	-	-	-	-	-	-
CO5	1	3	2	-	-	-	-	-	-	-	-	-

UNIT-1

Differential equations of first order and first degree - Formation of ODEs - Solution of ODEs - Exact, Non - Exact, Linear and Bernoulli's equations - Applications of ODEs to L - R & C - R circuits.

UNIT-2

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type, e^{ax}, Sin ax, Cos ax, Polynomials in x, e^{ax} V(x), xV(x), Method of Variation of parameters.

UNIT-3

Higher Order linear Differential Equations with variable coefficients: Cauchy's and Legendre's linear Differential equations, simultaneous linear differential equations with constant coefficients.

UNIT-4

Partial Differential Equations of First order:

First order partial differential equations, Formation of partial differential equations, solutions of first order linear and non – linear Partial differential equations, Method of separation of variables.

UNIT-5

Vector Differentiation: Introduction of Vector differentiation– Scalar and vector point functions – Gradient of scalar function– Directional derivatives – Divergence of a vector function – Curl of a vector function.

UNIT-6

Vector integration: Line integral - Potential function – Area, Surface and volume integrals. Vector integral theorems: Green's theorem (without proof) – Stoke's theorem (without proof) and Gauss Divergence Theorem (without proof); Verification of Green's, Stoke's and Gauss Theorems.

TEXT BOOKS/REFERENCES:

1) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4) T.K.V. Iyengar, B. Krishna Gandhi and Others, Mathematical Methods, S. Chand & Company.
5) T.K.V. Iyengar, B. Krishna Gandhi and Others, A Text Book of Engineering Mathematics, Vol – 1, S. Chand & Company.
6) S.R.K. Iyengar and R.K. Jain, Advanced Engineering Mathematics, Narosa publishing.
7) Ian Sneddon, Elements of Partial Differential equations, McGraw Hill.

I B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0008192) ENGINEERING PHYSICS

(For branches CE & Mech)

COURSE OBJECTIVES:

- To provide basic concepts of interaction of light with matter, nanomaterials, ultrasonics and quantum physics to the engineering students.

COURSE OUTCOMES:

After the completion of the course the students will be able to:

- Apply the concept of light to test the material properties
- Construct a quantum mechanical model to explain the behaviour of a system at the microscopic level.
- Apply the knowledge of nanomaterials in the development of nanotechnology.
- Detect the flaws present in the materials using ultrasonics
- Apply the functional materials for the benefit of mankind.

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	1	1	-	-	-	-	-	-	1
CO2	3	-	1	1	2	-	-	-	-	-	-	-
CO3	3	-	2	2	2	-	1	-	-	-	-	1
CO4	1	3	2	1	1	-	-	-	-	-	-	-
CO5	1	3	2	-	2	-	-	-	-	-	-	1

UNIT-1 WAVE OPTICS (9 h)

Interference: Introduction – Division of amplitude – Newton's rings and its applications. **Diffraction:** Introduction – Fraunhofer diffraction at single slit – Diffraction Grating – Grating spectra – Determination of wavelength of light.

UNIT-2 QUANTUM MECHANICS (9 h)

Introduction to quantum physics – Wave-Particle duality – de Broglie hypothesis – Verification of wave character of Matter waves (Davison–Germer experiment) – Uncertainty principle – Thought experiment (Electron diffraction) – Wave function (ψ) – Schrodinger's one-dimensional time-independent wave equation – Particle in 1D-potential box.

UNIT-3 THE CRYSTAL STRUCTURE OF SOLIDS (9 h)

Introduction – Space lattice – Basis – Unit cell (primitive and Non-primitive) – Crystal systems – Bravais lattices – Atomic radius, Nearest neighboring distance, Coordination number and packing factor for SC, BCC, FCC lattices – Diamond structure – Crystal planes and directions – Miller Indices – calculation of interplanar distance.

UNIT-4 ULTRASONICS (9 h)

Introduction – Production of ultrasonics by magnetostriction and piezoelectric method – Detection methods – Properties – Cavitation – Pulse-echo & Transmission mode of non-destructive testing (NDT) methods – General applications of ultrasonics.

UNIT-5 NANOMATERIALS (9 h)

Introduction – Properties of nanomaterials: Surface area to volume ratio and Quantum confinement – Synthesis of nanomaterials – Ball milling – Sol-gel – chemical vapour deposition (CVD) techniques – Carbon nanotubes (CNTs) – Applications.

UNIT-6 FUNCTIONAL MATERIALS (9h)

Introduction – Fiber reinforced plastics (FRPs) – Piezoelectrics – Piezoresistors – Metallic glasses – Shape memory alloys (SMAs) – Properties and Applications.

TEXT BOOKS

1) M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy" AText book of Engineering Physics"- S. Chand Publications, 11thEdition 2019.

2) R. K. Gaur and S.C. Gupta, "Engineering Physics", Dhanpat Rai Publications, New Delhi.

REFERENCES

1) "Concepts of Modern Physics", ArthusBeiser, Tata Mc Graw Hill Publications, New Delhi.
2) "Physics Volume – II", Resnick, Halliday and Krane, Wiley, New Delhi.
3) "Elements of Solid-State Physics", J.P. Srivastava, PHI Learning, 4th eds. New Delhi.
4) "Introduction to Nanotechnology", Charles P. Poole and Frank J. Ownen, Wiley.
5) "Applied Physics", S.P.Basavaraju, Subhas Stores, Bangalore.
6) "Nanotechnology", M. Ratner & D. Ratner, Pearson Ed, New Delhi.

I B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0301191) ENGINEERING DRAWING

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- Increase ability to communicate with people
- Learn to take data and transform it into graphic drawings.
- Learn basic engineering drawing formats
- Prepare the student for future Engineering positions

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Understand the theory of orthographic projection.
- Understand the conventions and the methods adopted in engineering drawing.
- Know the importance of sectioning and Developments of solids in actual applications.
- Improve their visualization skills so that they can apply these skills in developing new products.

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	-	-	-	-	-	2	-
CO2	3	2	3	2	3	-	-	-	-	-	-	-
CO3	3	2	2	1	3	-	-	-	-	-	-	1
CO4	3	2	2	2	3	-	-	-	-	-	1	-

UNIT-1

Polygons-Construction of Regular Polygons using given length of a side; Conic sections-Ellipse- Arcs of Circles and Oblong Methods, Construction of Parabola and Hyperbola by eccentricity method only.

UNIT-2

Introduction to Orthographic Projections- Projections of Points-Projections of Straight Lines parallel to both planes; Projections of Straight Lines-Parallel to one and inclined to other plane, inclined to both planes, determination of true lengths, angle of inclinations.

UNIT-3

Projections of Planes- Regular Planes Perpendicular / Parallel to one Reference, Plane and inclined to other Reference Plane.

UNIT-4

Projections of Solids-Prisms, pyramids, cones and Cylinders with the axis inclined to one Plane.

UNIT-5

Section of solids: Sectioning of prism, pyramid, cone and cylinder– sectional view – true shape. Solids in simple position and cutting plane inclined to one reference plane only.

Development of surface of solids: Development of truncated prism, pyramid, cone and cylinder – frustum of cone and pyramid

UNIT-6

Conversion of Isometric Views to Orthographic Views/Projections-Conversion of Orthographic Views to Isometric Projection/ Views.

TEXT BOOK:

1) Engineering Drawing by N.D. Bhatt, Chariot Publications.
2) Engineering Drawing and Graphics, Venugopal/New age publications.

REFERENCE BOOKS:

1) Engineering Drawing. K.L Narayana, P. Kannaiah, Scitech Publications.
2) Engineering Drawing, B.V.R Gupta, J.K. Publishers.
3) Engineering Drawing by M.B. Shah and B.C. Rana, Pearson Publishers.

4) Engineering Drawing, Johle, Tata Mc Graw - Hill.
5) K.V. Natarajan, 'A text book of Engineering Graphics', Dhanalakshmi publishers, Chennai (2006).

I B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0502192) PROGRAMMING FOR PROBLEM SOLVING-II

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- To make students aware about structures and unions in C language.
- To provide exposure on various searching and sorting techniques.
- To provide exposure on various data structures like stacks, queues, circular queues and linked lists etc.,
- To develop solutions for various problems by using C Programming Language by students.

COURSE OUTCOMES:

At the end of this course, the student would be able to

- Develop programs with user defined data types.
- Apply various file handling techniques for better data management
- Apply stacks in various applications
- Apply queues in various applications and distinguish between stacks and queues.
- Analyse various dynamic data structures.
- Implement various searching and sorting techniques

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	3	-	2	-	-	-	2	-	-	2
CO2	3	-	3	-	-	2	-	-	-	-	2	-
CO3	3	2	-	-	-	-	3	-	-	-	-	-
CO4	-	3	-	-	-	-	2	-	-	-	-	-
CO5	3	3	2	-	-	2	3	-	-	-	-	-
CO6	3	-	-	2	3	3	-	-	-	-	-	-

UNIT-1

STRUCTURE AND UNIONS IN C LANGUAGE: Structures – Introduction, Features of Structures. Declaration and Initialization of Structures, Accessing structure members, structure initialization. Nested Structures, Array of Structures, Arrays within structures and Pointers to Structures, Structures and Functions, Unions, typedef. Example Programs on the topics mentioned above.

UNIT-2

Files: Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions(standard library input / output functions for files), file status functions (error handling),Positioning functions, command –line arguments, C program examples.

UNIT-3

INTRODUCTION TO DATA STRUCTURES: Classification of data structures, dynamic memory allocation functions in C language. **Stacks:** Definition, Various representation methods, operations on stacks and their implementation in C language, applications of stacks.

UNIT-4

QUEUES: Definition, Various representation methods, operations on queues and their implementation in C language, applications of queues. Circular queues- operations on circular queues and their implementation in C language.

UNIT-5

LINKED LISTS: Definition, Various representation methods, operations on linked lists and their implementation in C language.

UNIT-6

SEARCHING AND SORTING TECHNIQUES: Searching Techniques - Linear search and Binary Search Techniques. Sorting techniques - Bubble Sort, Selection Sort, Insertion Sort. Implementation of all the above-mentioned techniques in C language and trace them by giving different test data.

TEXT BOOKS:

1) B.A.Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016
2) PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.

REFERENCE BOOKS:

1) Byron Gottfried, “Programming with C”, Schaum’s Outlines, 2nd Edition, TATA McGraw-Hill.
2) M.T.Somashekara, “Problem Solving Using C”, PHI, 2nd Edition 2009.
3) A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press
4) Rajaraman V., "The Fundamentals of Computers", 4th Edition,Prentice Hall of India, 2006.
5) R S Bichker, "Programming in C", University Press, 2012.

I B.Tech, II-Sem (CE) P C
3 1.5

(A0094191) ENGINEERING PHYSICS LAB

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- The laboratory should help the student to develop a broad array of basic skills and tools of experimental physics and data analysis.
- The laboratory should help students to understand the role of direct observation in physics and to distinguish inferences based on theory and the outcomes of experiments.
- To learn about the optical experiments in establishing the fundamentals in Interference and Diffraction phenomena which will be visualized with the light and laser experiments mentioned in the syllabus.
- To learn about the basic electronic experiments such as energy band gap determination, Hall Effect to know the type of extrinsic semiconductors, Stewart-Gee's experiment in field intensity determination and Solar I-V characteristics.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Operate optical instruments like microscope and spectrometer.
- Determine thickness of a hair/paper with the concept of interference.
- Estimate the wavelength of different colors using diffraction grating.
- Measure the resolving power of the given optical device.
- Study the variation of intensity of the magnetic field due to circular coil carrying current with distance.
- Evaluate the acceptance angle of an optical fibre and numerical aperture.
- Calculate the band gap of the given semiconductor using four probe method.
- Identify the type of semiconductor (i.e., n-type or p-type) using Hall Effect.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	1	-	-	-	-	-	-	1
CO2	2	-	2	1	-	-	-	-	-	-	-	-
CO3	3	2	-	1	1	-	-	-	-	-	-	1
CO4	3	2	-	1	1	-	-	-	-	-	-	1

LIST OF EXPERIMENTS (ANY10 EXPERIMENTS)

1) Determination of wavelength of light – Newton's rings
2) Determination of thickness of a thin film
3) Spectrometer – Transmission grating
4) Determination of wavelength of a Sodium light – Normal Incidence
5) Dispersive power of a prism - spectrometer
6) Laser experiment: wavelength determination using grating
7) Laser experiment: particle size determination
8) Determination of numerical aperture of an optical fiber
9) Field along the axis of coil carrying current – Stewart Gee's method
10) Determination of rigidity modulus – Torsional Pendulum
11) Determination of Band gap of Si or Ge – Four probe method
12) Study of B – H Curve.
13) Determination of Charge density and Hall coefficient or magnetic flux density – Hall effect.
14) Study of I-V characteristics of Solar Cell.
15) Measurement of Dielectric constant

I B.Tech, II-Sem (CE) P C
3 1.5

(A0593192) PROGRAMMING FOR PROBLEM SOLVING LAB - II

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- To understand how to use structures and unions as a compound data types
- To understand various basic file operations
- To understand various stack and queue operations
- To understand various linked list operations
- To understand basic searching and sorting techniques

COURSE OUTCOMES:

At the end of this course, the student would be able to

- Develop applications on user defined data types
- Apply dynamic memory allocation through pointers
- Use different data structures for create/update basic data files
- Implement linear data structures through stacks and queues
- Implement various searching and sorting techniques, Linked lists.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	3	2	-	3	-	-	2	-	-	-
CO2	-	-	-	-	3	-	2	-	-	-	1	-
CO3	-	2	-	-	3	2	-	-	-	-	-	2
CO4	3	-	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	2	-	3	-	-	-	2	-	-

RECOMMENDED SYSTEMS /SOFTWARE REQUREMENTS:

- Intel based desktop PC with ANSI C Compiler and Supporting Editors

Exercise-1

a) Write a C Program to copy the contents of one structure variable to another structure variable.
b) Write a C program to implement nested structure to store and display the student information. The structure student contains the field's S.no, name, and date. Date is the nested structure and it contains the fields day, month and year.

Exercise-2

a) Write a C program to add two distances which is in feet and inches
b) Write a C program to illustrate passing the whole structure as argument to a function.

Exercise-3

Write a C program that uses functions to perform the following operations:

a) Reading a complex number
b) Writing a complex number
c) Addition of two complex numbers
d) Multiplication of two complex numbers (Note: represent complex number using a structure.)

Exercise-4

a) Write a C program to implement Union Concept.
b) Write a C program which copies last 'n' characters from one file to another.

Exercise-5

a) Write a C program to reverse the first 'n' characters in a file.
b) Write a C program to merge two files into a third file.

Exercise-6

Write a C program to implement the following operations on Stack using array representation

a) Push

b) Pop
c) Display

Exercise-7

Write a C program to implement the following operations on Queue using array representation

a) Insert
b) Delete
c) Display

Exercise-8

Write a C program to implement the following operations on Singly Linked list using linked representation

a) Insert
b) Delete
c) Display
d) Search

Exercise-9

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order.

a) Bubble sort
b) Selection sort
c) Insertion sort

Exercise-10

Write C program to implement the following searching methods to search an element in a given list of integers

a) Linear Search
b) Binary Search

REFERENCE BOOKS:

1) Programming in C,Pradeep Dey, Manas Ghosh, Oxford Heigher Education
2) Computer programming and Data Structures, E.Balaguruswamy, Tata Mc Graw Hill. 2009 revised edition.
3) Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.

I B.Tech, II-Sem (CE) P C
3 1.5

(A0592191) ENGINEERING WORKSHOP AND IT WORKSHOP

(For Branches: CE, EEE, Mech, ECE & CSE)

ENGINEERING WORKSHOP

COURSE OBJECTIVES:

- To familiarize with the basic manufacturing processes and to study the various tools and equipment used, hands-on training is given in different sections. Essentially student should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work.

COURSE OUTCOMES:

At the end of the Engineering Work Shop:

- A student should know the basic knowledge of various tools and their use in different sections of manufacturing such as fitting, carpentry, tin smithy, welding etc. and basic engineering practices such as plumbing, electrical wiring, electronic circuits, machine shop practice.
- Ability to design and model various basic prototypes in the trade of fitting such as Straight fit, V- fit.
- Ability to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder.
- Ability to perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring.

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	1	2	2	1	-	-	-	2	-	2	1	1	-	-	1
CO2	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-	1
CO3	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-	1
CO4	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-	1

Note: At least two exercises to be done from each trade.

1) TRADES FOR EXERCISES:

A] Carpentry

1) T-Lap Joint
2) Cross Lap Joint
3) Dovetail Joint
4) Mortise and Tennon Joint

B] Fitting

1) Vee Fit
2) Square Fit
3) Half Round Fit
4) Dovetail Fit

C] House Wiring

1) Parallel/Series Connection of two/three bulbs
2) Stair Case wiring
3) Tube Light Wiring
4) Measurement of Earth Resistance/Go down Wiring

D] Tin Smithy

1) Rectangular Tray
2) Square Box without lid
3) Open Scoop

4) Funnel

E] Welding

1) Single V butt joint
2) Lap joint
3) Double V butt joint
4) T fillet joint.

F] Soldering

1) Soldering &Disordering Practice
2) Series Circuit
3) Parallel Circuit

2) TRADES FOR DEMONSTRATION:

a) Plumbing
b) Machine Shop
c) Bosch Power Tools

REFERENCE BOOKS:

1) Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009.
2) Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3) Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas.
4) Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House

IT WORKSHOP

COURSE OBJECTIVES:

- The modules include training on PC Hardware, and Productivity tools including text processor, spread sheet, presentation tools. It enables the students to understand and fix the common hardware, software issues & makes the students to install either Windows or UNIX based Operating system in the machines.
- Enable students to understand how computers work, different types of computers, functions of applications, input and data storage devices, different operating systems,
- It makes the students to understand and use the common office suite tools like word, excel etc. effectively in their daily usage.

COURSE OUTCOMES:

By the end of module students will be expected to demonstrate

- PC Hardware- introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer. The students should work on working PC to disassemble and assemble to working condition.
- To do installation of system software like MS Widows and Linux and the required device drivers.
- Productivity tools- module would enable the students in crafting professional word documents; excel spread sheets and power point presentations using the Microsoft suite of office tools.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	2	-	-	-	-	-	-	-	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	3	-	-
CO4	2	2	-	2	3	-	-	-	-	-	-	-

PC HARDWARE

Exercise 1 - Identify the peripherals of a computer, components in a CPU and its functions.

Exercise 2 - Every student should disassemble and assemble the PC back to working condition.

Exercise 3 - Every student should individually install MS windows on the personal computer and also install Linux as dual boot with both Windows and

OFFICE TOOLS

Exercise 4 - Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office equivalent tool word: Importance of LaTeX and MS office tool Word as word Processors, Details of the four tasks and features that would be covered in each. Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 1-Task III: Using Word Processor to create project certificate. Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

SPREAD SHEET

Exercise 5 – Spread Sheet Orientation: The mentor needs to tell the importance of MS office 2007, 2010/ equivalent tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1-Task III: Features to be covered: - Gridlines, Format Cells, Summation, auto fill, Formatting Text, Formulas, Functions

PRESENTATION

Exercise 6 - Students will be working on basic presentation utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes: PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

REFERENCES:

1) Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2) LaTeX Companion – Leslie Lamport, PHI/Pearson.
3) Introduction to Computers, Peter Norton, 6/e Mc Graw Hill
4) Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
5) Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech
6) IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

II B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0009193) NUMERICAL METHODS AND PROBABILITY THEORY

(For Branches: CE & Mech)

COURSE OBJECTIVES:

- To familiarize the students with the foundations of probability and Numerical methods.
- To impart probability concepts and Numerical methods in various applications in Engineering.

COURSE OUTCOMES:

After completion of the course the student will be able to:

- Understand various Numerical methods to solve transcendental equations and rate of convergence. Analyze the concept of Interpolation its applications in digital image processing, computer graphics and in many engineering disciplines.
- Understand the concept of Numerical differentiation and integration and its importance in mechanics.
- Identify various numerical methods to solve linear and non-linear ordinary differential equations and its applications in non-linear analysis.
- To know the importance of probability, random variables and distributions in solving various mechanical and civil engineering problems.

MAPPING WITH COs& POs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	2	-	-	-	-	-	-	-
CO2	3	3	2	2	3	-	-	-	-	-	-	-
CO3	2	3	2	3	2	-	-	-	-	-	-	-
CO4	3	2	3	2	3	-	-	-	-	-	-	-
CO5	2	3	2	3	3	-	-	-	-	-	-	-

UNIT-1

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

UNIT-2

Interpolation: Introduction – Finite differences – Forward Differences – backward Differences –Newton's forward and backward difference formulae for interpolation – Gauss forward and backward difference formulae for interpolation - Lagrange's Interpolation formula.

UNIT-3

Numerical Differentiation – Numerical Integration – Newton-cote's integration formula – Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations – Euler's Method – Runge – Kutta Method.

UNIT-4

Curve fitting: Fitting a straight line – Second degree curve – Exponential curve-Power curve by method of least squares.

UNIT-5

Basic concept of probability – Random variables – Expectation – Discrete and continuous distributions.

UNIT-6

Distribution functions: Binomial Distribution – Poison Distribution and Normal Distribution – Related properties.

TEXTBOOKS:

1) Iyengar T.K.V., Krishna Gandhi B., Rangantham S., and Prasad M.V.S.S.N., (2006), "Mathematical Methods", S. Chand & Company, India.
2) Iyengar T.K.V., Krishna Gandhi B., Rangantham S., and Prasad M.V.S.S.N., (2015), "Probability and Statistics", S. Chand & Company, India.

REFERENCES:

1) Erwin kreyszig., (2011), "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons, United States
2) Ramana B.V., (2010), "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, India
3) Kandasamy P., Thilagavathy K., and Gunavathi K., (2012), 2nd Edition, Numerical Methods, S. Chand & Company, Reprint India
4) Sastry S.S., (2005), 4th Edition, "Introductory methods of numerical analysis"., PHI.
5) Grewal B.S., (2010), 35th Edition, "Higher Engineering Mathematics"., Khanna Publishers, India

II B.Tech, I-Sem (CE) L T C
2 1 3

(A0204193) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(For Branches: CE & Mech)

COURSE OBJECTIVES:

- This course introduces the basic concepts in electric circuits and networks
- This course also introduces the working principles of D.C Generator, DC motor.
- It also helps to study the operating principles of Transformers and their working.
- To understand the fundamental principles of basic electronic devices.
- To provide theoretical prerequisites necessary to do lab work on DC machines and Electronic Devices.

COURSE OUTCOMES:

At the end of the course student is able to

- To know the basic knowledge of conducting materials and electrical circuit parameters.
- Understand the principles of dc machines.
- Analyze the working operation of Transformer.
- Determine the efficiency of machines, half wave and full wave rectifiers.
- Able to observe the different tests and calculations of all machines.
- Applications of dc machines, transformers and rectifiers.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	-	-	-	2	-	1	2			
CO2	3	3	1	2	-	-	-	-	2	-	1	2			
CO3	3	1	2	3	-	-	-	-	1	-	2	1			
CO4	3	3	2	2	-	-	-	-	2	-	2	2			
CO5	3	3	1	2	-	-	-	-	1	-	2	2			
CO6	3	1	3	2	-	-	-	-	2	-	1	1			

UNIT-1

Electrical DC Circuits: Basic definitions (electrical conductor, insulator, semiconductor, electrical circuit, electric current, electric potential, EMF and electric potential difference) - Types of elements(active and passive elements)- Ohm's Law and its limitations- electric power-electrical energy- Kirchhoff's Laws- Resistances in series- Resistances in parallel- Star to delta and delta to star transformations- simple problems.

UNIT-2

DC-Generator: CONSTRUCTION AND OPERATION: D.C Generators-Working Principle – construction of DC Generator - Action of commutator, types of armature windings, induced emf equation, – Classification of DC Generators-separately excited, self-excited- series, shunt, short & long shunt compound generator-simple problems regarding EMF.

UNIT-3

DC Motor: DC motors-principle of operation -back emf –voltage and power equation of dc motor, condition for maximum power -types of DC Motors- series, shunt, short & long shunt compound motor, torque & speed equation –speed control of DC Shunt Motor –armature control method, field control method-losses in DC machines- efficiency calculation –simple problems.

UNIT-4

Transformers: Necessity of transformer-classification of transformers-Principle of operation of single-phase transformers- Theory of an Ideal Transformer –Constructional features – core type & shell type transformers, induced emf equation, transformation ratio's-losses in a transformer- efficiency of transformer-transformer on no-load & R-load –simple problems.

UNIT-5

Diode and its Characteristics: Formation of n- type and p-type semiconductor – Construction of P-n junction diode, symbol - V-I Characteristics- Diode Applications- Rectifiers – Half Wave-Full wave-mid-point only-simple Problems.

UNIT-6

Transistors and CRO: Formation of PNP and NPN transistors – CE configuration of NPN and PNP transistors- applications -Transistor as an amplifier- construction and Principle of CRO(operation only)-Applications.

TEXT BOOKS:

1. Kothari D.P and Nagrath I.J., (2019),"Basic Electrical Engineering", 4th edition. McGraw-Hill Education., India
2. Naidu M.S and Kamakshaiah S., (1995),"Introduction to Electrical Engineering", McGraw-Hill Education (India) Pvt Limited, India

REFERENCES:

1. Mehata V.K and Rohit Mehata, (2005), "Principles of power systems", Revised edition, S. Chand, India
2. Mehta V.K and Mehta Rohit., (2008), "Principles of Electronics", S. Chand & Co., India
3. Salivahanan S and Suresh Kumar N., (2011),"Electronics and Devises", 2nd edition, Tata Mcgraw Hill., India

WEB RESOURCES

1. https://nptel.ac.in/courses/108/101/108101091/
2. https://nptel.ac.in/courses/108/108/108108076/

II B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0503193) PYTHON PROGRAMMING

(For branches CE, Mech, EEE, ECE & CSE)

COURSE OBJECTIVES:

- Learn Syntax and Semantics of various Operators used in Python.
- Understand about Various Input, Output and Control flow statements of Python.
- Handle Strings and Files in Python.
- Understand Lists, Tuples in Python.
- Understand Sets, Dictionaries in Python.
- Understand Functions, Modules and Regular Expressions in Python.

COURSE OUTCOMES:

At the end of the course student is able to

- Examine Python syntax and semantics and be fluent in the use of various Operators of Python.
- Make use of flow control statements and Input / Output functions of Python.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists and Tuples.
- Apply the core data structures like Sets and Dictionaries in Python Programming.
- Demonstrate the use of functions, modules and Regular Expressions in Python.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	-	-	-	-	-	-	-	1	-	-	-	1	1	1
CO2	2	3	-	-	-	-	-	-	1	-	-	-	1	1	1
CO3	1	-	2	-	-	-	-	-	1	-	-	-	1	1	1
CO4	2	-	2	-	-	-	-	-	1	-	-	-	1	1	1
CO5	2	-	2	-	-	-	-	-	1	-	-	-	1	1	1
CO6	2	-	2	-	-	-	-	-	1	-	-	-	1	1	1

UNIT-1

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Overview on data types: Numbers, Strings, Lists, Set, Tuple and Dictionaries.

Operators in Python: Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Shift Operators, Ternary operator, Membership Operators, Identity Operators, Expressions and order of evaluations. Illustrative examples on all the above operators.

UNIT-2

Input and Output statements: input() function, reading multiple values from the keyboard in a single line, print() function, 'sep' and 'end' attributes, Printing formatted string, replacement operator ({}). Illustrative examples on all the above topics.

Control flow statements: Conditional statements – if, if-else and if-elif-else statements. Iterative statements – for, while. Transfer statements – break, continue and pass. Illustrative examples on all the above topics.

UNIT-3

Strings: Introduction to strings, Defining and Accessing strings, Operations on string - String slicing, Mathematical Operators for String, Membership operators on string, removing spaces from the string, Finding Substrings, counting substring in the given String, replacing a string with another string, Splitting of Strings, Joining of Strings, changing case of a String,

checking starting and ending part of the string, checking type of characters present in a string. Illustrative examples on all the above topics.

Files: Opening files, Text files and lines, reading files, searching through a file, Using try, except and open, writing files, debugging.

UNIT-4

Lists: Creation of list objects, Accessing and traversing the elements of list. **Important functions of list** – len(), count(), index(), append(), insert(), extend(), remove(), pop(), reverse() and sort(). **Basic Operations on list:** Aliasing and Cloning of List objects, Mathematical Operators for list objects, Comparing list objects, Membership operators on list, Nested Lists, List Comprehensions. Illustrative examples on all the above topics.

Tuples: Creation of Tuple objects, Accessing elements of tuple, Mathematical operators for tuple, Important functions of Tuple – len(),count(),index(), sorted(), min(), max(), cmp().Tuple Packing and Unpacking. Illustrative examples on all the above topics.

UNIT-5

Sets: Creation of set objects, Accessing the elements of set. Important functions of set –add(), update(), copy(), pop(),remove(),discard(),clear(). Basic Operations on set - Mathematical Operators for set objects, Membership operators on list, Set Comprehensions. Illustrative examples on all the above topics.

Dictionaries: Creation of Dictionary objects, accessing elements of dictionary, Basic operations on Dictionary - Updating the Dictionary, Deleting the elements from Dictionary. Important functions of Dictionary – dict(), len(), clear(), get(), pop(), popitem(), keys(), values(), items(), copy(), setdefault(). Illustrative examples on all the above topics.

UNIT-6

Functions - Defining Functions, Calling Functions, Types of Arguments - Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Recursive functions, Illustrative examples on all the above topics.

Modules: Creating modules, **import** statement, from Import statement.

Regular Expressions: Character matching in regular expressions, extracting data using regular expressions, combining searching and extracting, Escape character.

TEXT BOOKS

1. Python for Everybody: “Exploring Data Using Python 3”., (2017), Charles R., Severance.

REFERENCE BOOKS

1. Allen Doweny., (2017), “Think Python”, 2nd Edition. Green Tea Press.,
2. Chun W., (2016), “Core Python Programming” Pearson.
3. Kenneth A., and Lambert. (2015), “Introduction to Python”, Cengages.

WEB RESOURCES

1. https://www.w3schools.com/python/python_reference.asp
2. https://www.python.org/doc/

II B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0102193) STRENGTH OF MATERIALS-I

COURSE OBJECTIVES:

- To understand the material strength with various forces acting on it.
- To provide basic knowledge in mechanics of materials so that the students can solve real engineering problems and design engineering systems.

COURSE OUTCOMES:

At the end of the course student is able to

- Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, relative to the strength and stability of structures and mechanical components.
- Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures; analyze solid mechanics problems using classical methods and energy methods.
- Analyze various situations involving structural members subjected to combined stresses by application of Mohr's circle of stress.
- Calculate the deflection at any point on a beam subjected to a combination of loads. Solve for stresses and deflections of beams under unsymmetrical loading.

MAPPING WITH COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	2	1
CO2	2	3	-	-	-	-	-	-	-	-	-	-	3	2	1
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	2	1
CO4	2	3	-	-	-	-	-	-	-	-	-	-	3	2	1

UNIT-1

Simple Stresses and Strains- Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain (dilatancy) – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT-2

Introduction to analysis of stress and strain – State of stress at a point – 2D system, stress at a point on a plane, principal stresses, principal planes and maximum shear stresses, Mohr circle of plane stress, - Principal stresses for a general state of stress. 2D stress-strain system, principal strains and principal axis of strain, Mohr Circle for plane strains.

UNIT-3

Shear Force (SF) and Bending Moment (BM) diagrams for cantilevers, simply supported beams with and without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of couples. Relationship between loads, SF and BM.

UNIT-4

Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of Beams for bending stresses.

Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT-5

Slope and deflection- Differential equation of the deflection curve, Relationship between moment, slope and deflection, Double integration method, Moment area method, Macaulay's method, Conjugate beam method.

UNIT-6

Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion., Transmission of power by circular shafts.

TEXT BOOKS:

1) Punmia B.C., and Jain A.K., (2017), "Mechanics of Materials", Lakshmi Publishers, India
2) Srinath L.S., (2000), "Strength of Materials", Macmillan Publishers, India

REFERENCE BOOKS:

1) Jindal U.C., (2012), "Strength of Materials", Pearson publishers, New Delhi.
2) Gere J.M., and Goodno B.J., (2013), "Mechanics of Materials", Eighth edition, Cengage Learning, USA.
3) Popov E.P., (2012), "Engineering Mechanics of Solids", Second edition, PHI Learning Private Limited, New Delhi.
4) Hibbeler, R. C., (2004), "Mechanics of Materials", Sixth edition, East Rutherford, NJ: Pearson Prentice Hall, USA.
5) Gere J.M., and Timoshenko S., (2004), "Mechanics of Materials", Second edition, CBS Publishers, New Delhi.

II B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0103193) FLUID MECHANICS

COURSE OBJECTIVES:

- The student shall learn the basics related to fluid i.e. properties of fluid, fluid statics, fluid kinematics, fluid dynamics, pipe flow, types of flow and flow measurement.

COURSE OUTCOMES:

At the end of the course student is able to

- Understand the different types and properties of fluid. Apply the concept of Pascal's law and hydrostatic law.
- Evaluate hydrostatic forces.
- Study the properties of fluid in motion and analyze forces on fluid through the continuity equation.
- Analyze laminar and turbulent flows.
- Compute friction losses and minor losses in pipes.
- Determine discharge through pipes, tanks and channels using Venturi meter / Orifice meter, orifice/mouthpiece and notches
- Understand how the fluids in motion are affected by the forces acting on them.

MAPPING WITH COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	2	1	1
CO2	3	3	-	-	-	-	2	-	-	-	-	-	2	1	1
CO3	3	3	-	-	-	-	-	-	-	-	-	-	2	1	1
CO4	3	3	1	-	-	-	-	-	-	-	-	-	2	1	1
CO5	3	3	1	1	-	-	2	-	-	-	-	-	2	1	1
CO6	3	3	1	1	-	-	2	-	-	-	-	-	2	1	1
CO7	3	3	1	-	-	-	2	-	-	-	-	-	2	1	1

UNIT-1

Properties of Fluids: Dimensions and units – Physical properties of fluids- specific gravity, viscosity, surface tension, Capillarity, vapor pressure and their influences on fluid motion.

Fluid Statics: Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure-measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers. Hydrostatic forces on submerged plane surfaces (Horizontal and Vertical)-total pressure and center of pressure.

UNIT-2

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions, flow net.

UNIT-3

Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Momentum equation and its application – forces on pipe bend. Kinetic energy correction factor and momentum correction factor.

UNIT-4

Measurement of Fluid Flow: Pitot tube, Venturi meter and orifice meter – classification of orifices, flow over rectangular, triangular, trapezoidal and stepped notches - –Broad crested weirs.

UNIT-5

Flow Through Pipes: Laws of Fluid friction – Darcy's equation, Minor losses (types), equation for head loss due to sudden expansion – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, Hydraulic transmission through pipe, siphon, Water Hammer.

UNIT-6

Laminar Flow

Reynold's experiment; Characteristics of laminar flow; Steady laminar flow through a circular pipe (Hagen Poiseuille equation).

Turbulent Flow

Characteristics of turbulent flow, Hydro dynamically smooth and rough boundaries, Velocity distribution, Friction factor for flow in pipe, Variation of friction factor with Reynold's number –Moody's chart.

TEXT BOOKS:

1. Modi P.N., and Seth S.M., (2019), "Hydraulics and Fluid Mechanics Including Hydraulics Machines", 22nd Edition, Standard Book House, New Delhi.
2. Frank. M. White., (2015), "Fluid Mechanics", 8th Edition, Tata Mc. GrawhillPvt. Ltd., USA.

REFERENCES:

1. Bansal R.K., (2018), "Fluid Mechanics and Hydraulic Machines", 10th Edition, Laxmi Publications (P) Ltd., New Delhi.
2. Douglas, J.F., Gaserek, J.M. and Swaffirld, J.A. (Longman), (2005), "Fluid Mechanics (4th edition)", by Delhi Pearson Education, India.
3. Mohanty A.K., (1994,) "Fluid Mechanics", Prentice Hall of India Pvt. Ltd., New Delhi.
4. Som S.K., and Biswas. G., (2010), "Introduction to Fluid Machines", Tata Mc.Grawhill publishers Pvt. Ltd., USA.
5. Edward J. Shaughnessy, Jr, Ira M. Katz and James P., (2005), "Schaffer Introduction to Fluid Machines", Oxford University Press, New Delhi.

WEB RESOURCES:

1. Fluid Mechanics, http://nptel.ac.in/courses/105101082/
2. Fluid Mechanics, http://www.nptel.ac.in/courses/112104118/ui/TOC.htm

II B.Tech, I-Sem (CE) L T C
2 0 2

(A0010193) BIOLOGY FOR ENGINEERS

(Life Sciences)

(For branches: CE, EEE, Mech, ECE &CSE)

COURSE OBJECTIVES:

- To familiarize about biological components and their applications
- To train the students on the principles and Mechanisms in Biological Chemistry
- To train the concepts of molecular structures of Biomolecules
- To introduce the basic principles of Cell Structures and Functions
- To apply the concepts in the development of biosensors for mankind.

COURSE OUTCOMES:

At the end of the course, the students will be able to

- Explain concept and function of cell and cell organelles
- Develop knowledge about various physiological processes in biological systems
- Explain about biomolecules, their structure and function and their role in living organisms. How biomolecules are useful in industry.
- Understanding about human physiology
- Identify and describe the functions of the skeletal system

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	2	-	2	-	-	-	2	-	-	-	-	1	-	-	-
CO3	2	-	2	-	-	-	-	1	-	-	1	1	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
Course	1	-	1	-	1	-	-	-	1	-	-	-	-	-	-

UNIT-1:

Cell Structure and Function - Cell theory, Ultra structure of eukaryotic cell (Cell wall, Cell membrane, Golgi complex, Endoplasmic Reticulum, Peroxisome, Lysosomes), Semi-autonomous cell Organelles (Mitochondria & Chloroplast) (5 Periods)

Learning outcomes:

1) Understand the structure and importance of the cell.
2) Explain the importance of eukaryotic cell.
3) Explain the functions of cell organelles.

UNIT-2:

Human Physiology – Nutrition (Functions of micro & macro nutrients and their role), Respiration (Definition, Types, Respiration in humans), Digestion (Process and digestive organs in humans), Excretion (Definition, Urinary system in humans). (6 Periods)

Learning outcomes:

1) Understand the metabolism in living organism.
2) Explain about the importance of human physiological process.
3) Identify the nutritional values in human body.

UNIT-3:

Biomolecules - Proteins (Denaturation of proteins), Nucleic acids (Mechanism of Replication & Transcription), Vitamins (Classification & functions of vitamins in bio-systems).
(5 Periods)

Learning outcomes:

1) Describe the denaturation of proteins.
2) Illustrate replication of nucleic acids.
3) Identify the importance of Vitamins in human body.

UNIT-4:

Biomaterials - Definition of biomaterials, Requirements of biomaterials, Classification of biomaterials, Physical and Mechanical properties of bio-materials, Comparison of properties of some common biomaterials. (5 Periods)

Learning outcomes

1) Understand the role of biomaterials for humans.
2) Understand the properties of biomaterials for organ substitution.

UNIT-5:

Skeletal System-Types of bones, Structure and composition of bone, artificial bone replacements with soft engineering materials. (6 Periods)

Learning outcomes

1) Understand bone structure and composition
2) Able to develop knowledge about bone replacement.

UNIT-6:

Applications of Biology- Stem Cells (Sources, Types and its Uses) Cancer Therapy, Basics of bio-sensors and bio-chips for bio-engineering. (5 Periods)

Learning outcomes

1) Understand the role of stem cells in biology.
2) Develop new type of biosensors, biochips etc.

TEXT BOOKS

1) Nelson, D. L. and Cox, M.M. (2008).Lehninger, Principles of Biochemistry, 5th Edition, W.H.Freeman and Company, N.Y., USA.
2) Ross & Wilson, Anatomy and Physiology, Churchill Livingstone publications (2014).

REFERENCE BOOKS

1) Voet, D. and Voet, J.G. (2004). Biochemistry, 3rd Edition, John Wiley & Sons, Inc. USA.
2) Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition, John Wiley & Sons. Inc.
3) De Robertis, E. D. P. and De Robertis R. E. 2009. Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia.
4) Cooper G. M. Hausman R. E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press and Sunderland, Washington D. C.; Sinnauer Academic Press.
5) L. Hench & E.C. Ethridge, Biomaterials – An Interfacial approach, Academic Press, 1982.

II B.Tech, I-Sem (CE)

L	T	C
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(A0011193) APTITUDE, ARITHMETIC REASONING AND COMPREHENSION

(Skill Development Course-I)

(For branches: CE, EEE, Mech, ECE &CSE)

COURSE OBJECTIVES:

- To familiarize the students about the concepts of aptitude, arithmetic and reasoning.
- To cope up the students to improve their employable skills.

COURSE OUTCOMES:

- After completion of the course the student will be able to:
- Understand number system which helps to become well trained for recruitment drives.
- Analyze permutations and combinations concept
- Obtain the knowledge of coding and decoding concept.
- Understand the topics related to clock and probability.
- Identify the topics related to Venn diagrams, reasoning and Non-verbal reasoning.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-			
CO2	3	3	2	-	-	-	-	-	-	-	-	-			
CO3	3	2	2	-	-	-	-	-	-	-	-	-			
CO4	3	2	3	-	-	-	-	-	-	-	-	-			
CO5	3	3	2	-	-	-	-	-	-	-	-	-			

UNIT-1

Numbers, Number Systems Simple Equations, Ratio, Proportion, Variation Quadratic Equations, Progressions Percentages.

UNIT-2

Profit, Loss, Partnerships Averages, Mixtures & Allegations, Simple Interest, Compound Interest, Time and Work-Pipes, indices, surds, inequalities,Cisterns Time and Distance Geometry and Menstruation.

UNIT-3

Permutations & Combinations and Probability Data Interpretation & Data Sufficiency.

UNIT-4

Number & Letter Series, Analogies, Coding Decoding, Odd Man Out Blood Relations.

UNIT-5

Direction Sense, Symbols and Notations Deductions & Connectives Clocks, Calendars Analytical

UNIT-6

Reasoning (Verbal and Non-Verbal) , Venn Diagrams, Analytical Puzzles and Octal number system.

TEXTBOOKS:

1. Agarwal R.S., (1997), “Quantitative Techniques”., Chand S Series, India
2. Shankuntala Devi., (1998), “Techniques of Reasoning”., Chand S Series, India

II B.Tech, I-Sem (CE) P C
3 1.5

(A0191193) STRENGTH OF MATERIALS LAB

Prerequisites: Strength of materials

COURSE OBJECTIVES:

- The course objective of this subject consists. Shear, tension, bending test, hardness, spring, impact, torsion, Maxwell's reciprocal theorem on beam

COURSE OUTCOMES:

At the end of the course student is able to

- Conduct tension test on steel, aluminium, copper and brass
- Conduct compression tests on spring, wood and concrete
- Conduct flexural and torsion test to determine elastic constants
- Determine hardness of metals

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3	3	-	-	-	-	-	-	2	1	-	-	1	1	3
CO2	3	3	-	-	-	-	-	-	2	1	-	-	1	1	3
CO3	3	3	-	-	-	-	-	-	2	1	-	-	2	1	3
CO4	3	3	-	-	-	-	-	-	2	1	-	-	2	1	3

EXPERIMENTS

1) Tension test
2) Bending test on (Steel / Wood) Cantilever beam or simply supported beam
3) Torsion test
4) Hardness test
5) Spring test
6) Compression test on wood or concrete
7) Split tensile test on concrete
8) Impact test
9) Verification of Maxwell's Reciprocal theorem on beams.
10) Continuous beam – deflection test.

READING:

1. Timoshenko and Gere, (1996), "Mechanics of Materials", CBS Publishers, New Delhi.

II B.Tech, I-Sem (CE) P C
3 1.5

(A0291193) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

COURSE OBJECTIVES:

- To experiment and verify the basic electrical and electronic principles.
- To provide practical exposure to test the performance of DC machines.
- It helps to study the characteristics of basic electronics devices

COURSE OUTCOMES:

At the end of the course student is able to

- To know the basic knowledge of electrical circuit parameters and Kirchhoff's laws.
- Understand the principles of dc machines and transformers.
- Analyse the working operations of measuring instruments, electrical machines.
- Determine the efficiency of machines, half wave and full wave rectifiers.
- Able to observe the different tests and calculations of all machines.
- Applications of dc machines, instruments and rectifiers.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	-	-	-	3	-	-	-			
CO2	3	1	2	-	2	-	-	-	3	-	-	-			
CO3	3	3	2	2	1	2	-	-	3	-	2	-			
CO4	3	1	1	1	-	1	-	-	3	-	-	-			
CO5	3	2	1	2	-	2	-	-	3	-	2	-			
CO6	3	2	1	1	2	1	-	-	2	1	-	-			

SECTION – A

Electrical Engineering Lab: (Any five experiments)

1) Verification of Kirchhoff's laws
2) Resistors in Series & Parallel.
3) Verification of Ohm's law
4) Speed control of D.C. Shunt motor by Armature Voltage control
5) Speed control of D.C. Shunt motor by Field flux control method
6) Brake test on D.C Shunt Motor

SECTION – B

Electronics Engineering Lab: (Any five experiments)

1) PN-junction diode characteristics
2) Half wave Rectifier without filters
3) Full wave center tapped without filters
4) Transistor CE Characteristics (Input and Output)
5) CE Amplifiers
6) Study of CRO (Voltage and time measurements)

II B.Tech, I-Sem (CE) P C
3 1.5

(A0594193) PYTHON PROGRAMMING LAB

(For branches: CE, EEE, Mech, ECE &CSE)

COURSE OBJECTIVES:

- To be able to introduce core programming basics and various Operators of Python programming language.
- To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- To understand about Functions, Modules and Regular Expressions in Python Programming.

COURSE OUTCOMES:

- Student should be able to understand the basic concepts of scripting and the contributions of scripting language.
- Ability to explore python data structures like Lists, Tuples, Sets and dictionaries.
- Ability to create practical and contemporary applications using Functions, Modules and Regular Expressions.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1	2	-	-	-	-	-	1	-	-	-	1	1	1
CO2	3	3	2	-	-	-	-	-	1	-	-	-	1	1	1
CO3	3	1	2	-	-	-	-	-	1	-	-	-	1	1	1

LIST OF PROGRAMMES

1) Program to demonstrate basic data type in python
2) Program to demonstrate operators in python
3) A cashier has currency notes of denominations 10, 50, and 100.If the amount to be withdrawn is input through the keyboard using input() function in hundreds, find the total number of currency notes of each denomination the cashier will have to give to the withdrawer
4) Program to demonstrate list and tuple in python
5) Write a program in Python, A library charges a fine for every book returned late. For first 5 days the fine is 50 paisa, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a program to accept the number of days the member is late to return the book and display the fine or the appropriate message
6) Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs.12.00 per hour for every hour worked above 40 hours. Assume that employee do not work for fractional part of an hour.
7) Two numbers are entered through the keyboard; write a program to find the value of one number raised to the power of another.
8) Write a function that receives marks received by a student in 3 subjects and returns the average and percentage of these marks. Call this function from main() and print the result in main
9) Write a program to read a file and display its contents.
10) Write a program to demonstrate Regular Expressions in python.

TEXT BOOKS

1) Learning Python, Mark Lutz, Orielly, 3 Edition 2007.
2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2017.

REFERENCE BOOKS

1) Think Python, 2 Edition, 2017 Allen Downey, Green Tea Press
2) Core Python Programming, 2016 W.Chun, Pearson.
3) Introduction to Python, 2015 Kenneth A. Lambert, Cengages
4) https://www.w3schools.com/python/python_reference.asp
5) https://www.python.org/doc/

II B.Tech, II-Sem (CE)

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(A0104194) SURVEYING

COURSE OBJECTIVES:

- Provides knowledge of various surveying & geomatics instruments Chain, Tape, Compass, Auto level, Theodolite, Total Station, GPS, DGPS etc.
- Provides understanding and application of various concepts: Principles of surveying, Chain Surveying, Compass Surveying, Levelling & Contouring, Tachometric Surveying, Trigonometric and Trilateral Principles, Curve Setting techniques, Computation of Areas & Volumes, EDM.

COURSE OUTCOMES:

At the end of the course student is able to

- Understand the basics of surveying, geomatics and various surveying instruments chain, tape, compass, auto level, theodolite, total station, GPS, DGPS etc. and their utility and precision.
- Understand and apply the concepts of triangulation, trilateration, levelling & contouring, tachometric surveying, setting out of curves, computation of area & volumes.
- Understand and apply the concepts of modern surveying like EDM, GPS.
- Able to plan the survey work for given application.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-
CO4	1	2	3	-	1	-	-	-	-	-	-	-	3	2	-

UNIT-1

Basics of Surveying: Definition, principles and classification of surveying - Principles of chain survey - Methods of measuring horizontal and slope distance - Ranging - Chaining past obstacles - Plotting of chain survey - Construction and working of prismatic compass - Types of bearing - Plotting of a traverse - Declination, dip, local attraction.

UNIT-2

Levelling: Principle of levelling - Methods of levelling - Booking of readings–Contouring - Trigonometric levelling and Axis signal corrections

UNIT-3

Computation of areas: Area Between a Traverse Line and an irregular Boundary-Methods-Mid ordinate, Average ordinate, Trapezoidal rule, Simpsons rule-Coordinates.

Computation of volumes: Area of cross sections-Single level section-Two level section

UNIT-4

Triangulation & Trilateration: Theodolite traversing - Measurement of horizontal and vertical angles - Omitted Measurements - Triangulation network – Signals - Base line measurement - Inter-visibility of stations.

Tachometric Surveying: Principle of tachometric surveying - Distance equation for horizontal and inclined line of sights -Tangential Tachometry – Errors.

UNIT-5

Curves: Types of curves–Terminology - Elements of simple circular curve - Setting out methods - Elements of compound curve - Transition curve – Types - Methods of determination of length - Characteristics and elements of transition curve - Vertical curve – Types and length of vertical curves - Setting out of foundation trench of a building and culvert.

UNIT-6

Modern Field Survey Systems

EDM and Total Station: Measurement principle of EDM - EDM instrument characteristics - Accuracy in EDM - Total station – Introduction – Advantages - Types and applications of total station - Field procedure

Global Positioning System (GPS): Introduction - Working principle - GPS receivers - Applications of GPS.

TEXT BOOKS

1) B.C. Punmia B.C. and Jain A.K, (2005), Surveying Vol. I, II & III", Laxmi Publications (P) Ltd., New Delhi.
2) Venkatramaiah C., (2011), "Surveying", Universities Press, India

REFERENCE BOOKS

1) Arora K.R, (2015), "Surveying vol. I, II& III", standard book house, New Delhi.
2) Subramanyam R., (2012), "Surveying and Levelling", Oxford University Press, New Delhi.
3) Basak N.N., (1994), "Surveying and Levelling", Tata McGraw Hill Publishers, New Delhi.
4) Agor R., A (1980), "Surveying& Levelling", 12th Edition, Khanna Publishers, New Delhi.
5) Satheesh Gopi., Sathi Kumar R., and Madhu N., (2006), "Advanced Surveying", Pearson Education, Dorling Kindersley (India) Pvt. Ltd, New Delhi.

II B.Tech, II-Sem (CE)

L	T	C
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(A0105194) BUILDING TECHNOLOGY

COURSE OBJECTIVES:

- Principles & bye-laws in planning public and residential buildings.
- Properties & application of various building materials like stones, bricks etc.,
- Principles and methods of construction of building components.
- Building services required with respect to safety and other requirements.
- Concept of Green Building system.

COURSE OUTCOMES:

At the end of the course student is able to

- Classify and understand the applications of building materials.
- Explain the principles and methods of construction of building components.
- Understand the building services required with respect to safety and other requirements.
- Apply the principles & bye-laws in planning Public and Residential buildings.
- Understand the concept of Green Building system.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	3	1	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	3	1	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	3	1	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	3	1	-

UNIT-1

Principles of Building Planning: Introduction – Selection of site – Aspect, prospect, furniture requirements, roominess, grouping, circulation, privacy, sanitation, elegance, economy, flexibility and practical considerations.

Building Bye–laws and Regulations: Introduction – Objectives of building bye-laws – Principles underlying building bye-laws – Terminology – Floor area ratio (FAR), Floor space index (FSI) – Classification of buildings – Open space requirements – Built up area limitations – Height of the buildings – Wall thickness – Lighting and ventilation requirements.

Planning of Residential Buildings: Introduction – Minimum standards for various Components of building like Bed room, Kitchen etc.,

UNIT-2

Basic Building materials: Introduction: Importance – Objectives of study of building materials – Classification of construction materials – Properties of materials.

Stones: Properties of building stones– Relation to their structural requirements – Classification of stones– Dressing of stones – Natural bed – Testing of stones.

Bricks: Composition of good brick earth – Methods of manufacturing of bricks– comparison between clamp burning and kiln burning – Qualities of a good brick –Testing of bricks.

Lime: Technical terms – Constituents of lime stone – Classification of lime – Manufacturing of lime. Cement: Properties of cement – types of cements – Testing of cements.

Wood: Structure – Seasoning of timber – Defects in timber.

UNIT-3

Tiles: Characteristics of good tile - Manufacturing methods – Types of tiles - Testing of tiles.

Other Materials: Properties and uses of iron, glass, ceramics, plastics, steel, aluminum, fiber-reinforced plastics.

UNIT-4

Building Construction: Foundations: Shallow foundations – Spread, combined, strap and mat footings. Masonry: Bonds in Stone & brick masonry - Cavity& Partition walls. Floors: Materials used – Different types of floors – concrete, mosaic, terrazzo, tiled floors. Roofs: Pitched, flat & curved roofs – Lean-to-roof, couple roofs, trussed roofs – King and queen post trusses – RCC roofs. Stairs: Terminology – Types of stairs. Surface Finishes: Plastering – Pointing – White washing, distempering and Painting – Damp proofing. Form work and scaffolding.

UNIT-5

Building Services: Ventilation: Necessity – Functional requirements – Natural and mechanical ventilation. Lighting: Day and artificial lighting – Types of lighting in working places. Fire Protection: Causes – Fire load – General fire safety requirements – Fire resistant construction.

UNIT-6

Green Building: Concept of Green building, Principles of green buildings, Eco-friendly materials, Certification systems – Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED).

TEXT BOOKS:

1) Kumara Swamy N., and KameswaraRao A., (2012), “Building Planning & Drawing”, Charotar Publishers, India
2) Rangwala S.C., Rangwala K.S., and Rangwala P.S., (2012), “Engineering materials”, Charotar Publishers, India

REFERENCE BOOKS:

1) Punmia B.C., (2008), “Building construction”, Laxmi Publications (P) Ltd., New Delhi.
2) Duggal S.K., (2012), “Building materials”, New Age international (P) Ltd., New Delhi.
3) Arora N.L., and Gupta B.L., (2014), “Building construction”, Satya prakshan publications, New Delhi.
4) Bureau of Indian Standards, National Building Code of India, New Delhi, 2005.
5) Arora N.L., Gupta B.K., and V.K. Jain (2009), “Automation Systems in smart and Green Buildings”, Khanna Publications, New Delhi.
6) Tom Woolley., Sam Kimmins., Paul Harrison and Rob Harrison, (2003), “Green Building – Handbook”, Volume I, Spon Press., UK

WEB REFERENCES:

1) IGBC website- https://igbc.in/
2) GRIHA website: https://www.grihaindia.org/griha-rating

II B.Tech, II-Sem (CE)

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(A0106194) STRENGTH OF MATERIALS - II

COURSE OBJECTIVES:

- Students can learn how to analyse beams which are subjected to complex stresses; also learn different theories to be considered while designing any structures or material.
- Knowledge on fluid tubes subjected to pressure will be imparted. Also, knowledge on bending stresses in masonry structures, and can learn details about unsymmetrical sections.

COURSE OUTCOMES:

At the end of the course student is able to

- Can be able to analyse structures subjected complex stresses
- Can be able to design thin and thick cylinder & shells
- Can be able to analyse unsymmetrical sections
- Analyse columns and struts

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	-	-	-	-	-	-	-	3	2	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CO3	1	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CO4	1	2	-	-	-	-	-	-	-	-	-	-	3	2	-

UNIT-1

Columns and Struts: Direct and bending stresses –Kernel of section – Slenderness ratio and effective length of column - Buckling and stability – Columns with pinned ends, other support conditions, Eccentric axial loads using differential equations

UNIT-2

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

UNIT-3

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

Thick Cylinders: Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

UNIT-4

Direct and Bending Stresses: Determination of stresses in the case of chimneys, retaining walls and dams - conditions for stability – stresses due to direct loading and B.M. about both axes.

UNIT-5

Unsymmetrical Bending: Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis Deflection of beams under unsymmetrical bending.

Shear Centre: Concept of Shear Centre – Shear Centre of various cross sections – Shear flow–Shear lag.

UNIT-6

Strain Energy: Introduction – principle of virtual work – unit load method for calculating displacement – reciprocal theorems – strain energy and complementary energy – strain energy methods – complementary energy methods

Springs: Introduction – Helical springs – closed coil helical springs – open coiled helical springs.

TEXT BOOKS:

1) Punmia B.C., Jain A.K., (2017), "Mechanics of Materials", Lakshmi Publishers, India.
2) Rajput R.K., (2015), "Strength of Materials", S Chand Publishers, India.

REFERENCE BOOKS:

1) Jindal U.C., (2012), "Strength of Materials", Pearson publishers, India.
2) Gere J.M., Goodno B.J., (2013), "Mechanics of Materials", Eighth edition, Cengage Learning, USA.
3) Popov E.P., (2012), "Engineering Mechanics of Solids", Second edition, PHI Learning Private Limited, New Delhi.
4) Hibbeler, R. C., (2004), "Mechanics of Materials", Sixth edition, East Rutherford, NJ: Pearson Prentice Hall, USA.
5) Gere J.M., and Timoshenko S., (2004), "Mechanics of Materials", Second edition, CBS Publishers, New Delhi.

II B.Tech, II-Sem (CE)

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(A0107194) HYDRAULICS AND HYDRAULIC MACHINES

COURSE OBJECTIVES:

- The student shall learn the concept of boundary layer theory and fundamentals of flow through open channels, dimensional analysis; Hydraulic machines such as flow through turbines and pumps including their performance characteristics and design aspects.

COURSE OUTCOMES:

At the end of the course student is able

- To understand the concept of boundary layer theory.
- To know the different types of flows and channels.
- To understand the fundamentals of Uniform and Non-Uniform flow, GVF and RVF in open channels.
- To prepare models for prototypes of hydraulic structures.
- To determine the forces exerted by the jet of fluid on vanes.
- To evaluate the performance of turbines and pumps.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	-	-	1
CO2	3	-	-	-	-	-	-	-	-	-	-	2	-	-	3
CO3	3	3	2	-	-	-	-	-	-	-	-	2	1	2	3
CO4	3	3	3	-	-	-	-	-	-	-	-	2	1	2	3
CO5	3	3	-	-	2	-	-	-	-	-	-	2	1	2	3
CO6	3	3	2	-	2	-	-	-	-	-	-	2	1	2	3

UNIT-1

Boundary Layer Theory: Boundary layer – concepts, Characteristics of boundary layer along a thin flat plate, Von Karman momentum integral equation (No derivation); Forces on Submerged bodies: Drag & Lift force (Concepts and problems), Magnus effect.

UNIT-2

Open Channel Flow:

Uniform Flow: Introduction, Classification of flows, Types of channels; Chezy, Manning's, Bazin, Kutter's Equations; Hydraulically efficient channel sections - Rectangular, Trapezoidal and Circular channels; Velocity distribution; Energy and momentum correction factors.

Non - Uniform Flow: Concept of specific energy; Specific energy curves; Critical flow; Critical flow in a rectangular channel; Critical slope.

Gradually Varied Flow: Dynamic equation; surface profiles; Computation of surface profiles by single step method; Back water curves and Draw down curves.

Rapidly Varied Flow: Hydraulic jump; Elements and characteristics of hydraulic jump; Types of hydraulic jump; Location and applications of hydraulic jump; Energy loss in a hydraulic jump.

UNIT-3

Hydraulic Similitude: Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

UNIT-4

Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency

UNIT-5

Hydraulic Turbines: Layout of a typical Hydropower installation – Heads and efficiencies-classification of turbines- Pelton wheel-Francis turbine-Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency - draft tube – theory and function efficiency. Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitation.

UNIT-6

Centrifugal-Pumps: Pump installation details-classification-work done- Manometric head-minimum starting speed-losses and efficiencies-specific speed- multistage pumps-pumps in parallel- performance of pumps-characteristic curves- NPSH-cavitation-Model testing – Performance characteristics.

Reciprocating Pumps: Main components – Working of a Reciprocating Pump – Types of reciprocating pumps – Work done by single acting and double acting pumps – Coefficient of discharge, slip, percentage slip – Negative slip.

TEXT BOOKS:

1. Modi P.N., and Seth SM., (2019), "Hydraulics and Fluid Mechanics Including Hydraulics Machines", 19thEdition, Standard Book House, New Delhi.
2. Dr. Bansal R.K., (2018), "Fluid mechanics and hydraulic machines", by - Laxmi Publications (P) ltd., New Delhi.

REFERENCES:

1. Ranga Raju, (2008), "Elements of Open channel flow", Tata McGraw Hill Publications, New Delhi.
2. Rajput Er., (2016), "Fluid Mechanics and Fluid Machines", S Chand & Co., India.
3. Banga and Sharma, (1995), "Hydraulic Machines", Khanna Publishers, India.
4. Subramanya K, (2015), "Open Channel Flow", Tata McGraw Hill Publishers, New Delhi.
5. Ramamrutham S, (2014), "Hydraulics, Fluid Mechanics and Fluid Machines", 9th Edition, Dhanapat Rai Publishing Company, India.

II B.Tech, II-Sem (CE)

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(A0108194) STRUCTURAL ANALYSIS

COURSE OBJECTIVES:

- To learn analysis of fixed & continuous beams with differing loading and support settlements with theorem of three moments.
- To learn analysis of beams and portal frames with slope deflection method, moment distribution method and Kani's method, analysis of rolling loads, influences line diagrams.

COURSE OUTCOMES:

At the end of the course student is able to

- Understand fundamental concepts, theorems & derivations for analysis of structures.
- Analyses of beams and portal frames by using various conventional methods.
- Draw influence line diagrams for beams and indeterminate structures.
- Analyses of structures for moving loads.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-

UNIT-1:

Fixed Beams- Introduction to statically indeterminate beams with U.D. load, central point load, eccentric point load, series of point loads, uniformly varying load, couple and combination of loads shear force and bending moment diagrams-Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

UNIT-2:

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.

UNIT-3:

Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports and portal frames

UNIT-4:

Moment Distribution Method: Introduction-Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports –portal frames with and without Sway.

UNIT-5:

Kani's Method: Basic concepts- Analysis of continuous beams – including settlement of supports - portal frames (single bay-single storey) with and without sway.

UNIT-6:

Influence Lines & Moving Loads:

Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads

Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section single point load, U.D.load longer than the span, U.D. load shorter than the span.

TEXT BOOKS:

1) Bhavikatti S.S., (2013), "Structural Analysis (Vol-1&II)" Vikas Publishing House, India.
2) Vaidyanathan R., and Perumal., (2016), "Structural Analysis (Vol-1&II)", Laxmi Publications (pvt) Limited, India.

REFERENCE BOOKS:

1) Negi L.S., Jangid R.S., (2004), "Structural Analysis", Tata Mcgraw Hill Publishing Co Ltd, New Delhi.
2) Hibbeler, R.C., (2006), "Structural Analysis", Pearson, India.
3) Wang C.K., (2010), "Intermediate Structural Analysis", Tata McGraw Hill Publishing Co Ltd, New Delhi.
4) Ramamrutham S., Narayan R., (2013), "Theory of structures", Dhanpat Rai Publishing Co Ltd, India.
5) Devdas Menon, (2018), "Structural Analysis", Narosa Publishing House, India.

II B.Tech, II-Sem (CE)

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(A0015194) ENVIRONMENTAL SCIENCE

(Mandatory Learning Course -I)

(For Branches: CE, EEE, Mech, ECE, CSE)

COURSE OBJECTIVES:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.
- Environmental education should be compulsory, right from the primary up to the post graduate stage.
- Environmental education should have an interdisciplinary approach by including physical, chemical, biological as well as socio-cultural aspects of the environment. It should build a bridge between biology and technology.
- Environmental education should take into account the historical perspective, the current and the potential historical issues.
- Environmental education should emphasize the importance of sustainable development i.e., economic development without degrading the environment.
- Environmental education should emphasize the necessity of seeking international cooperation in environmental planning.

COURSE OUTCOMES:

At the end of the course student is able to

- Understand environmental problems arising due to developmental activities.
- Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- Identify the natural resources and suitable methods for conservation and sustainable development.
- Identify the environmental pollutants and abatement devices.
- Adopt practices that help in promoting balance in nature by making judicious utilization of recourses.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1															
CO2															
CO3															
CO4															
CO5															

UNIT-1

Multidisciplinary nature of environmental science:

Environment -Definition, Scope and importance, Segments of Environment (Atmosphere, Lithosphere, Hydrosphere and Biosphere) - Importance, Productivity, Aesthetical & Optional values of nature, Need for public awareness. (8 periods)

UNIT-2

RESOURCES AND UTILIZATION

Renewable and Non-renewable resources.

a) Natural Resources: Soil & Water sources (salinity intrusion –conflicts of over utilization of water Resources-water logging, Hydro power project-problems), forest & mineral resources – Utilization-problems.
b) Non-conventional resources of energy (Solar Energy, wind energy and their applications)
c) Chemical fertilizers and pesticides-problems. (8 periods)

UNIT-3

a) **CONCEPTS OF ECO-SYSTEM**
Structure and functions of an ecosystem: Producers, Consumers and Decomposers- Interaction between biotic and abiotic factors in an ecosystem- Energy flow and its importance- Trophic levels- Food chain- Food web –Ecological Pyramid, Ecological succession

b) TYPES OF ECOSYSTEMS
Understanding the types of ecosystems: (i) Terrestrial (forest and grassland) (ii) Aquatic (fresh waterand salt water) with an example of each. (8 periods)

UNIT-4

BIODIVERSITY

Introduction – Definition - genetic, species and ecosystem diversity- Biogeographical classification of India- Value of biodiversity - Biodiversity at global, National and Local levels- India as a mega diversity nation - Hot-spots of biodiversity- Threats to biodiversity- IUCN Red data book. Conservation of bio diversity (IN-SITU and EX-SITU conservation) (8 periods)

UNIT-5

ENVIRONMENTAL POLLUTION:

Introduction - Cause, effects and control measures of

a) Air pollution
b) Water pollution
c) Soil pollution
d) Marine pollution
e) Noise pollution
f) Thermal pollution
g) Nuclear hazards

Municipal Solid Waste Management: Sources and Disposable methods.
Disaster management: Floods, Earthquake, Cyclone. (8 periods)

UNIT-6

HUMAN POPULATION:

a) Population and Environment: Definition of species, community, population; Population growth rate curves, Sex ratio, From unsustainable to sustainable development,
b) Diseases- AIDS, Malaria, COVID, Cancer.
c) Human rights, Fundamental duties and Value education.
d) Women and Family welfare Programs. (8 periods)

SOCIAL ISSUES:

a) Climatic changes
b) Greenhouse effect and global warming.
c) Ozone layer depletion.
d) Acid rain.
e) Resettlement and rehabilitation of people.
f) Sustainability- water conservation methods- Rain water harvesting.

TEXT BOOKS:

1) Deswal S and Deswal A (2004), "A Basic Course in Environmental Studies"., Dhanapat Rai & Co, Delhi
2) AnubhaKousik and Kousik C.P., New age international publishers.

REFERENCES:

1) Garg, S.K and Garg R., (2006), "Ecological and Environmental Studies"., Khanna Publishers, Delhi.
2) Chauhan A.S., (2006), "Environmental Studies"., Jain Brothers, New Delhi
3) Agarwal K.C., (2001) "Environmental Biology"., Nidi Publ. Ltd. Bikaner.
4) BharuchaErach., "The Biodiversity of India"., Mapin Publishing Pvt. Ltd.,Ahmedabad –380 013, India, E-mail:mapin@icenet.net (R)
5) Brunner R.C., (1989), "Hazardous Waste Incineration"., McGraw Hill Inc. 480p
6) Clark R.S., "Marine Pollution.," Clanderson Press Oxford (TB)
7) Cunningham W.P., Cooper T.H., Gorhani E., and Hepworth.,(2001), M.T. "Environmental
8) Encyclopedia"., Jaico Publ. House, Mumbai, 1196p
9) De A.K., "Environmental Chemistry"., Wiley Eastern Ltd.

II B.Tech, II-Sem (CE)

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(A0016194) DESIGN THINKING FOR INNOVATIONS

(Skill Development Course-II)

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To create awareness of design thinking among students of engineering
- To teach a systematic approach to identifying and defining a problem before brainstorming for a solution
- To instil a sense of significance towards applying creativity to product and service design
- To motivate students to apply design thinking while implementing a project focusing on local or global societal problems

COURSE OUTCOMES:

After completion of this course, the student will be able to

- Identify design principles from an engineering perspective.
- Cultivate sensitivity towards design aspects of Activities, Environments, Interactions, Objects, and Users (A-E-I-O-U) in daily life.
- Validate problem statements through user empathisation with societal and environmental consciousness.
- Devise visual design and documentation to communicate more effectively.
- Develop project management skills in a multidisciplinary environment

STUDENTS' RESPONSIBILITIES:

1. Forming diverse teams of 3–5 members each to work collaboratively throughout the semester.
2. Proactively engaging to observe the objects and interactions in their daily life and society from a design perspective.
3. Identifying general societal and social problems that may be effectively addressed using design thinking principles
4. Presenting and reporting the tasks to the concerned faculty members using their creative communication and people skills.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1															
CO2															
CO3															
CO4															
CO5															

UNIT-1:

Design Thinking Overview and Motivation

Introduction, What is Design thinking, Why design, Design is Everywhere – Various perspectives, Four principles of successful innovation, A model of design Innovation process, Seven Modes of the Design Innovation Process, Understanding. Design Engineering vs. Engineering Design

UNIT-2:

Sense Intent and Know Context

Sense Intent: Mindsets, Sensing Changing Conditions, Seeing Overviews, Foreseeing Trends, Reframing Problems, Forming an Intent. Methods: Buzz Reports, Popular Media Scan, Key Facts, Innovation Sourcebook, Trends Expert Interview, Keyword Bibliometrics, Ten Types of Innovation Framework, Innovation Landscape, Trends Matrix, Convergence

Map, From…To Exploration, Initial Opportunity Map, Offering-Activity-Culture Map, Intent Statement

Know Context: Mindsets, Knowing Context History, Understanding Frontiers, Seeing System Overviews, Understanding Stakeholders, Using Mental Models, Know Context: Methods, Contextual Research Plan, Popular Media Search, Publications Research, Eras Map, Innovation Evolution Map, Financial Profile, Analogous Models, Competitors-Complementors Map, Ten Types of Innovation Diagnostics, Industry Diagnostics, SWOT Analysis, Subject Matter Experts Interview, Interest Groups Discussion.

UNIT-3:

Know People & Frame Insights

Know People: Mindsets, Observing Everything, Building Empathy, Immersing in Daily Life, Listening Openly, Looking for Problems and Needs, Know People: Methods, Research Participant Map, Research Planning Survey, User Research Plan, Five Human Factors, POEMS, Field Visit, Video Ethnography, Ethnographic Interview, User Pictures Interview, Cultural Artifacts, Image Sorting, Experience Simulation, Field Activity, Remote Research, User Observations Database,

Frame Insights: Mindsets, Exploring Systems, Looking for Patterns, Constructing Overviews, Identifying Opportunities, Developing Guiding Principles, Frame Insights: Methods, Observations to Insights, Insights Sorting, User Observation Database Queries, User Response Analysis, ERAF Systems Diagram, Descriptive Value Web, Entities Position Map, Venn Diagramming, Tree/Semi-Lattice Diagramming, Symmetric Clustering Matrix, Asymmetric Clustering Matrix, Activity Network, Insights Clustering Matrix, Semantic Profile, User Groups Definition, Compelling Experience Map, User Journey Map, Summary Framework, Design Principles Generation, Analysis Workshop

UNIT-4:

Explore Concepts

Explore Concepts: Mindsets, Challenging Assumptions, Standing in the Future, Exploring Concepts at the Fringes, Seeking Clearly Added Value, Narrating Stories about the Future, Explore Concepts: Methods, Principles to Opportunities, Opportunity Mind Map, Value Hypothesis, Persona Definition, Ideation Session, Concept-Generating Matrix, Concept Metaphors and Analogies, Role-Play Ideation, Ideation Game, Puppet Scenario, Behavioral Prototype, Concept Prototype, Concept Sketch, Concept Scenarios, Concept Sorting, Concept Grouping Matrix, Concept Catalog.

UNIT-5:

Frame Solutions

Frame Solutions: Mindsets, Conceiving Holistic Solutions, Conceiving Options, Making Value Judgments, Envisioning Scenarios, Structuring Solutions, Frame Solutions: Methods, Morphological Synthesis, Concept Evaluation, Prescriptive Value Web, Concept-Linking Map, Foresight Scenario, Solution Diagramming, Solution Storyboard, Solution Enactment, Solution Prototype, Solution Evaluation, Solution Roadmap, Solution Database, Synthesis Workshop

UNIT-6:

Realize Offerings

Realize Offerings: Mindsets, Reiterating Prototypes, Evaluating in Reality, Defining strategies, Implementing in Reality, Communicating Vision, Realize Offerings: Methods, Strategy Roadmap, Platform Plan, Strategy Plan Workshop, Pilot Development and Testing, Implementation Plan, Competencies Plan, Team Formation Plan, Vision Statement, Innovation Brief

TEXT BOOKS:

1. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", John Wiley & Sons (2012) (ISBN: 978-1118083468)
2. Jeanne Liedtka and Tim Ogilvie, Designing for Growth: A Design Thinking Tool Kit for Managers, Columbia Business School Publishing, E-ISBN 978-0-231-52796-5
3. B. K. Chakravarthy, Janaki Krishnamoorthi, Innovation By Design: Lessons from Post Box Design & Development, Springer India, 2013
4. Donald A. Norman, "The Design of Everyday Things", MIT Press, 2013 (ISBN: 978-0262525671)

REFERENCES:

1. Tim Brown, "Change by Design", Harper Business, 2012 (ISBN: 978-0062337382)
2. Daniel Ling, "Complete Design Thinking Guide for Successful Professionals", Create Space Independent Publishing, 2015 (ISBN: 978-1514202739)
3. Bruno Munari, "Design as Art", Penguin UK, 2009 (ISBN: 978-0141035819)
4. Tom Kelly, Jonathan Littman, "The Art of Innovation", HarperCollins Business, 2002 (ISBN: 978-0007102938)
5. Thomas Lockwood, "Design Thinking: Integrating Innovation, Customer Experience, and Brand Value", Allworth Press, 2009 (ISBN: 978-1581156683)
6. Joost Groot Kromelink, "Responsible Innovation: Ethics, Safety and Technology", 2nd ed., TU Delft, Faculty of Technology, Policy and Management, 2019 (e-Book ISBN: 978-9463662024)
7. Jimmy Jain, "Design Thinking for Start-up's: A Handbook for Readers and Workbook for Practitioners", Notion Press, 2018 (ISBN: 978-1642495034)
8. Beverly Rudkin Ingle, "Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work", A Press, 2013 (ISBN: 978-1430261810)

II B.Tech, II-Sem (CE) P C
3 1.5

(A0192194) SURVEYING LAB

COURSE OBJECTIVES:

- Provide knowledge & skill in using various traditional and modern Surveying Instruments.
- Provides knowledge and application of concepts in Chain Surveying, Compass Surveying, Levelling & Contouring, Tachometric Surveying, Trigonometric Surveying, and Curve Setting.

COURSE OUTCOMES:

At the end of the course student is able to

- Acquire skill in using various Surveying instruments Chain, Tape, Electronic Distance Meter, Compass, Auto level, Theodolite, Total Station, GPS, etc.,
- Acquire knowledge and skill in various areas of Surveying namely Chain Surveying, Compass Surveying, Levelling, Tachometric Surveying, Trigonometric Surveying, and Curve Setting.
- Able to plan, select the instruments and able to do Survey for a given work.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	2	1	1	-	1	1	-	-	3	1	-	-	2	2	3
CO2	2	1	1	-	1	1	-	-	3	1	-	-	2	2	3
CO3	2	1	1	-	1	1	-	-	3	1	-	-	2	2	3

LIST OF EXERCISES:

1) Surveying by chain (Obstacles, area) & Plotting
2) Compass Surveying.
3) An exercise of L.S and C.S and plotting using levelling instrument.
4) Measurement of horizontal angles and vertical angles by using theodolite.
5) Trigonometric Levelling - Heights and distance problem (Two Exercises)
6) Heights and distance using Principles of tacheometric surveying (Two Exercises)
7) Curve setting – different methods. (Two Exercises)
8) Setting out works for buildings & pipe lines.
9) Determine of area using total station
10) Traversing, contouring, stake out & finding remote height using total station
11) Distance, gradient, Difference in height between two inaccessible points using total stations
12) Learning the use of GPS
13) Learning the use of DGPS
14) Perform different built-in application programmes using Total Station.
15) Data collection using Total Station.
16) Demonstration of Advanced surveying instruments and E-Survey CAD

II B.Tech, II-Sem (CE) P C
3 1.5

(A0193194) FLUID MECHANICS, HYDRAULICS AND HYDRAULIC MACHINES LAB

COURSE OBJECTIVES:

- Provides practical knowledge to understand fluid mechanics concepts
- Provides practical knowledge to understand fluid machines

COURSE OUTCOMES:

At the end of the course student is able to

- Calibrate flow measuring devices used in pipes, channels and tanks
- Determine fluid flow properties
- Characterize laminar and turbulent flows
- Determine the performance characteristics of various fluid machines like pumps, turbines etc.
- Establish the specific energy curve
- Determine Energy loss in Hydraulic jump

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	3	1	-	-	-	-	3
CO2	1	3	-	-	-	-	-	-	3	1	-	-	-	-	3
CO3	1	3	-	-	-	-	-	-	3	1	-	-	-	-	3
CO4	2	3	-	-	-	-	-	-	3	1	-	-	-	-	3
CO5	2	3	-	-	3	-	-	-	3	1	2	-	-	-	3
CO6	2	3	-	-	3	-	-	-	3	1	2	-	-	-	3

LIST OF EXPERIMENTS:

1) Determination of Coefficient of discharge for Venturi meter & Orifice meter
2) Determination of Coefficient of discharge for a small orifice by a constant head method.
3) Determination of Coefficient of discharge for an external mouth piece by variable head method.
4) Determination of Coefficient of discharge for contracted Rectangular Notch and /or Triangular Notch
5) Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6) Verification of Bernoulli's equation.
7) Impact of jet on vanes
8) Study of Hydraulic jump.
9) Performance test on Pelton wheel turbine
10) Performance test on Francis turbine.
11) Efficiency test on centrifugal pump.
12) Efficiency test on reciprocating pump.
13) Incipient motion of sand bed particles

READING:

1) Modi P.N., and Seth S.M., (2019), "Hydraulics and Fluid Mechanics Including Hydraulics Machines", Standard Book House, New Delhi.

II B.Tech, II-Sem (CE) P C
3 1.5

(A0194194) BUILDING PLANNING & DRAWING LAB

COURSE OBJECTIVES:

- To have knowledge of building bye-laws and the regulations as per National Building Code.
- To obtain skill in planning and drawing of different types of buildings (plan, elevation and sectional views).

COURSE OUTCOMES:

At the end of the course student is able to

- Apply the knowledge of National Building code and regulations.
- Plan the layout of the building satisfying the building bye-laws.
- Draw the line plan, dimensional plan, elevation and sectional elevation of the buildings as per the data given.
- Prepare building drawings identifying the functional requirements and building rules.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3	-	-	-	-	2	2	-	-	-	2	-	3	2	2
CO2	3	2	3	-	3	2	2	-	-	-	2	-	3	2	2
CO3	3	2	3	-	3	2	2	-	-	-	2	-	3	2	2
CO4	3	2	3	-	3	2	2	-	-	-	2	-	3	2	2

MODULE 1

As per the building bye-laws, line plan and dimensional plan are drawn to scale as per the dimensions in AutoCAD for

1) Residential Building
2) Office building
3) Hospital building
4) School building

MODULE 2

For the dimensional plan, elevation and sectional elevation are drawn to scale as per the required dimensions in AutoCAD for

1) Residential Building
2) Office building
3) Hospital building
4) School building

MODULE 3

A problem statement including all the dimensions of building as per required is given. Line Plan, Dimensional plan, Elevation and Sectional elevation are to be drawn to scale in AutoCAD (for any category of building).

NOTE:

1) Students should sketch to dimension the above in a sketch book before doing the computer drawing.
2) Each module consists of 4 questions each. From total of 12, 8 lab drawings are to be compulsorily submitted by student at the end of semester.
3) Two full questions from module 2 and module 3 are to be answered by the students compulsorily.

READING:

1) Kumara Swamy N., and Kameswara Rao A., (2012), “Building Planning & Drawing”, Charotar Publishers, India.
2) Bureau of Indian Standards, National Building Code of India, New Delhi, 2005.

III B.Tech, I-Sem (CE)

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(A0109195) CONCERETE TECHNOLOGY

PREREQUISITES: Building Materials and Construction

COURSE OBJECTIVE:

- Student shall learn about the various ingredients of concrete, admixtures, workability and strength of concrete, effect of shrinkage and creep, methods of curing, design of concrete mix by IS method, special concretes and their importance.

COURSE OUTCOMES:

At the end of the course student is able to

- Illustrate physical and chemical properties of concrete ingredients and able to conduct test on cement and concrete
- Classify the physical properties of fresh and hardened concrete and also about manufacturing of cement
- Distinguish the special concrete like Self compacting Concrete, Fiber Reinforced Concrete, Polymer Concrete and Light weight concrete etc.
- Compute the design mix proportion for special work for required strength and workability with available material at workplace.

MAPPING WITH COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1											2	1	2
CO2	2	2	2	2									2	1	2
CO3	3	1											2	1	2
CO4	3	1											2	1	2

UNIT I

FRESH CONCRETE: Properties of fresh concrete- Workability – different tests of workability- Factors influencing workability compaction, finishing, curing.

UNIT II

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 compressive & tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – codal provisions for NDT.-

UNIT III

DURABILITY: Factors influencing durability – Chemical effects on concrete- Carbonation, Sulphate attack, Chloride attack.

UNIT IV

CREEP OF CONCRETE: – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT V

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 various methods – ACI method & IS 10262 methods.

UNIT VI

SPECIAL CONCRETES: Light weight aggregates – 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 – Applications – Polymer concrete – Types of Polymer concrete – Properties of polymer concrete – Applications – High performance concrete – Self- compacting concrete

TEXT BOOKS:

1) AM Nevelli, (2012), Properties of Concrete, Prentice Hall Publishers.
2) M. S. Shetty, (2006), Concrete Technology, S Chand Co. Publishers.
3) M. L. Gambhir, (2017), Concrete Technology, Tata Mc Graw Hill Publishers.

III B.Tech, I-Sem (CE) L T C
2 1 3

(A0110195) DESIGN OF REINFORCED CONCRETE STRUCTURAL ELEMENTS

PREREQUISITES: Concrete Technology and Mechanics of Materials.

COURSE OBJECTIVES:

- For any construction of a Civil Engineering, structure such as a building or a bridge or a dam the knowledge of application of reinforced cement concrete (RCC) is very essential. This course provides the knowledge of different design methods of RCC Beams, Columns, Slabs etc., using respective IS 456 – 2000, IS 875 (part-I and II).

COURSE OUTCOMES:

At the end of the course student is able to

- Apply basic knowledge on RCC structural elements with relevant IS codes.
- Understand the design Philosophies of various methods of design.
- Analyse structural members subjected to various loading.
- Evaluate the required reinforcement and sections to structural members.

MAPPING WITH COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1			2								3	2	
CO2	3	1	3		2							2	3	2	
CO3	3	2	3		2			3			1	3	3	2	
CO4	3	2	3		2			3			1	3	3	2	

Module 1:

Introduction- Review of Concrete making materials - Grades- properties of Concrete- Modulus of elasticity-flexural strength-Characteristic and Design Values-Partial safety factor. Methods of design- Aims of design- RCC- Limit State method- Assumptions- Stress-Strain behaviour of Steel and Concrete- Stress block parameters- Working stress method.

Module 2:

Serviceability: Design for Serviceability- Concept of Serviceability- Deflection- Span to depth ratio- Short term-Long term deflection due to Shrinkage, Creep- Cracking-Crack width calculation.

Module 3:

Slabs: Design of RCC Slabs- Design of One-Way, Two-way slabs and Continuous Slabs- Effect of edge conditions- Moment of resistance-Torsion reinforcement at corners.

Module 4:

Beams: Analysis and Design of Singly Reinforced Beams, doubly reinforced beams, continuous beams and T beams.

Module 5:

Columns: Design of RC Columns- Design principles of RC columns- Assumptions- Rectangular and Circular columns- Helical reinforcement- Minimum Eccentricity-Use of Interaction diagrams for Axial load and Moment.

Module 6:

Footings: Design of Rectangular Footing, Square Footing and Combined Footing.

NOTE: All the designs to be taught in Limit State Method. IS 456 – 2000 and also any other relevant codes are permitted for examination.

TEXT/REFERENCE BOOKS:

1. P.C.Varghese, (2008), Limit state design of reinforced concrete, Printice Hall of India, New Delhi.
2. S.Unnikrishna Pillai &Devdas Menon, (2017), Reinforced concrete design, Tata Mc.Graw Hill, New Delhi.
3. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, (2007), Limit State Design, Laxmi, publications Pvt. Ltd., New Delhi.

III B.Tech, I-Sem (CE)

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(A0111195) HYDROLOGY AND WATER RESOURCES ENGINEERING

COURSE OBJECTIVES:

- A Civil Engineer requires complete understanding of hydrological cycle so that harnessing of water in various forms will be justified. This course discusses some basic topics from hydrology such as techniques for measuring the different parameters involved in a hydrological cycle, ground water hydrology, well hydraulics, and complete overview of irrigation and water application methods, open channel flow and how to design different water distribution networks.

COURSE OUTCOMES:

At the end of the course student is able to;

- Understand the water cycle occurs in nature
- Apply and analyze the various abstractions from rainfall.
- Analysis of Hydrograph for design discharge of the basin.
- Understand the groundwater characteristics and application of irrigation techniques.
- Design canal distribution network.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	2	-	-	-	-	-	1	2	-
CO2	3	2	-	-	-	-	1	-	-	-	-	1	1	2	-
CO3	2	3	2	-	1	-	-	-	-	-	-	1	1	2	-
CO4	3	2	-	-	-	-	1	-	-	-	-	-	1	2	-
CO5	2	2	3	-	-	-	-	1	-	-	-	-	1	2	-
Avg.	3	2	3	-	-	-	-	-	-	-	-	-	1	2	-

UNIT –I

INTRODUCTION: Introduction to engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data.

UNIT-II

ABSTRACTION FROM RAINFALL: Evaporation, factors affecting evaporation, measurement of evaporation, Evapotranspiration, Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices. Runoff-components of runoff, factors affecting runoff.

UNIT-III

HYDROGRAPH: Hydrograph Analysis, Flood Hydrograph, Effective Rainfall, Base Flow, Base Flow Separation, Unit Hydrograph, definition and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph, S-hydrograph, Instantaneous Unit Hydrograph (IUH), Synthetic Unit Hydrograph. Design discharge, computation of design discharge, rational formula, Soil Conservation Service (SCS) method.

UNIT-IV

GROOUND WATER: Ground water Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcy‘s law, radial flow to wells in confined and unconfined aquifers.

UNIT-V

IRRIGATION: Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility, preparation of land for Irrigation. Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, consumptive use, Duty and Delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies.

UNIT-VI

CANALS: Classification of canals, design of Irrigation canals by Kennedy‘s and Lacey‘s theories, balancing depth of cutting, canal lining, types of canal lining.

TEXT BOOKS:

1) B. C. Punmia and Lal, (2021), Irrigation and water power engineering, Laxmi publications pvt. Ltd., New Delhi
2) K.Subramanya, (2017), Engineering Hydrology, The Tata Mcgraw Hill Company, Delhi.

REFERENCES:

1) S.K Garg, (2006), Irrigation engineering and hydraulic structures, Khanna publishers.
2) Jayarami Reddy, (2017), Engineering Hydrology, Laxmi publications pvt. Ltd., New Delhi
3) P.N.Modi, (2020), Irrigation and Water Resources & Water Power, Standard Book House.
4) D.K. Majumdar, (2014), Irrigation Water Management, Prentice Hall of India
5) C.S.P.Ojha, (2008), Engineering Hydrology, Oxford Publishers, New Delhi.

III B.Tech, I-Sem (CE)

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(A0112195) ENVIRONMENTAL ENGINEERING

COURSE OBJECTIVES:

- To protect human against environmental factors and to protect environment against human actions.
- This is one of such courses which motivates the students to learn different concepts of public water supply, water quality & Quantity and also different methods of purification for the water which is bad in quality for drinking.
- They can also learn how to distribute treated water to the communities by maintaining sufficient requirements and also can be able to design it according the standards using different principles of hydraulics.
- To quickly drain waste water away from community (to prevent breakup of water borne diseases).
- To make waste water fit to dispose.
- Getting acquainted with physical, chemical and biological methods & possibilities of separation, recovery and deformation of various pollutants of gaseous and solid phase; basic processes and engineering equipment of the technology; characterization, collection and treatment, theoretical basics of burning solid wastes, typical equipment, solid waste disposal and recycling.

COURSE OUTCOMES:

- Forecast the water demand and analyze the characteristics of water which are obtained from different sources.
- Apply various water treatment methods to treat the raw water and designing the distribution network system.
- Understand the collection process of waste water and sewerage system.
- Identify the characteristics of sewage water, treatment methods of sewage water along with suitable methods for effluents disposals.
- Understand human interaction with the Environment and have knowledge about sources of pollution and their effects,

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	2	-	-	-	-	2	-	2	2
CO2	3	2	3	2	2	2	2	-	-	-	-	2	1	-	1
CO3	3	2	-	-	-	2	2	-	-	-	-	2	1	-	-
CO4	1	3	3	-	-	2	2	-	-	-	-	2	1	1	1
CO5	2	1	-	-	-	2	2	-	-	-	-	2	-	-	-

UNIT - 1

Introduction of Water Supply Engineering: Population Forecasting & Water Demands, Sources and Conveyance of Water, Surface Source of Water types, Sub Surface of Water types, Various types of Pressure pipes, Quality of Water, Physical Characteristics of water, Chemical Characteristics of water and Biological Characteristics of water, Water borne diseases.

UNIT - 2

Treatment of Water : Methods of Purification, Screening, Plain Sedimentation, Sedimentation aided with coagulation, Filtration, Disinfection, Aeration, Softening, Miscellaneous Water Treatment such as Fluoridation, Re-carbonation, Liming, Desalination etc…, Types of Sedimentation tanks , Slow sand filters , Rapid sand filters and pressure filters, Disinfection methods, Various forms of Chlorine, Types of Chlorination, Removal of temporary hardness of water and Removal of permanent hardness of water , Removal of

colour, odour and taste, Fluoridation and De-fluoridation , Desalination, Designs of Distribution systems, Appurtenances in Distribution System.

UNIT- 3

Introduction of Waste Water: Fundamental Definitions of Refuse, Garbage, Rubbish, Sewage, Sullage, Storm Water, Systems of Sewarage, Separate System, combined system and partially separate system Classification of sewers, House sewer, Lateral sewer, Trunk or Main sewer, Out fall sewer, Estimation of dry & wet weather flow, sewer materials.

UNIT - 4

Characteristics of Sewage: Physical Characteristics of waste water, Turbidity, Colour, Odour, Temperature, Chemical Characteristics, Determination of solids, dissolved oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand, BOD and COD Tests, BOD and COD ratio, Relative Stability, Population Equivalent.

UNIT - 5

Treatment of Sewage: Preliminary Treatment, Primary Treatment, Secondary or Biological treatment and complete final treatment of waste water, grit chambers, detritus tanks, skimming tank, Activated Sludge process, Trickling filters, Sludge digestion, Septic Tanks, Oxidation Ponds and Disposal of Sewage Effluents.

UNIT - 6

Types of Pollution: Water pollution, land pollution, Air pollution, Noise pollution, Various methods of disposal refuse, Sources of air, water, land and noise pollution, Classification of air, water, land and noise pollution, Characteristics of air, water, land and noise pollution.

TEXT BOOKS:

1) K.N.Duggal, (1996), Elements of environmental engineering, S Chand Publishers.
2) B.C. Punmia, Ashok Jain & Arun Jain, (1997), Water supply engineering vol 1, Laxmi publications pvt.ltd. New Delhi
3) Basak, (2017), Environmental engineering, Tata Mc. Graw Hill edition, New Delhi

REFERENCES:

1) Mark J Hammer and Mark J Hammer, (2011), Water and waste water technology, Pearson Publishers.
2) C.S.Rao, (2018), Environmental pollution control engineering, New age publishers.
3) Fair Geyer and Okun, (2010), Water and waste water engineering, Wiley publishers.

III B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0113195) GEOTECHNICAL ENGINEERING

COURSE OBJECTIVES:

- Provide knowledge about soil formation, the properties of soil and the soil classification.
- Provide knowledge about the concept and methods of estimation of seepage, concept and calculation of effective stress, determination of vertical stress using different methods
- Provide knowledge compaction, consolidation phenomenon
- Provide knowledge about shear strength of soil

COURSE OUTCOMES:

- Understand minerals, rocks, soil formation, and various properties of soil, classify the given soil and specify suitability for an application.
- Able to find geostatic stresses and stresses due to applied loads.
- Calculate water flow through ground, and understand the effects of seepage on the stability of structures. Able understand consolidation, its effect and to find consolidation settlements. Able to understand soil compaction and specify compaction requirements.
- Able to determine shear strength parameters (total and effective) of the soil and apply to problems.
- Able to find bearing capacity(or load carrying capacity) of shallow and deep foundations.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2						1	1	1	1	1	3	2	3
CO2	3	2	1					1	1	1		1	3	2	1
CO3	3	2	2			1	1	1	1	1	1	1	3	2	3
CO4	3	2	1			-	-	1	1	1	1	1	3	2	3
CO5	3	2				1	1	1	1	1	1	1	3	2	1

UNIT – I

INTRODUCTION: Engineering Geology-Minerals –Rocks- Soil formation – Major soil deposits of India-different types of soils-cohesive and cohesion less soils.

Clay Mineralogy and Soil Structure – basic structural units –Adsorbed water- soil structure

Basic Definitions in soil mechanics- Three Phase diagram of soil-Volume relations ships, weight relations ships, Mass/Weight volume relationship – Relative density.

Index Properties of Soils – I.S. Classification of soils

UNIT – II

PERMEABILITY: Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting – laboratory determination of coefficient of permeability – Permeability of layered soil systems.

SEEPAGE THROUGH SOILS: Total, neutral and effective stresses –quick sand condition – Seepage through soils

COMPACTION: Mechanism of compaction – factors affecting – effects of compaction on soil properties.

UNIT – III

SHEAR STRENGTH OF SOILS: Mohr – Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands – Critical Void Ratio – Liquefaction- shear strength of clays.

UNIT –IV

STRESS DISTRIBUTION IN SOILS: Boussinesq's and Westergaard's theories for point loads and areas of different shapes – Newmark's influence chart.

CONSOLIDATION: stress history of clay; e-p and e-log p curves – magnitude and rate of 1-D consolidation – Terzaghi's Theory. Time rate of consolidation and settlement calculations.

UNIT – V

Soil Exploration: Need- Different methods

SHALLOW FOUNDATIONS: Types – choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi`s, Meyerhoff's, IS Code Method- Settlement Analysis

UNIT – VI

DEEP FOUNDATIONs: Types of Deep foundations -Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae –Negative Skin Friction-Load carrying capacity of pile groups.

TEXT BOOKS:

1. Gopal Ranjan & ASR Rao, (2016), Basic and Applied Soil Mechanics, New age International Pvt. Ltd, New Delhi.
2. Robert D Hodtz, (2013), An Introduction to Geotechnical Engineering, Pearson Education India.

REFERENCES:

1. T.W. Lambe and Whitman, (2012), Soil Mechanics, Wiley India Pvt Ltd.
2. Braja. M. Das& Khaled Sobhan, (2017), Principles of Geotechnical Engineering, Cengage Publications, New Delhi.
3. P. Purushotham Raj, (2013), Soil Mechanics and Foundation Engineering, Pearson Publishers.
4. Gulati S. K& Manoj Dutta, (2017), Geotechnical Engineering, Tata Mc.Grawhill Publishers New Delhi.
5. Alam Singh, (2006), Modern Geotechnical Engineering, CBS Publishers & Distributors.
6. V.N.S.Murthy, (2016), Geotechnical Engineering, CRC Press, Newyork.
7. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, (2017), Soil Mechanics and Foundation, Laxmi, publications Pvt. Ltd., New Delhi.
8. K.R. Arora, (2020), Soil Mechanics and Foundation Engg, Standard Publishers and Distributors, Delhi.
9. C. Venkataramiah, (2018), Geotechnical Engineering, New age International Pvt.Ltd.

III B.Tech, I-Sem (CE)

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(A0014195) CONSTRUCTION TECHNOLOGY AND PROJECT MANAGEMENT

(Skill Development Course-III)

COURSE OBJECTIVES:

To impart knowledge on

- Objectives, need, functions, types, resources and stages of project management.
- PERT-CPM network formulation and analysis
- Causes- classification- accident report- safety measures

COURSE OUTCOMES:

At the end of the course student is able to:

- Understand the method, planning, scheduling and principles of construction management.
- Formulate CPM and Pert Network and Bar Charts
- Understand the concepts of time, money and quality management.
- Understand the procedure and importance of tenders and contractors.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-							1		3	-	2	1	
CO2	2	3							-		3	-	2	1	
CO3	2	3							1		3	-	2	1	
CO4	2	-							2		3	1	2	1	

UNIT-I

Project Management – Introduction, Objectives and functions of project management, Project planning, Scheduling, Controlling, Role of Project Manager

UNIT-II

Develop of Bar charts- Illustrative examples, Shortcomings of bar charts and remedial measures, Milestone charts, Development of PERT network Problems

UNIT-III

Elements of network- Introduction, Event, Activity, Dummy, Network rules, Graphical guidelines for network, Common partial situations in network - Development of network- Planning for network construction – Modes of network construction – Steps in development of network – Work breakdown structure

UNIT-IV

Program Evaluation and Review Technique (PERT) - Introduction, Time estimates – Frequency distribution – Mean, variance and standard deviation, earliest expected time – Formulation for TE - Latest allowable occurrence time – Formulation for TL - Combined tabular computations for TE and TL problems.

UNIT-V

PERT AND CPM (NETWORK ANALYSIS)-Introduction, Slack, Critical path, CPM-Networks, Activity time estimate, Earliest event time, Latest allowable occurrence time, combined tabular computations for TE and TL, Start and finish times of activity, Float – Critical activities and critical path problems.

UNIT-VI

Tenders: Type of tenders, Principles of tendering – Notice inviting tender**.**

Construction Safety Management: Importance of safety, Causes, Classification, Measurement, cost of accidents, Accident report, General safety programmes, Safety measures for different construction works.

TEXT BOOKS:

1) B.C. Punmia& K.K. Kandelwal, (2009), Project Planning & Control with PERT & CPM, Laxmi Publishers.

2) J.L. Sharma, (2003), Construction Management and Accounts, Sathya Prakashan, New Delhi.

REFERENCES:

1) Antil&Woodh, (1990), Critical Path Method in Construction, Wiley International Publishers.
2) Mahesh Varma, (1995), Construction Planning and Equipment, Metropolitan Co. Ltd.
3) Choudhary S, (2017), Project Management, Tata McGraw Hill Publishing Company Limited.

III B.Tech, I-Sem (CE)

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(A0017194) INDIAN HERITAGE AND CULTURE

(Mandatory Learning Course-II)
(For Branches: CE, EEE, Mech, ECE & CSE)

INTRODUCTION

Indian Heritage is an ancient facet pertaining to bygone ages. It reflects strong ethical culture and embodiment of nature in life style. It had its deep roots in great Indian epics and Upanishads. It has been transformed and strengthened by many kings and queens. It is received by erudite writers. The glory of Indian Heritage & culture has been ignored or distorted in wake of western culture. The present generation ought to know their indigenous culture and heritage.

COURSE OBJECTIVES

- To enable the students to have an insight into and understanding of the great heritage and culture ofIndia.
- To sensitize them towards preservation and progression of the same.

COURSE OUTCOMES

- Equip themselves with knowledge about the heritage and culture of India.
- Apply the ancient wisdom to become successful professionals.

UNIT-I:

Origin of Indian Culture - Indus valley & Vedic Culture Evolution - Political unification of India under Mauryas and Guptas - Cultural achievements - Cultural conditions under the Sathavahanas - Contribution of Pallavas and Cholas to art and letters.

UNIT-II:

Influence of Islam on Indian Culture - The Sufi, Bhakti and Vishnavite Movements - Cultural achievements of Vijayanagara rulers - Contribution of Shershah and Akbar to the evolution of administrative system in India - Cultural Developments under Mughals - Great Indian Monuments.

UNIT-III:

Great Indian Epics - Ramayana and Mahabharata - Upanishads - Vedas - Pathanjali - Yoga - Principles of Jainism and Buddhism.

UNIT-IV:

Indian Literature - Rabindranath Tagore - Arundhathi Roy - RK.Narayan - Sri Sri - Gurajada -Jashuva - Western Impact on India - Introduction of Western Education - End of the Gurukulas educational system.

UNIT-V:

Social and Cultural awakening and social reform movements - Raja Rama Mohan Roy - Dayananda Saraswathi -Theosophical Society - Ramakrishna Paramahamsa and Vivekananda - Iswara Chandra Vidyasagar and Kandukuri Veeresalingam - Emancipation of women and struggle against Caste.

UNIT-VI:

Mahatma Gandhi - Non-violence and Satyagraha - Great leaders of Freedom struggle - Post Independent Era.

TEXT BOOK

1) Madanlal Malpani & Shamsunder Malpani (2009), ***Indian Heritage and Culture,*** New Delhi: Kalyani Publishers.

REFERENCE BOOKS:

1) Romila Thapar (2018), Indian Cultures as Heritage: Contemporary Pasts, India.

2) Anurag Mathur (2017), Indian Culture & Heritage, Create space independent publishing Platform, 2017.
3) P.R.Rao& P. Raghavendra , Indian Heritage and culture, Sterling Publication Pvt. Ltd.
4) Madhukar Kumar Bhagat, Indian Heritage and culture, Access Publications.
5) Dhirendra Singh, Indian Heritage and culture, APH Publications.

III B.Tech, I-Sem (CE) P C
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(A0195195) CONCRETE TECHNOLOGY LAB

PREREQUISITES: Concrete Technology.

COURSE OBJECTIVES:

- The student shall learn the conduct of various tests on cement, aggregates (fine & course), fresh and hardened concrete.

COURSE OUTCOMES:

At the end of the course student is able to:

- Achieve the practical knowledge regarding concrete testing equipment
- Demonstrate test on cement Aggregate and Concrete.
- To interpret behavior of concrete materials and their properties
- To test concrete and construction structures for various characteristics or properties and compare the same with those given as per IS Code.

MAPPING WITH COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3							2	1			1	2	1
CO2	2	3							2	1			1	2	1
CO3	1	2							2	1			1	2	1
CO4	1	3							2	1			2	2	1

TESTS ON CONSTRUCTION MATERIALS LIKE CEMENT, FINE AND COARSE AGGREGATE:

1. Fineness of cement
2. Standard consistency of cement paste.
3. Initial and final setting of cement.
4. Soundness of cement(By Lechatlier method)
5. Specific gravity of cement
6. Compressive strength of cement
7. Tests on Fine Aggregate
   a) Sieve analysis – finding FM value and identifying zone as per code of practice.
   b) Specific gravity
   c) Determination of moisture content
8. Tests on coarse aggregate
   a) Sieve analysis
   b) Specific gravity of Coarse Aggregate
9. Mix Design (IS Code method)
   a. Workability Tests: Slump Cone Test, Compaction factor test.
   b. Preparing and curing concrete specimens for tests & Determination of compressive strength of concrete cubes
10. Demonstration of rebound test hammer.

READING:

1) AM Nevelli, (2012), Properties of Concrete, Prentice Hall Publishers.
2) M. S. Shetty, (2006), Concrete Technology, S Chand Co. Publishers.
3) M. L. Gambhir, (2017), Concrete Technology, Tata Mc Graw Hill Publishers.

III B.Tech, I-Sem (CE) P C
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(A0196195) GEOTECHNICAL ENGINEERING LAB

COURSE OBJECTIVES:

- Provide hands on experience in using various geotechnical lab equipment
- Provides knowledge in determining the properties of soil using IS standards.

COURSE OUTCOMES:

At the end of the course student is able to:

- Determine the various properties of soil like index properties and classify soil
- Determine engineering properties of soil like coefficient of permeability, consolidation parameters and interpret the results for the given soil.
- Determine engineering properties of soil from laboratory (shear parameters) and field tests.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-		1	1	1	3	2	-	1	2	2	3
CO2	1	-	-	-		1	1	1	3	2	-	1	2	2	3
CO3	1	-	-	-		1	1	1	3	2	-	1	2	2	3

LIST OF EXPERIMENTS

1. Grain size analysis
2. Atterberg's Limits
3. Compaction test
4. Field density-core cutter and sand replacement method
5. Permeability of soil, constant and variable head test
6. CBR Test
7. Consolidation test
8. Unconfined compression test
9. Vane shear test
10. Direct shear test
11. Tri-axial Compression test
12. SPT Test

Any eight experiments may be completed.

TEXT BOOKS:

1) K.V.S. Appa Rao &V.C.C.Rao, Soil Testing Lab Manual, University Science Press , Laxmi Publication.
2) S.Mittal and J.P.Shukla, Soil Testing for Engineers, Khanna Publishers, New Delhi.

III B.Tech, I-Sem (CE) P C
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(A0197195) COMPUTER AIDED DESIGN LAB- I

COURSE OBJECTIVES:

- The course objective of this Lab is to draw the structures and visualizing a building using different 2D and 3D tools.

COURSE OUTCOMES:

At the end of the course student are able to:

- Apply basic commands to draw the structure using Auto CAD and REVIT software.
- Understand each command to draw building components using REVIT software.
- Analyze and draw plan, elevation, and sectional view of structures as per requirements using software.
- Create architectural and 3D non-structural elements using REVIT software.

MAPPING WITH COs& POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				3							3	3		
CO2	3				3							3	3		
CO3	3				3	1			1			3	3		
CO4	3				3	2			2	2		3	3		

BASIC EXPERIMENTS:

- Drawing of a residential building using Auto CAD
- Drawing of a school building using Auto CAD
- Drawing of a hospital building using Auto CAD
- Drawing of a office building using Auto CAD

MAJOR EXPERIMENTS:

- Drawing of a residential building using REVIT
- Drawing of a school building using REVIT
- Drawing of a hospital building using REVIT
- Drawing of a office building using REVIT

TEXT BOOKS:

1. https://cupdf.com/document/beginner-student-workbook-revit.html

III B.Tech, II-Sem (CE)

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(A0115196) DESIGN OF STEEL STRUCTURAL ELEMENTS

PREREQUISITES: Mechanics of Materials.

COURSE OBJECTIVE:

- Design principles of steel structures are essential for Civil Engineers for any fabrication of structure such as Industrial sheds, bridges, trusses etc. This course provides the thorough knowledge of different design specifications of steel structures using respective IS 800 – 2007.

COURSE OUTCOMES:

At the end of the course student is able to;

- Understanding of basic knowledge on different types of connections.
- Understand the design guidelines of IS 800-2007.
- Analyze the steel structural members subjected to various loading.
- Evaluate the steel sections of various structural components.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2			2	1		1	1	3	2	
CO2	3	3	3	3	2			2			1	1	3	2	
CO3	3	3	3	3	2	1	2	1			1		3	2	
CO4	3	3	3	3	2		2	1			1		3	2	

UNIT I:

Introduction: General- Types of Steel – Mechanical behavior of steel –Types of Structural Steel Sections. Design of Steel fasteners: Types of fasteners – Riveted connections- Bolted connections- Assumptions- Failure of bolted joints – Strength of bolted joints – Design examples – Design of Welded connections – Butt weld- fillet weld – Design examples

UNIT II:

Design of Tension Members: General – Modes of Failure of Tension member- Analysis of Tension members- Example - Design steps – Design examples – Lug angles.

UNIT III:

Design of Compression Members: General – Strength of Compression members- Design Compressive strength- Example on analysis of Compression members – Design of Angle struts – Design Examples- Built up Columns- Design of Lacing – Design of Battens- Design Examples.

UNIT IV:

Design of Column Base: Design of Column Base- Slab Base- Gusseted Base- Design Examples.

UNIT V:

Design of Roof Trusses: Various types of trusses and their selection, effect of wind loads on purlin and trusses – Design of purlin and elements of truss.

UNIT VI:

Design of Plate Girder: General- Components of Plate Girder- Optimum depth – Bending Strength – Shear Strength – Shear Buckling- Simple Post critical method- Tension Field method- Stiffeners-Bearing- Transverse stiffeners - Design Examples

NOTE: IS 800– 2007 and Steel Tables are permitted for examination.

TEXT/REFERENCE BOOKS:

1) S.K. Duggal, (2017), Design of steel structures, Tata Mcgraw Hill, New Delhi
2) N. Subramanian, (2008), Design of Steel structures, Oxford Publishers, New Delhi.
3) Arya and Azmani, Design of Steel Structures, PHI Publishers, New Delhi.

III B.Tech, II-Sem (CE) L T C
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(A0116196) ESTIMATION, COSTING AND VALUATION

PREREQUISITES: Building Planning and Construction, Building Drawing,

COURSE OBJECTIVES:

- Impart sound knowledge about the estimation of structures such as buildings, roads and canal.
- Discuss the preparation of tenders, contract documents and rate analysis including the standard specification of materials and works.

COURSE OUTCOMES:

At the end of the course student is able to;

- To understand the necessity of estimation, rate analysis, bills, and reinforcement details
- Calculate the quantity required for civil engineering works as per the specifications
- Apply the knowledge of contract and tenders in construction practices.
- To evaluate the health of the Civil Engineering structures

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	3	2	1	2	2	1	3	2	3	1	1
CO2	1	2	-	-	3	2	1	2	2	1	3	2	3	1	1
CO3	1	2	-	-	3	3	3	2	2	3	3	2	3	1	1
CO4	1	2	-	-	3	3	3	2	2	1	3	2	3	1	1

UNIT – I

INTRODUCTION: Introduction to estimation, purpose of estimation, Different types of estimates- their function and preparation, main items of work, Units of dimensions for materials and work.

UNIT – II

ESTIMATION OF BUILDINGS: Detailed Estimates of Buildings by using centreline & long wall and short wall method. (singlestorey with two rooms)

UNIT – III

EARTHWORK ESTIMATION: Road estimate: General specifications for modern road, Volume of earthwork, Different methods, Estimation of Earth work for roads , Earthwork for hill roads. Earthwork in canals.

UNIT – IV

RATE ANALYSIS: Need of rate analysis**,** Preparation for analysis of rates. Quantity of materials per unit rate of work, labor estimate for building works, Over head and Contingent charges. Measurement book – bills – types.

UNIT-V

REINFORCEMENT ESTIMATION: Necessity of bar bending schedule, types of bars for construction, Percentage of steel reinforcement, standard hooks and cranks of reinforcement bars, Preparation of Reinforcement bar bending and bar requirement schedules- Beam, RCC Slab, RCC Column and Footing.

UNIT – VI

CONTRACTS AND TENDERS:

CONTRACT: Types of contracts, Formation of contract, Contract conditions, contract problems, Contract for labor, material, design and construction, Drafting of contract document, arbitration and legal requirements.

TENDERS: Types of Tenders, Requirement of Tendering, Corrigendum notice – tender procedures, Drafting model tenders

VALUATION: Introduction, Purpose of valuation, Gross income, Capitalized value, Annuity, Sinking fund, Depreciation, Methods of depreciation, Mortgage lease, Different methods of valuation, Valuation of buildings.

STANDARDS SPECIFICATIONS: General specifications for first class, second class, third class and fourth class buildings, Detailed specifications for various items of works.

TEXT BOOKS

1. B.N. Dutta, (2020), Estimating and Costing, UBS publishers.
2. Kohli, D.D and Kohli, R.C., (2013), A Text Book of Estimating and Costing (Civil), S.Chand& Company Ltd.

REFERENCE BOOKS:

1. Chakraborti, M, (2006), Estimation, costing, specifications and valuation in civil engineering – National Halftone Co. Calcutta.
2. Birdie G.S, (2015), A text book on estimating and costing, Dhanpat Rai and Sons, New Delhi.

III B.Tech, II-Sem (CE)

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(A0117196) TRANSPORTATION ENGINEERING

Prerequisites: None.

COURSE OBJECTIVES:

- The Objective of the subject to provide basic knowledge of highway development in India, highway alignment, geometric design of highways with an introduction to construction of flexible and rigid pavements.

COURSE OUTCOMES:

At the end of the course student is able to;

- Carry out surveys involved in planning and highway alignment
- Determine the characteristics of pavement materials
- Design cross section elements, sigh distance. horizontal and vertical alignment
- Design flexible and rigid pavements as per IRC
- Understand the principles of construction and Maintains of highway

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2				2								3		
CO2	3													3	
CO3	3	3	3											3	
CO4	3	3	3											3	
CO5	2										2			3	

UNIT I

Introduction to Transportation Engineering: Transportation as system, modes of transportation systems

Highway Engineering: Introduction; Roads Development plans in India: Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

HIGHWAY MATERIALS: Soil, Aggregate and Normal Bitumen and Modified Bitumen- Tests on aggregates – Aggregate Properties and their Importance- Tests on Bitumen – Bituminous Concrete- Requirements of Design Mix- Marshall's Method of Bituminous Mix design

UNIT – II

HIGHWAY GEOMETIC DESIGN: Importance of Geometric Design- Design controls and Criteria- Highway Cross section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance

UNIT – III

DESIGN OF HORIZONTAL AND VERTICAL ALIGNMENT: Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical Alignment-Gradients- Vertical curves.

UNIT – IV

FLEXIABLE PAVEMENT DESIGN: Types of pavements – Difference between flexible and rigid pavements – Pavement Components – Sub grade, Sub base, base and wearing course – Functions of pavement components – Design Factors – Flexible pavement Design methods – G.I method, CBR Method, IRC method

UNIT – V

RIGID PAVEMENT DESIGN: Design of Rigid pavements – Critical load positions - Westergaard's stress equations – computing Radius of Relative stiffness and equivalent radius of resisting section – stresses in rigid pavements – Design of Expansion and contraction joints in CC pavements. Design of Dowel bars and Tie bars. Introduction to IRC method of plain jointed rigid pavement Design

UNIT – VI

HIGHWAY CONSTRUCTION: Construction of Earth Roads- Gravel Roads – WBM Roads- Bituminous Pavements- Cement Concrete Roads- Steps in Construction- Reinforced Concrete Pavements – Soil Stabilization – Methods and Objectives- Soil-cement Stabilization and Soil-lime Stabilization.

TEXT BOOKS:

1) S.K.Khanna and C.E.G.Justo (2011), Highway Engineering, S.K.Khanna Publishers.

REFERENCE BOOKS/ MATERIAL

1) C. JotinKhisty and B. Kent Lall, (2002), Transportation Engineering – Introduction, Prentice Hall India.
2) Chakraborty Partha and Animesh Das, Principles of Transportation Engineering, Prentice Hall India
3) IRC:37-2001 – Guidelines for Design of Flexible Pavements; 2 nd Revision Indian Road Congress, New Delhi.
4) IRC:58-2002 – Guidelines for Design of Plain Jointed Rigid Pavements; Indian Road Congress, New Delhi.
5) IS:73-2006 - Paving Bitumen, Bureau of Indian Standards, New Delhi

III B.Tech, II-Sem (CE)

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(A0118196) PRESTRESSED CONCRETE

(Open Elective - I)

Pre-requisites: Design of concrete structures.

COURSE OBJECTIVES:

For certain Structural elements RCC may not provide required strength. One of the alternatives to get the high strength is by using prestressed concrete. This course discusses

- Methods & systems of pre-tensioned & post-tensioned members,
- Different systems of pre-stressing,
- Losses of pre-stressing members,
- Analysis of section for flexure,
- Design of section for flexure & shear & deflection.

COURSE OUTCOMES:

At the end of the course student is able to;

- Understand the knowledge on basic concepts of pre-stressed concrete and their methods
- Evaluate the losses of pre-stress in pre-tensioned and post-tensioned members
- Analyze and design of pre-stress concrete members and sections
- Create knowledge on short-term and long-term deflections

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	2	1	1	1	1	2	1	2			
CO2	2	3	2	3	1	1	1	1	2	1	1	1			
CO3	1	3	3	2	2	1	2	1	2	1	1	1			
CO4	3	2	1	1	1	1	2	1	1	2	1	1			

UNIT I

INTRODUCTION: Basic concepts of prestress concrete - Historic development - Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics.

UNIT II

METHODS OF PRESTRESSING: I.S.Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

UNIT III

LOSSES OF PRESTRESS: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, bending of member and frictional losses.

UNIT IV

LIMIT STATE DESIGN CRITERIA FOR PRESTRESSED CONCRETE MEMEBERS: Introduction-Inadequacies of the Elastic and Ultimate Load Methods-Philosophy of Limit-State Design-Criteria for Limit States-Design Loads and Strengths-Strength and Serviceability limit States- Crack Width in Prestressed Members-principles of Dimensioning Prestressed Concrete Members.

UNIT V

ANALYSIS AND DESIGN OF SECTIONS: Analysis of sections for flexure; Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons. Allowable stress, Design criteria as per I.S.Code – Elastic design of simple

rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.

UNIT VI

DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS: Importance of control of deflections – factors influencing deflections – short term deflections of uncracked member's prediction of long-term deflections.

TEXT BOOKS:

1. Krishna Raju, (2018), Prestressed Concrete, Tata Mc.Graw Hill Publications.
2. N.Rajasekharan, (2006), Prestressed Concrete, Narosa publications.

REFERENCE:

1. Ramamrutham, (2005), Prestressed Concrete, Dhanpatrai Publications.
2. T.Y. Lin, and Ned H.Burns, (2011), Design of Prestressed concrete structures, John Wiley and Sons.

Codes: BIS code on prestressed concrete, IS: 1343-2012. These codes are permitted in the examinations

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT CIVIL ENGINEERING

III B.Tech, II-Sem (CE)

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(A0119196) GLOBAL WARMING AND CLIMATE CHANGE

(Open Elective - I)

COURSE OBJECTIVES:

- To know the basics, importance of global warming
- To know the concept of mitigation measures against global warming

COURSE OUTCOMES:

At the end of the course student is able to;

- Understand the components of atmosphere and its characteristics.
- Understand the green house effects and impact of the climate change.
- Analyze the protocols with observed changes along with its causes
- Evaluate the climate changes and mitigation measures**.**

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	2	2	-	-	1	-	1	1	1	-
CO2	3	-	1	-	-	2	2	-	-	1	-	1	1	1	-
CO3	3	1	1	-	-	2	2	-	-	1	-	-	1	1	-
CO4	2	1	1	-	-	2	2	-	-	1	-	1	1	1	-

UNIT I (EARTH'S CLIMATE SYSTEM)

Role of ozone in environment-ozone layer-ozone depleting gases-Green House Effect, Radioactive Effects of Greenhouse Gases-The Hydrological Cycle-Green House Gases and Global Warming – Carbon Cycle.

UNIT II (ATMOSPHERE AND ITS COMPONENTS)

Importance of Atmosphere-Physical Chemical Characteristics of Atmosphere- Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric Stability-Temperature profile of the atmosphere-Lapse Rates-Temperature inversion-effects of inversion on pollution dispersion.

UNIT III (IMPACTS OF CLIMATE CHANGE)

Causes of Climate change: Change of Temperature in the environment-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

UNIT IV (OBSERVED CHANGES AND ITS CAUSES)

Climate change and Carbon credits- CDM- Initiatives in India-Kyoto Protocol Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC –Evidence of Changes in Climate and Environment – on a Global Scale and in India.

UNIT V (CLIMATE CHANGE MEASURES)

Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power.

UNIT VI (MITIGATION MEASURES)

Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry - Carbon sequestration – Carbon capture and storage (CCS)- Waste (MSW & Bio waste, Biomedical, Industrial waste) – International and Regional cooperation.

TEXT BOOK

1. Dash Sushil Kumar, (2007), Climate Change – An Indian Perspective, Cambridge University Press India Pvt. Ltd.

REFERENCES

1. R.T. Watson, M.C. Zinyowera and R.H. Moss, (1996), Climate Change Impacts, Adaptations and Mitigation of Climate Change - Scientific-Technical Analysis, Cambridge University Press.
2. J.M. Wallace and P.V. Hobbs, (2006), Atmospheric Science, Academic Press.
3. Jan C. van Dam, (2003), Impacts of Climate Change and Climate Variability on Hydrological Regimes, Cambridge University Press.

III B.Tech, II-Sem (CE)

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(A0120196) EXPERIMENTAL STRESS ANALYSIS

(Open Elective - I)

PREREQUISITES: Strength of Materials and Mathematical Methods.

COURSE OBJECTIVES:

- Discusses the various experimental techniques like photo elasticity, strain gauges, brittle coatings etc for the analysis of problems

COURSE OUTCOMES:

At the end of the course student is able to;

- Understand the overall concepts of stress or strain analysis by experiments
- Creating knowledge in experimental techniques using strain gauges
- Applying the concepts of non-destructive techniques and brittle coating method
- Analyze the theory of photo-elasticity

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	3	1	1	2	2	3			
CO2	3	3	3	3	3	2	1	1	1	1	3	1			
CO3	3	3	3	3	3	1	2	1	1	1	1	2			
CO4	1	3	2	3	1	1	1	1	1	1	1	1			

UNIT I

Principles of Experimental Approach: Merits of Experimental Analysis Introduction, uses of experimental stress analysis advantages of experimental stress analysis, Different methods – Simplification of problems.

UNIT II

Strain Measurement Using Strain Gauges: Definition of strain and its relation of experimental Determinations Properties of Strain Gauge Systems-Types of Strain – Gauge Systems-Types of Strain Gauges – Mechanical, Acoustic and Optical Strain Gauges.

UNIT III

Electrical Strain Gauges: Inductance strain gauges – LVDT – Resistance strain gauges – various types – Gauge factor – Materials of adhesion base etc.

Strain Rosettes: Introduction – Three element Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge.

UNIT IV

Non-Destructive Testing: Ultrasonic Pulse Velocity method – Application to Concrete – Schmidt hammer Test Application to Concrete.

Brittle Coating Methods: Introduction – Coating Stress – Failure Theories – Brittle Coating Crack Patterns – Crack Detection – Types of Brittle Coating – Test Procedures for Brittle Coating Analysis – Calibration Procedures – Analysis of Brittle Coating Data.

UNIT V

Theory of Photoelasticity: Introduction – Temporary Double refraction – The stress Optic Law – Effects of stressed model in a polariscope for various arrangements – Fringe Sharpening. Brewster's Stress Optic law.

UNIT VI

Two-Dimensional Photoelasticity: Introduction – Isochromic Fringe patterns – Isoclinic Fringe patterns passage of light through plane Polariscope and Circular polariscope Isoclinic Fringe patterns – Compensation techniques – Calibration methods – Separation methods – Scaling Model to prototype Stresses – Materials for photo – Elasticity Properties of Photoelastic Materials.

TEXT/REFERENCE BOOKS:

1. J.W.Dally and W.F.Riley, (1991), Experimental stress analysis, Printice Hall of India, New Delhi
2. Sadhu Singh, (2009), Experimental stress analysis, Tata Mc.Graw Hill, New Delhi.
3. Vazrani and Ratwani, (1981), Experimental stress analysis, Laxmi, publications Pvt. Ltd., New Delhi.

III B.Tech, II-Sem (CE)

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(A0121196) REHABILITATION OF STRUCTURES

(Open Elective - I)

PREREQUISITES: Concrete technology and construction materials.

COURSE OBJECTIVE:

- To study damages, repair, rehabilitation of structures

COURSE OUTCOMES:

At the end of the course student is able to;

- Understand the repair strategies for buildings and structures
- Applying cost effective retrofitting strategies for repair in buildings
- Creating knowledge in diagnosis techniques in structures and modern techniques of retrofitting
- Analyze strength and material deficiency in concrete structures

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2	1	2	1	1	2	1	2			
CO2	1	3	3	3	2	2	2	1	1	1	1	2			
CO3	3	3	1	2	3	1	2	1	1	2	1	2			
CO4	3	3	1	2	2	1	1	1	1	1	2	1			

UNIT I:

Failure of Structures: Review of the construction theory – performance problems – responsibility and accountability.

Case studies – learning from failures – causes of distress in structural members –Design and material deficiencies – over loading

UNIT II:

Diagnosis and Assessment of Distress: Diagnosis and Assessment of Distress: Visual inspection – nondestructive tests – ultrasonic pulse velocity method – rebound hammer technique – ASTM classifications –Bremor test – Windsor probe test

UNIT III:

Crack patterns: crack patterns - crack detection techniques – case studies – single and multistorey buildings – Fiber optic method for prediction of structural weakness assessments

UNIT IV:

Environmental Problems: Effect of corrosive environments, chemical and marine environments – pollution and carbonation problems – detection and measurement of corrosion durability of RCC structures.

UNIT V:

Natural Hazards Problems: damage due to earthquakes and strengthening of buildings – provisions of BIS 1893 and 4326.

UNIT VI:

Modern Techniques of Retrofitting: Structural elements - first aid after a disaster – gunitin, jacketing– use of chemicals in repair – application of polymers – Ferro-cement, fiber composites and fiber reinforced concretes as rehabilitation materials.

Case studies Of Retrofitting: bridges – water tanks – cooling towers – heritage buildings – high rise buildings

TEXT/REFERENCE BOOKS:

1. Dovkaminetzky, (1989), Design and Construction Failures, Galgotia Publication, New Delhi.
2. Jacob Feld and Kenneth L Carper, (1997), Structural Failures, Wiley Publishers.

III B.Tech, II-Sem (CE) L T C
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(A0122196) ADVANCED GEOTECHNICAL ENGINEERING

(Professional Elective - I)

COURSE OBJECTIVES:

- Provide knowledge in soil exploration methods.
- Provide knowledge about various types of foundations and various bearing capacity equations.
- Provide knowledge about deep & well foundations.
- Learn various slope stability methods

COURSE OUTCOMES:

- Able to design & execute the soil exploration scheme.
- Able to find allowable bearing pressure based on different field tests and to find the settlement of shallow foundations.
- Able to analyze, design and construct the deep foundation based on soil investigation
- Able to perform the stability analysis of given slope and design retaining structure (gravity & sheet pile wall)

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	2	1	-	1	1	1	1	1	1	1	3	2	1
CO2	1	3	2	1	-	1	1	1	1	1	1	1	3	2	1
CO3	1	3	2	1	1	1	1	1	1	1	1	1	3	2	1
CO4	1	3	2	1	1	1	1	1	1	1	1	1	3	2	1

UNIT – I

SOIL EXPLORATION: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test – Pressure meter – planning of Program and preparation of soil investigation report.

UNIT – II

ALLOWABLE BEARING PRESSURE: Safe bearing pressure based on N- value, CPT – allowable bearing pressure; safe bearing capacity and settlement from plate load test – allowable settlements of structures – Settlement Analysis – Design of Foundations for equal settlement.

UNIT-III

EARTH SLOPE STABILITY: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number- Stability of slopes of earth dams under different conditions.

UNIT – IV

EARTH PRESSURE THEORIES: Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Rebhann's and Culmann's graphical method

UNIT – V

RETAINING WALLS: Types of retaining walls – stability of gravity retaining walls. – Sheet Pile wall analysis and design- Anchored Sheet Piles Analysis- Mechanical stabilized Retaining structure

UNIT –VI

PILE FOUNDATION: Load carrying capacity of piles based on static pile formulae – Pile load tests – Load carrying capacity of pile groups –Load carrying capacity of under reamed piles based on IS Code– Settlement of pile groups.

WELL FOUNDATIONS: Types – Different shapes of wells – Components of wells – functions and Design Criteria – Sinking of wells – Tilts and shifts.

Note: Relevant IS: codes and tables are permitted for examination

TEXT BOOKS:

1) K.R. Arora, (2020), Soil Mechanics and Foundation Engg., Standard Publishers and Distributors, Delhi.
2) Varghese,P.C., (2005), Foundation Engineering, Prentice Hall of India., New Delhi.

REFERENCES:

1) Bajra M. Das, (2017), Principles of Foundation Engineering, Cengage India Pvt Ltd.
2) Joseph E Bowles, (2017), Foundation Analysis and Design, McGraw-Hill Publishing company, New York.
3) Swami Saran, (2018), Analysis and Design of Substructures, Oxford and IBH Publishing company Pvt Ltd.
4) Gulati S.K & Manoj Dutta, (2017), Geotechnical Engineering, Tata McGraw Hill Publishers New Delhi.
5) C. Venkataramiah, (2018), Geotechnical Engineering, New age International Pvt.Ltd.
6) V.N.S.Murthy, (2017), Advanced Foundation Engineering, CBS Publishers.
7) B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, (2017), Soil Mechanics and Foundation, Laxmi, publications Pvt. Ltd., New Delhi.

III B.Tech, II-Sem (CE)

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(A0123196) BRIDGE ENGINEERING

(Professional Elective - I)

PRE-REQUISITES: Design of steel structures and Design of concrete structures.

COURSE OBJECTIVES:

- To develop an understanding of and appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
- To help the student develop an intuitive feeling about the sizing of bridge elements, ie. develop a clear understanding of conceptual design.
- To understand the load flow mechanism and identify loads on bridges.
- To carry out a design of bridge (like box culvert, T-beam bridge etc.,) starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements

COURSE OUTCOMES:

At the end of the course student is able to;

- Apply essential loading that act on RCC bridges.
- Understand IRC code on general loading.
- Analyse bridge components to obtain shear forces and bending moments.
- Evaluate the reinforcement required for bridge components.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2										2		3	
CO2	3	2	2		2	2						2		3	
CO3	3	3	3	2	2	2		2			1	2		3	2
CO4	3	3	3	2	2	2		2			1	2		3	2

UNIT I:

Introduction: Definitions, components of a bridge, classification, importance and standard specifications.

UNIT II:

IRC Loading Standards: Indian Road Congress (IRC) bridge code, width of carriageway, clearances, loads to be considered - dead load, IRC standard live loads, impact effect, wind loads, longitudinal forces, centrifugal forces, horizontal forces due to water currents, buoyancy effect, earth pressure, temperature effect, deformation stresses, secondary stresses, erection stresses, seismic effects.

UNIT III:

Design of Deck Slab: General Features-Courbon's method for computation of Deck Slab-Design Examples.

UNIT IV:

Design of Tee Beam: General features - Design example of T-beam

UNIT V:

Design of Piers and Abutments: General Features-Bed Block-Materials for Piers and Abutment-Forces acting on Piers-Design of Piers-Stability Analysis of piers- Forces acting on Abutment-Stability Analysis of Abutment - Design of Abutment

UNIT VI:

Design of Bearings: General Features-types of Bearings-Design of Rocker and Roller Bearings-Design of Elastomeric pad Bearing.

Note: Necessary tables and codes are permitted in the Examination Hall

TEXT BOOKS:

1) N. Krishna Raju, (2019), Design of Bridges, Oxford & IBH Publishing Co. Pvt Ltd.
2) Johnson Victor D, (2019), Essentials of bridge engineering, Oxford & IBH Publishing Co. Pvt Ltd.

REFERENCE BOOKS:

1) Standard specifications and code of practice for road bridges IRC: 06 - 2017, Bureau of Indian Standards, India
2) Standard Specifications and Code of Practice for Road Bridges Section: III Cement Concrete (Plain and Reinforced) IRC: 21 - 2000, Bureau of Indian Standards, India
3) Standard Specifications and Code of Practice for Road Bridges Section: IX Bearings IRC: 83 - 2015, Bureau of Indian Standards, India

III B.Tech, II-Sem (CE)

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(A0124196) ENVIRONMENTAL POLLUTION AND CONTROL

(Professional Elective - I)

COURSE OBJECTIVES:

- To understand sources, nature and health effects of air pollutants and basic control strategies and equipment; fundamentals of water pollution; nature of sound and quantification, noise control strategies and solid waste, and basic strategies for proper handling of solid waste.
- Getting acquainted with physical, chemical and biological methods & possibilities of separation, recovery and deformation of various pollutants of gaseous and solid phase; basic processes and engineering equipment of the technology; characterization, collection and treatment, theoretical basics of burning solid wastes, typical equipment, solid waste disposal and recycling.

COURSE OUTCOMES:

- Understand the sources and effects of air pollution on environment and its preventive measures.
- Understand the noise pollutions along with its effects and identify various Environmental acts.
- Analyze properties of solid waste and management techniques to dispose.
- Classify various hazardous waste and effluent disposal methods.
- Recommend various Theories of industrial waste treatment**.**

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	2	2	2	-	-	-	-	2	2	2	-
CO2	3	1	-	-	-	2	2	-	-	-	-	2	2	-	-
CO3	3	2	-	-	-	2	2	-	-	-	-	2	2	-	-
CO4	2	-	-	-	-	2	2	-	-	-	-	2	2	-	-
CO5	3	1	-	-	-	2	2	-	-	-	-	2	2	-	-

UNIT - 1

INTRODUCTION OF AIR POLLUTION: Air Pollution and Sources of Air Pollution, Classification of Air Pollution, Characteristics of air pollutants, Effects on Human beings, Plants and Materials, Global Effects of Air Pollution, Air Emission Standards.

UNIT - 2

AIR POLLUTION CONTROL METHODS AND DEVICES: Air Pollution Control Methods, Particulate Control Devices, General Methods of controlling Gaseous Emission, Special Treatment Methods, Adsorption, Reverse Osmosis, Defluorination, Ion Exchange, Ultra-Filtration.

UNIT- 3

SOLID WASTE MANAGEMENT: Sources and Composition of Solid waste, Properties of Solid waste, Collection and handling of solid waste, Separation and Processing, Solid waste disposal methods, Land filling and composting, Incineration, Barging it out into the sea and pulverization.

UNIT - 4

HAZARDOUS WASTE: Sources and Composition of Hazardous Waste, Characteristics of Hazardous waste, nuclear waste, Biomedical waste, Chemical waste, Effluent Disposal and Control Methods.

UNIT - 5

THEORIES OF INDUSTRIAL WASTE TREATMENT: Theories industrial waste Treatment, Volume Reduction, Strength Reduction, Neutralization, Equalization,

Proportioning, Nitrification and Denitrification, Removal of Phosphates and Effluent Standards of industrial waste water.

UNIT - 6

NOISE POLLUTION: Noise pollution, Effects of Noise Pollution and Control Methods, Effects of Noise and Control Methods, Types of Noise, Environmental Audit, Water act, Air Act.

TEXT BOOKS:

1) Basak, (2017), Environmental Engineering, Tata Mc.Graw Hill Edition, New Delhi.
2) C.S Rao, (2018), Environmental Pollution Control Engineering, New Age Publishers.
3) Eckenfelder, W.W., (1999), Industrial Water Pollution Control, Tata Mc-Graw Hill.

REFERENCES:

1) J.G.Henry and G.W.Heinke, (2015), Environmental Science and Engineering by– Person Education.
2) Suresh K.Dhameja, (2005), Environmental Engineering and Management, S.K. Kartarai& Sons.
3) PaarneVesilind, Willaiam, (2011), Solid Waste Engineering, Cengage Publications, New Delhi.
4) Gerard Kiely, (2006), Environmental Engineering, Tata Mc.Graw Hill Edition, New Delhi.

III B.Tech, II-Sem (CE)

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(A0125196) ADVANCED STRUCTURAL ANALYSIS

(Professional Elective - I)

PREREQUISITES: Strength of Materials, Structural Analysis.

COURSE OBJECTIVES:

To analyse continuous beams, portal frames, arches using various methods.

COURSE OUTCOMES:

At the end of the course student is able to;

- Apply basic concepts to determine stress resultants.
- Understand principles of mechanisms for beams, frames, arches subjected to various loading.
- Analyze the structure using various methods such as strain energy method, flexibility method, stiffness method, approximate methods.
- Evaluate shear forces, and bending moments for different loading and boundary conditions.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3								3	2	
CO2	3	3	3	3	3	1	1						3	2	
CO3	2	3	3	3	3	1							3	2	
CO4	2	3	3	3	3	1	1						3	2	

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 – Rib shortening and temperature stresses, tied arches – fixed arches

UNIT II:

Strain energy method: Application to the analysis of continuous beams and simple portal frames.

UNIT III:

Plastic Analysis: Introduction – Idealized stress – Strain diagram – shape factors for various sections – Moment curvature relationship – ultimate moment – Plastic hinge – lower and upper bound theorems – ultimate strength of fixed and continuous beams.

UNIT IV:

Flexibility Method: Introduction to the structural analysis by flexibility concept using Matrix approach and application to beams and portal frames.

UNIT V:

Stiffness Method: Introduction to the structural analysis by stiffness concept using Matrix approach and application to beams and portal frames.

UNIT VI:

Approximate methods: Analysis of building frames using portal frame method, cantilever method.

TEXT BOOKS:

1) Bhavikatti S.S., (2013), Structural Analysis (Vol-1&II), Vikas Publishing House, India.
2) Vaidyanathan R., and Perumal, (2016), Structural Analysis (Vol-1&II), Laxmi Publications (pvt) Limited, India.

REFERENCE BOOKS:

1) Negi L.S., Jangid R.S., (2004), Structural Analysis, Tata Mcgraw Hill Publishing Co Ltd, New Delhi.

2) Hibbeler, R.C., (2006), Structural Analysis, Pearson, India.
3) Wang C.K., (2010), Intermediate Structural Analysis, Tata McGraw Hill Publishing Co Ltd, New Delhi.
4) Ramamrutham S., Narayan R., (2013), Theory of structures, DhanpatRai Publishing Co Ltd, India.
5) Devdas Menon, (2018), Structural Analysis, Narosa Publishing House, India.

III B.Tech, II-Sem (CE)

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(A0518196) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(Skill Development Course-IV)

COURSE OBJECTIVES:

After taking this course, the student should be able to:

- Describe the Windows event-driven programming model
- Build simple JAVA applications according to the model
- Write fluent JAVA code for creating classes
- Use JAVA variables, data, expressions and arrays
- Design and create forms, menus and controls
- Write clear, elementary Java programs (applets and applications)
- Use a Java-enabled browser and/or the applet viewer to execute Java applets
- Use the Java interpreter Torun Java applications
- Designandconstructeffectivegraphicuserinterfacesforapplicationsoftware.
- Use Java Beans, RMI to build complex business applications

COURSE OUTCOMES:

- Understand the syntax and concepts of J AVA
- Write JAVA programs to implementing Object Oriented Concepts
- Able to build directories and manage applications with interfaces
- Write JAVA programs that used at a from flat files and databases
- Develop programs with error free and multi-tasking.
- Program assignment utilizing Java GUI components, event listeners and event-handlers.

MAPPING WITH COs &POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	1	2				1		2	2			
CO2	2	1	3	2	2			1				3			
CO3	1	2	2	1	1							2			
CO4	1	1	2	1	2			1			2	2			
CO5	2	2	2		2			1			1	2			
CO6		1	1		2							1			

UNIT-I

Introduction To Java – Introduction to OOP, OOP Concepts, History of Java, Java buzzwords, How Java differs from C, Structure of Java Program, data types, variables, constants, type conversion and casting, enumerated types, scope and life time of variables, operators, expressions , control flow- conditional statements, break and continue, simple java program, arrays, parameter passing, static fields and methods, access control ,this, overloading methods and constructors, recursion, garbage collection.

UNIT-II

Inheritance –Inheritance concept, Super and Sub classes, Member access rules, types of Inheritance, super uses, final classes and methods, casting, polymorphism- dynamic binding, method overriding, abstract classes and methods, the Object class and its methods.

UNIT-III

Interfaces–Interfaces. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.

Packages-Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT-IV

Files – streams, text Input/output, binary input/output, random access file operations, File management using File class, Usingjava.io.

Strings: Strings, string functions.

UNIT-V

Exception handling – benefits of exception handling, exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, built in exceptions, creating own exceptions. Multithreading - Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads, thread deadlock.

UNIT-VI

Event Handling - Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

TEXTBOOKS:

1. Herbert Scheldt, (2020), Java: the complete reference, TMH Publishers.
2. T.Budd, (1999), Understanding OOP with Java, Pearson Education.

REFERENCES:

1. Nino and F.A.Hosch, (2008), An Introduction to programming and OO design using Java, John Wiley and sons.
2. Sachin Malhotra, Saurabh Choudhary, (2010), Programming in Java, Oxford Publishers.
3. Y.Daniel Liang, (2020), Introduction to Java programming, Pearson Education.
4. R.A. Johnson-Thomson, (2006), An introduction to Java programming and object-oriented application development, Course Technology Inc.
5. Cay.S.Horstmann and Gary Cornell, (2004), CoreJava2, Vol1, Fundamentals, Pearson Education.
6. Cay.S.Horstmann and Gary Cornell, (2004), CoreJava2, Vol2, Advanced Features, Seventh Edition, Pearson Education.

III B.Tech, II-Sem (CE)

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(A0018194) CONSTITUTION OF INDIA

(Mandatory Learning Course-III)
(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

Students will be able to

- Study the structure and composition of Indian Constitution
- Learn about the federalism in the Indian context.
- Study the Panchayathi Raj Institutions as a medium of decentralization
- Learn about the three organs of the state in the contemporary scenario.

COURSE OUTCOMES:

Students will be able to

- Understand historical background of the constitutional making and its importance for building a democratic India.
- Be aware of the History, features of Indian constitution, the role Governor and Chief Minister, role of state election commission, the decentralization of power between central, state and local self-government.
- Aware of Indian government, the structure of state government, the local Administration.
- Able to evaluate Preamble, Fundamental Rights and Duties, Zilla Panchayat, block level organization, various commissions.

UNIT I

History of Indian Constitution: History of Making of the Indian Constitution - History Drafting Committee - Composition & Working of Constitution.

UNIT II

Philosophy of the Indian Constitution: Preamble Salient Features of Indian Constitution.

UNIT III

Contours of Constitutional Rights & Duties: Fundamental Rights: Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy.

UNIT IV

Organs of Governance: Parliament - Composition - Qualifications and Disqualifications Powers and Functions of Executive - President - Governor - Council of Ministers – Judiciary – Qualifications, Appointment and Transfer of Judges.

UNIT V

Local Administration: Role and Importance of Municipal Corporation Role and Importance Pachayati raj: Role and Importance Zilla Pachayat: Position and role - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT VI

Election Commission: Role and Functioning of Election Commission Role and Functioning of Chief Election Commissioner and Election Commissioners - Role and Functioning of State Election Commission.

TEXT BOOKS

1) Introduction to Constitution of India, D.D. Basu, Lexis Nexus
2) The Constitution of India, PM Bhakshi, Universal Law

III B.Tech, II-Sem (CE) P C
3 1.5

(A0198196) COMPUTER AIDED DESIGN LAB-II

PREREQUISITES: None.

COURSE OBJECTIVES:

- The course objective of this Lab consists of Analysis & design of fixed beam, continuous beam, plane frame, and space frame, one – way and two – way slabs, roof truss, isolated column footing. Retaining wall.

COURSE OUTCOMES:

At the end of the course student is able to;

- Know application of various software to model the structure in Civil Engineering domain.
- Understand the usage of software commands.
- Analyze the structural elements / structures.
- Evaluate and estimate the reinforcement required to the structural elements.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3		3					1			3	1	1
CO2	1	3	3		3					1			3	1	1
CO3	1	3	3		3					1			3	1	1
CO4	1	3	3		3					1			3	1	1

EXPERIMENTS

1. Analysis & design of fixed beam.
2. Analysis & design of continuous beam
3. Analysis & design of plane frame +
4. Analysis and design of space frame
5. Analysis of roof truss.
6. Design of one – way slabs.
7. Design of two – way slabs.
8. Design of isolated column footing.
9. Design of retaining wall.

SOFTWARE: Using STAAD Pro or STRUDS or STRAP etc.

III B.Tech, II-Sem (CE) P C
3 1.5

(A0199196) ENVIRONMENTAL ENGINEERING LAB

COURSE OBJECTIVES:

- Civil Engineers must be in a position to predict the quality of water, wastewater and sludge/Solid.
- This course motivates the students to learn different experimental techniques to analyse and characterize the water, wastewater and sludge quality from different sources in terms of its physical, chemical and biological parameters by using different chemical, instrumental and analytical techniques.
- They can use the knowledge of physics, chemistry, biology and mathematics to do this lab.

COURSE OUTCOMES:

At the end of the course student is able to;

- Estimate physical, chemical and biological characteristics of water and waste water
- Determine optimum dosage of coagulants.
- Asses the quality of water and waste water.
- Measure the quality parameters using environmental testing equipment

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	2	2	-	2	1	-	1	1	-	3
CO2	3	2	1	-	-	2	2	-	2	1	-	1	1	-	3
CO3	3	2	1	-	-	2	2	-	2	1	-	1	1	-	3
CO4	3	2	1	-	-	2	2	-	2	1	-	1	1	-	3

ANALYSIS OF WATER QUALITY PARAMETERS:

1. Determination of pH
2. Taste and odour
3. Determination of Acidity and Alkalinity
4. Determination of Chlorides
5. Determination of Dissolved Oxygen
6. Estimation of Sulphates
7. Estimation of Total Dissolved Solids.
8. Estimation of Conductivity
9. Determination of Turbidity
10. Estimation of Hardness of water by EDTA Titration Method
11. Determination of Available Chlorine in Bleaching Powder, Residual Chlorine, Break Point Chlorination and Chlorine Demand.
12. Optimum Coagulant Dose by Jar Test Apparatus
13. Determination of MPN Index for Coliforms

ANALYSIS OF WASTEWATER QUALITY PARAMETERS

1. Determination of Total solids, settelable solids, dissolved solids and volatile Solids.
2. Determination of BOD and COD
3. Determination of Ammonia–nitrogen and Nitrates.
4. Estimation of Phosphates

TEXT BOOK

1. Sawyer, N.C., and McCarty, P.L., (1985), Chemistry for Environmental Engineering, McGraw-Hill Book Co., New York.

REFERENCE BOOK:

1. Standard Methods for the Examination of Water and Waste Water, APHA-AWWAWPCF, 25th Edn., Washington (D.C), 1995.

IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0024197) MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

(For Branches: CE & ECE)

COURSE OBJECTIVES

- Provide knowledge management, CPM, PERT, Issues in organizations.

COURSE OUTCOMES

At the end of the course student is able to

- To have a practical insight of the concepts of managerial economics
- Apply the techniques of demand forecasting in the present economic scenario.
- Relate the concepts to the performance of different businesses, in the changing environment.
- Apply and interpret the different situations with the help of corporate finance techniques.
- Analyse the financial position of the company.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	1-	-	-	-
CO2	-	-	3	3	2	2	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	1	3	3	-	-	2	2	-	-	-
CO4	3	-	-	3	2	-	-	-	-	-	2	-	-	-	-
CO5	-	-	-	-	-	2	-	1	-	-	2	2	-	-	-
Avg.	3	2	2	3	2	2	3	3	-	-	2	2	-	-	-

UNIT I

INTRODUCTION TO MANAGERIAL ECONOMICS

Definition, nature and scope of managerial economics- relation with other disciplines- Demand Analysis: Demand Determinants, Law of Demand and its exceptions

UNIT II

ELASTICITY OF DEMAND

Definition, Types, Measurement and Significance of Elasticity of Demand. Demand forecasting, factors governing demand forecasting, methods of demand forecasting (Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach to Demand Forecasting)

UNIT III

TYPES OF BUSINESS ORGANISATIONS AND NEW ECONOMIC ENVIRONMENT

Characteristic features of business, features and evaluation of sole proprietorship, partnership, Joint Stock Company, public enterprises and their types, changing business environment in post-liberalization scenario.

UNIT IV

CAPITAL AND CAPITAL BUDGETING

Capital and its significance, types of capital, estimation of fixed and working capital requirements, methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposal, methods of capital budgeting – payback method, accounting rate of return (ARR) and Net present value method (Simple problems).

UNIT V

INTRODUCTION TO FINANCIAL ACCOUNTING

Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

UNIT VI

FINANCIAL ANALYSIS THROUGH RATIOS

Computation, Analysis and Interpretation of financial statements through Liquidity Ratios (Current and Quick ratio), Activity ratios (Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt- Equity Ratio, Interest Coverage Ratio) and Profitability ratios (Gross Profit Ratio, Net Profit Ratio, Operating Ratio, P/E Ratios and EPS), Du Pont Chart.

TEXT BOOKS

1. Management Economics and Financial Analysis, Aryasri, 4/e, TMH, 2009.
2. Managerial Economics, Varshney & Maheswari, Sultan Chand, 2009.

REFERENCES

1. Financial Accounting and Analysis, Premchand Babu, Madan Mohan, Himalaya, 2009
2. Managerial Economics and Financial Analysis, S.A. Siddiqui, and A.S. Siddiqui, New Age,2020
3. Principles of Business Economics, Joseph G. Nellis and David Parker, 2/e, Pearson.
4. Managerial Economics in a Global Economy, Domnick Salvatore, Cengage, 2009.
5. Managerial Economics, H.L.Ahuja, 3/e, S.Chand, 2009

IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0126197) GEOINFORMATICS

(Open Elective - II)

COURSE OBJECTIVES:

- This is an introductory based course on Remote Sensing and GIS. The main goal of this course is to impart the core principles and basic techniques of Remote sensing and Geographic Information Systems (GIS). The GIS has emerged as a generic tool that has applications touching upon all disciplines of Civil Engineering as well as all aspects of life.
- Finally, students can understand the various engineering applications of remote sensing and GIS. The rapid progress and increased visibility of remote sensing and GIS since the 1990s has been made possible by a paradigm shift in computer technology, computer science and software engineering., as well as airborne and space observation technologies.

COURSE OUTCOMES:

At the end of the course, student is able to

- Understand the geometry of aerial photographs and use of digital photogrammetry in solving engineering problems.
- Know the basics of remote sensing, understand electromagnetic radiation interaction and various fundamental image processing routines.
- Basic knowledge of GIS terminology, components and frame work.
- Understand and analyze geospatial analysis techniques for better results.
- Apply Remote Sensing & GIS applications to solve various real-world problems.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3	2			1	1	1						1	1	
CO2	3	2			2		1						1	1	
CO3	3	2	1										1	1	
CO4		3	1		1								1	1	
CO5			2	3	2		2				2		1	1	
Avg.	3	2	1	3	2	1	1				2		1	1	

UNIT - I

INTRODUCTION TO PHOTOGRAMMETRY: Principle and types of aerial photographs, Scales, Maps, Map Projections, Coordinate Systems, Stereoscopy, Ground control, Parallax measurements for height, determinations.

UNIT - II

REMOTE SENSING: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. Energy resources, energy interactions with earth surface features and atmosphere, resolutions, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, introduction to Digital Image Processing.

UNIT - III

GEOGRAPHIC INFORMATION SYSTEM: Introduction, GIS definition and terminology, GIS Categories, Components of GIS, Fundamental Operations of GIS, A Theoretical Framework for GIS. Introduction to Global Positioning System (GPS).

UNIT - IV

TYPES OF DATA REPRESENTATION: Data collection and input overview, data input and output. Keyboard entry and Coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

UNIT – V

GIS SPATIAL ANALYSIS: Introduction, geospatial data analysis, integration and modeling of spatial data, geospatial data analysis methods, database query, geospatial measurements, overlay operations, network analysis, surface analysis, Geo-statistics, Geo-visualization,

UNIT – VI

REMOTE SENSING & GIS APPLICATION: Flood management; Reservoir sedimentation; Geomorphology; Monitoring urban growth; Military operations; Watershed management, Satellite surveillance for drought conditions; Estimating Forest cover, Water resources management, Land use/Land cover – changes and mapping; Agriculture – crop type mapping, monitoring and damage assessment; Ground Water Targeting, Identification of sites for artificial Recharge structures.

TEXT BOOKS

1. Remote Sensing and GIS by B. Bhatta, Oxford University Press, New Delhi, 2020.
2. Remote sensing and GIS by M.Anji Reddy, B.S.Pubilications, New Delhi, 2021.

REFERENCES

1. Principals of Geographical Information Systems – Peter A Burragh and Rachael Mc Donnell, Oxford Publishers,2020
2. Remote Sensing and Image Interpretation by Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman, John Wiley & Sons Publications,2021
3. Remote Sensing and its applications by LRA Narayana University Press 1999.
4. Advanced surveying: Total station GIS and remote sensing – Satheesh Gopi – Pearson publication,2021
5. Geographical Information Science, Narayana Panigrahi, University press, New Delhi, 2020.
6. GIS by Kang – Tsung Chang, TMH Publications & Co.,
7. Basics of Remote sensing & GIS S.Kumar, Laxmi Publications, 2019
8. Geoinformation for Development by Zeil/Kienberger (Eds) – Univ. Science Press, New Delhi, 2020.

IV B.Tech, I-Sem (CE)

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(A0127197) BUILDING INFORMATION MODELLING

(Open Elective - II)

COURSE OBJECTIVES

- Building Information Modelling (BIM) is argued to be a catalyst for change poised to reduce industry's fragmentation, improve its efficiency, effectiveness and lower the high costs of inadequate interoperability.
- To demonstrate how construction management functions are impacted by new technologies and helps students understand the fundamentals and practical uses of the state-of-the-art information technologies and tools in the building industry. It also promotes project-based learning through cross-disciplinary, geographically distributed, and virtual project team collaboration

COURSE OUTCOMES

At the end of the course student are able to

- Improve Collaboration
- Resolve Conflict
- Apply the Software Tools, for analysis & designing of models
- Promotes project-based learning through cross-disciplinary

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2	2	1	2	2	2	3	2	2	2
CO2	3	2	3	3	3	2	2	1	2	2	2	3	2	2	2
CO3	3	2	3	3	3	2	2	1	2	2	2	3	2	2	2
CO4	3	2	3	2	3	2	2	1	2	2	2	3	2	2	2

UNIT I

INTRODUCTION

Introduction, The Settings for BIM, Current Practice, Legal Considerations

UNIT II

BIM STAGES

Building Information Modeling, Introduction, BIM Concepts, BIM Planning, BIM Implementation

UNIT III

BIM TOOLS

Software Tools, Introduction, Modeling Tools, Model Analysis, Specific Software Options

UNIT IV

LEARNING BIM

Introduction, Learning Methods, Skill Set, The learners

UNIT V

CASE STUDIES OF BIM

DPR Construction, RQ Construction,

UNIT VI

CASE STUDIES

TEXT BOOKS:

1. Turner Construction, Seattle, Washington, Gregory P. Luth & Assoc. Inc, Webcor Builders, 2021.
2. Building Information Modeling Technology Foundations and Industry Practice, Andrew Borrman, Markus Konig, Christian Koch, Springer, 2021.

IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0128197) RAILWAYS, DOCKS AND HARBOUR ENGINEERING

(Open Elective - II)

Pre-requisites: Transportation Engineering.

COURSE OBJECTIVES:

- The course objective covers the geometric design of railway track,stations and yards, Tunnelling, Introduction of Harbour Engineering

COURSE OUTCOMES:

At the end of the course student is able to

- Students could learn about the various components involved in planning, design, construction and operation of railways and waterways.
- Incase of railways the need of tunnel sand their late surveys, operation and construction is covered.
- Pros and cons of railways and waterways in terms of construction, operations, maintenance and economics are learnt.
- Urban rail transportation as mass transportation facility is studied a part from the vital role played by harbour structure for the import and export of goods.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1									-	2	2
CO2	3	2	2	1									-	2	-
CO3	1	2	2	2									-	2	-
CO4	-	2	1	2									-	2	1

UNIT– I

INTRODUCTION TO RAILWAY ENGINEERING

Permanent way components–Cross Section of Permanent Way – Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails - Theories related to creep–Adzing of Sleepers - Sleeper density.

UNIT–II

GEOMETRIC DESIGN OF RAILWAY TRACK

Gradients – Grade Compensation – Cant and Negative Super elevation – Cant Deficiency– Degree of Curve–Crossings and Turnouts.

UNIT-III

STATIONS AND YARDS

Introduction-purposes of a rail way station–selection of a site for a railway station– types of railway station, Plat Forms – Definition of a yard – types of yards – level crossing—signalling systems and inter locking –staff quarters– goods traffic at way side stations.

UNIT–IV

TUNNELLING

Definition – types of tunnelling – Drainage in tunnels – ventilation of tunnels – lining of tunnels– under ground railways–tube railways –maintenance of railway tunnels

UNIT– V

HISTORICAL DEVELOPMENT OF PORTS HARBOURS AND DOCKS

Introduction – Early Period of travellers – Mediterranean Harbours – Cretan Harbours – Phasor Harbours Phoenician Harbours – Greek harbours – Roman Harbours – Eighteenth Century Harbours – Slipways and Dry Docks – Dredging Machines –Historical Development of Bombay Port.

UNIT– VI

HARBOURS, DOCKS AND BREAK WATER: Introduction – Natural Harbours – Artificial Harbours – Size of Harbours – Open Berths – Docks Shape of Docks and Basins –

Design and Construction of Basin or Dock Walls – Dock Entrances and Entrance Locks – Classification of Breakwaters – Upright Wall Breakwater –Mound with Super structure Water Breaker–Mound Breakwaters.

TEXT BOOKS

1. Railway Engineering by Rangwala Chrotar Publisihing House, Anand, 2021
2. Railway Engineering – A text book Transportation Engineering by S.P.Chandola, S.Chand and Co. Ltd, 2020.

REFERENCEBOOKS

1. Docks and Harbour Engineering – Textbook of Transport Engineering Vol.II by. N.Vaziraniand, S.P.Chandola, Khanna Publishers, NewDelhi, 2020.
2. Railway Engineering by Chandra and Agrawal, Oxford Publishers, New Delhi, 2020.

IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0129197) EARTHQUAKE RESISTANT DESIGN

(Open Elective - II)

Pre-requisites: Physics, Mathematical Methods and Engineering Mechanics.

COURSE OBJECTIVES

The course objective of this subject consists of Introduction to earthquake, terminology, classifications, causes, effects, formulations of single degree of freedom & multi degree of freedom. Design of shear walls.

COURSE OUTCOMES

At the end of the course student is able to

- Understand about the Earthquake Phenomenon and its features related to earthquake terminology.
- Apply the various vibrations on SDOF and MDOF systems.
- Analyse any structure subjected to earthquake.
- Design of various structures subjected to earthquake.
- Get knowledge regarding codal methods of analysis.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	1	3	-	1	-	1	-	2	2	2
CO2	3	2	-	-	-	2	-	-	1	-	1	-	3	1	3
CO3	1	3	1	1	2	-	-	-	1	-	1	-	3	2	3
CO4	-	-	3	2	3	-	2	-	1	-	1	-	3	3	3
CO5	-	-	2	3	1	-	2	-	1	-	1	-	3	3	3

UNIT-I

EARTHQUAKE ENGINEERING

Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Faults – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology – Source, Focus, Epicentre etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes-Seismic Waves- Seismic Zones-Seismic Zoning Map of India – Seismograms and Accelerograms.

UNIT-II

INTRODUCTION TO STRUCTURAL DYNAMICS

Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration – Damping – Response to harmonic excitation – Earthquake response analysis of single storied buildings - Concept of response spectrum.

UNIT-III

DESIGN CODAL PROVISIONS

Review of the latest Indian seismic code IS:1893 – 2016 (Part-I) provisions for buildings – Earthquake design philosophy –Assumptions – Analysis by seismic coefficient and response spectrum methods – Displacements and drift requirements – Provisions for torsion – Analysis of a multistore building using Seismic Coefficient method.

CODAL DETAILING PROVISIONS

Review of the latest Indian codes IS: 13920 Provisions for ductile detailing of R.C buildings – Beam, column and joints.

UNIT-IV

HORIZONTAL AND VERTICAL IRREGULARITIES

Regular and Irregular configurations - lateral forces - Design imposed loads for earthquake force calculation - Torsion - RC frames buildings with open storeys - Deformations - Proximity of Adjacent Buildings.

UNIT-V

ANALYSIS FOR EARTHQUAKE LOADS

IS: 1893-2016 - Seismic Coefficient method- modal analysis- Applications to multi-storied building frames – water tanks – chimneys.

UNIT-VI

SHEAR WALLS

Types – Design of Shear walls as per IS: 13920 – Detailing of reinforcements.

TEXT BOOKS:

1. "Dynamics of Structures", A.K. Chopra, Pearson Education, Delhi, 2020
2. "Dynamics of Structures", Clough &Penzien,2003, McGraw Hill – International Edition, 2021.

REFERENCEBOOKS

1. "Earthquake Resistant Design of Structures", Pankaj Agarwal & Manish Shrikhande, Prentice Hall of India, New Delhi, 2021.
2. IS Codes: IS: 1893 - 2016, IS: 4326 and IS: 13920 - 2016.

IV B.Tech, I-Sem (CE)

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(A0130197) FINITE ELEMENT METHODS IN CIVIL ENGINEERING

(Professional Elective - II)

Prerequisites: Mathematical Methods and structural analysis

COURSE OBJECTIVES:

- This is an introductory course to understand and applies the finite element method for various Civil Engineering applications. This course provides to learn different concepts of finite element methods to generate the stiffness matrices for different elements.

COURSE OUTCOMES:

At the end of the course student is able to

- Understand the fundamental ideas of FEM.
- Develop shape functions and stiffness matrices for different elements
- Generate global stiffness matrices and global load vectors
- Have knowledge on generation of shape function for higher order elements.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	-	1	-	1	-	1	-	3	3	-
CO2	2	3	-	-	2	-	1	-	1	-	1	-	3	3	-
CO3	2	3	-	-	2	-	1	-	1	-	1	-	3	3	-
CO4	3	3	-	-	2	-	1	-	1	-	1	-	3	3	-

UNIT- I

FUNDAMENTAL CONCEPTS: Introduction-historical background-Stress and equilibrium-Boundary Conditions-Strain displacement relationship-Stress-strain relationship-Temperature effects-potential energy-Equilibrium-Rayleigh-Ritz method-Saint venant's principle

UNIT-II

ONE DIMENSIONAL FEM: Introduction-Finite element modeling-Coordinates and shape functions-Potential Energy Approach-Problems

UNIT-III

TWO-DIMENSIONAL FEM: Introduction-Finite element modelling-Constant Strain Triangle-Iso-parametric representation-potential energy approach-Element Stiffness-Force Terms-Stress calculations-problems

UNIT-IV

AXISYMMETRIC SOLIDS: Introduction-Axisymmetric Formulation-Finite element modeling-Triangular Element-Potential Energy Approach-Body force term- Surface Traction-Stress calculations

UNIT-V

ISOPARAMETRIC ELEMENTS (2D): Introduction-Four node Quadrilateral-numerical Integration- Four node Quadrilateral-Eight node Quadrilateral

UNIT-VI

BEAMS AND FRAMES: Introduction-Potential Energy Approach-Finite element formulation-Load Vector-Boundary Conditions-Shear force and Bending moment-problems

TEXTBOOKS

1. Introduction to Finite Elements in Engineering, TR Chandrupatla and AD Belegundu, Third Edition, Phi Learning, USA,2020.
2. Finite Element Analysis: Theory and Practice, CS Krishnamoorthy, Second edition, McGraw Hill Inc., New Delhi, 2020.

IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0131197) HYDRAULIC STRUCTURES

(Professional Elective - II)

COURSE OBJECTIVES:

- Practicing design principles of various hydraulic structures is very much essential for a Civil Engineer. This course discusses overview of dams and reservoirs such as types of dams, design and construction methodology of gravity and earthen dams, overview of spillways. Seepage is inevitable when the structure constructed across the water flow. Hence the pressure due to seepage estimated by Bligh's creep theory and Khosla's theories are discussed. In addition to this the design principles of cross drainage works; canal falls are practiced.

COURSE OUTCOMES:

At the end of the course student is able to

- Get the knowledge of hydraulic structures and fixing the storage capacity of reservoirs
- Understand the design principles of Gravity and Earthen dams
- Get the knowledge of Spillways, Gates and design of Ogee Spillway
- Do seepage analysis though the soil under impervious floors of Hydraulic Structures
- Do analysis and design of Canal falls and Cross Drainage works

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		-	-	2	-	-	-	-	-	-	1	2	-
CO2	3	3	3	-	-	2	-	-	-	-	-	-	1	2	-
CO3	3	2	3	-	-	2	-	-	-	-	-	-	1	2	-
CO4	3	3	3	-	-	2	-	-	-	-	-	-	1	2	-
CO5	3	3	3	-	-	2	-	-	-	-	-	-	1	2	-
Avg.	3	3	3	-	-	2	-	-	-	-	-	-	1	2	-

UNIT-I

INTRODUCTION TO DAMS & RESERVOIRS

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

UNIT-II

GRAVITY& EARTHEN 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. Types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage.

UNIT-III

SPILLWAYS

Types of spillways, design principles of Ogee spillways, types of spillway gates.

UNIT-IV

DIVERSION HEAD WORKS

Types of Diversion head works-diversion and storage head works, weirs and barrages, layout of diversion head works, components. Bligh's creep theory, Khosla's theory, determination of uplift pressure, impervious floors using Bligh's and Khosla's theory, exit gradient

UNIT-V

CANAL STRUCTURES

Types of falls and their location, design principles of Sarda type fall, trapezoidal notch fall and straight glacis fall, principles of design of distributary and head regulators

UNIT-VI

CROSS DRAINAGE WORKS

Types of cross drainage works, selection of site, design principles of aqueduct, siphon aqueduct and super passage.

TEXT BOOKS

1. Irrigation engineering and hydraulic structures by S.K Garg, Khanna publishers.2021
2. Irrigation and Water Power Engineering Punmia and Lal,Laxmi Publications, New Delhi

REFERENCES

1. Irrigation Water Power and Water Resources Engineering,K.R.Arora, 10th edition, 2020
2. Irrigation Engineering R.K. Sharma and T.K. Sharma, S. Chand Publishers,2021
3. Irrigation and water resources engineering G.L. Asawa, New Age International Publishers.2021
4. Theory and Design of Hydraulic structures Varshney, Gupta & Gupta, 2020.
5. Water Resources engineering Satyanarayana Murthy. Challa, New Age International Publishers, 2019

NOTE

Khosla's Charts, necessary tables and graphs are permitted in the Examination Hall.

IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0132197) WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT

(Professional Elective - II)

COURSE OBJECTIVES:

- Water resource systems deals with modelling techniques for optimum utilization of the available water resources in a system. This course emphasis on the basics of systems technique in water resources with illustrative examples, and potential applications to real systems.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Understand the concepts of system and system analysis
- Get the knowledge about systems techniques in water resources
- Understand the economic considerations in water resource systems
- Analyse reservoir systems-deterministic and random inflow
- Get the knowledge of applications of linear and dynamic programming

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3				1				2	1	1		1
CO2	3	3	3		2		1			1	2	1	1		1
CO3	3	3	3			3	1	2		1	3	1	1		1
CO4	3	3	3	3			1	2		1	1	1	1		1
CO5	3	3	3	3	2		1		2	1	1	1	1		

UNIT - I

CONCEPT OF SYSTEM AND SYSTEM ANALYSIS

Definition of a system, types of a systems, systems approach, system analysis, basic problems in systems analysis and example problems.

UNIT - II

SYSTEM TECHNIQUES IN WATER RESOURCES

Optimization using calculus, function of a single and multiple variables, linear programming, prelude to simplex method, dual simplex method, matrix form, sensitivity analysis, dynamic programming, solution of DP problems, characteristics of a DP problem, application of DP, multiple state variables, simulations, simulation model, simulation runs, combination of simulation and optimizations.

UNIT- III

ECONOMIC CONSIDERATIONS IN WATER RESOURCE SYSTEM

Basics of engineering economics, general principles, discount factors, comparison of alternative plans, economic analysis, market demand and supply, aggregation of demand, conditions of project optimality, benefit cost analysis, cost and benefits curves, cost and benefits estimation.

UNIT - IV

RESERVOIR SYSTEMS-DETERMINISTIC INFLOW

Reservoir sizing, sequent peak analysis, Reservoir capacity using linear programming, storage yield function, reservoir operation, standard operating policy, optimal operating policy, stationary policy, simulation of reservoir operation for hydropower generation.

UNIT - V

RESERVOIR SYSTEMS-RANDOM INFLOW

Review of basic probability theory, chance constrained linear programming, concept of reliability, stochastic dynamic programming for reservoir operation, state variable discretization, inflow as a stochastic process, steady state operating policy, real time operation.

UNIT - VI

APPLICATIONS OF LINEAR AND DYNAMIC PROGRAMMING

Irrigation water allocation for single and multiple crops, multi reservoir system for irrigation planning, reservoir operation for irrigation, reservoir operation for hydro power optimization, application of dynamic programming, optimal crop water allocation, steady state reservoir operating policy for irrigation, real time reservoir operation for irrigation.

TEXT BOOKS:

1. Water resources systems- modelling techniques and analysis – S. Vedula and PP Mujumdar, 2020
2. Water resources system analysis – S. Vedula and PP Mujumdar- Tata Mc Graw Hill company Ltd.2019

REFERENCES:

1. Water resource economics- James & Lee Oxford publishers 2005.
2. Optimal design of water distribution networks P.R.Bhave and Narosha publishing house 2005.
3. Operation research by P. Shankar Iyer, TMH publications, New Delhi, 2020
4. Operation research by N. Ramanathan, TMH publications, New Delhi, 2019.

IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0133197) ADVANCED STRUCTURAL DESIGN

(Professional Elective - II)

PREREQUISITES: Structural analysis and Design of reinforced concrete and steel structures

COURSE OBJECTIVES:

- The course objectives of this subject consist of Design of retaining wall, cantilever, Counterfort, RCC water, circular, rectangle tank, chimney, composite slab and tubular member.

COURSE OUTCOMES:

At the end of the course student is able to

- Design different elements like retaining structures, water tanks, chimneys and silos independently
- Use Indian Standards for design
- Understand the codal provision for loading and design standards for composite slab.
- Design of tubular member

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	1	-	-	-	-	1	2	-
CO2	3	3	3	-	-	1	-	-	-	-	-	2	1	2	-
CO3	3	3	3	-	-	-	-	2	-	-	-	-	1	3	-
CO4	3	3	3	-	-	2	-	-	-	-	-		1	3	-

UNIT-I

RETAINING WALLS: Design Example of Cantilever retaining wall and Counter fort retaining wall.

UNIT-II

WATER TANKS: Types of water tanks- Design Example of Rectangular water tank and Circular water tank resting on ground.

UNIT-III

FLAT-SLAB: Design Example of interior panel and exterior panel of Flat slab.

UNIT-IV

COMPOSITE SLAB: Design example of composite slab

UNIT-V

CHIMNEYS AND SILOS: Design Examples of chimneys and silos using Janssen's theory and Airy's theory.

UNIT-VI

TUBULAR MEMBER: Design of Tubular members and tubular joints. Relevant IS codes and tables are permitted for examination

TEXT BOOKS

1. Design drawing of concrete and steel structures, N.Krishna Raju, University Press, 2021
2. "Advanced Reinforced concrete structures", Varghese, CBS Publishers,2020

REFERENCE BOOKS

1. "RCC Designs(Reinforced Concrete Design)", Punmia B.C. Ashok Kumar Jain and Arun K. Jain, Lakshmi Publishers, 2015.
2. IS:11384 Code of Practice for Composite Construction in Structural Steel and Concrete", Bureau of Indian Standards, New Delhi, 1985.

IV B.Tech, I-Sem (CE)

L	T	C
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(A0134197) MAINTENANCE AND REPAIR OF BUILDINGS

(Professional Elective - III)

COURSE OBJECTIVES

- Provides insight into various maintenance & repair techniques

COURSE OUTCOMES

At the end of the course, student is able to

- Understand the reasons for distress in structure and will be able to suggest suitable solutions.
- Understand properties of different building materials. And able to suggest the proper maintenance or repair technique to suit the situation.
- Basic knowledge of using modern tools in maintenance process.
- Understand long-term durability characteristics of structures.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3	1	2										2		2
CO2	2	1	1		2								2		2
CO3	2	1	1		2		2						2		2
CO4	2	1			2							2	2		2
Avg.	2	1	2		2		2					2	2		2

UNIT-I

INTRODUCTION

Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage.

UNIT-II

PERFORMANCE OF BUILDING MATERIALS IN SERVICE

Maintenance philosophy – phases of maintenance-routine preventive and curative maintenance- methods, specification and cost analysis- common defects in buildings and measures to prevent and control the same-Building failures- causes and effects- cracks in buildings- types, classification & investigation.

UNIT-III

INSPECTION AND TESTING

Symptoms and Diagnosis of Distress -Damage Assessment -NDT – RCPT –PUDIT.

UNIT-IV

TECHNIQUES FOR REPAIR

Surface repair-material selection-surface preparation –rust eliminators and polymers - coating for rebar during repair – repair of cracks in concrete and masonry – methods of repair- epoxy injection, mortar repair for cracks-gunitinig and shotcreting- Water proofing of concrete roofs.

UNIT-V

STRENGTHENING MEASURES

Flexural strengthening, beam shear capacity strengthening, column strengthening, shorting, under pinning and jacketing- Conservation movement- materials and methods for conservation work-examples.

UNIT-VI

HEALTH MONITORING OF STRUCTURES

Use of Sensors – Building Instrumentation.

TEXT BOOKS:

1. Maintenance, Repair & Rehabilitation and Minor Works of Buildings - P.C. Varghese – PHI, 2014.

2. Maintenance and Repair of Structures, Sidney M. Johnson- Deterioration, Mc Graw Hill, 2016.

REFERENCES:

1. Maintenance and Repair of Civil Structures,B.L. Gupta and Amit Gupta, Standard Publications,2020.
2. Failure and Repair of Concrete Structure, ChampionS, 2020.
3. Concrete Repair and Maintenance,Peter H. Emmons - Galgotia Publishers, 2021.
4. Building Failures,Mckaig T.M, Applied Science Publications, 2021.
5. Concrete Structures- Repair, water proofing and protection,Philip.H. Perkins, 2020
6. Durable Structures- Through Planning for Preventive Maintenance Raikar, R&D Centre Structural Designers and Consultants Pvt Ltd, Vashi, New Bombay

IV B.Tech, I-Sem (CE)

L	T	C
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(A0148197) SOIL DYNAMICS AND MACHINE FOUNDATIONS

(Professional Elective-III)

COURSE OBJECTIVES:

- Provide knowledge in vibrations, vibration of soil system, field and laboratory determination of dynamic soil properties.
- Provide knowledge about machine foundations like reciprocating & impact machines, vibration isolation.

COURSE OUTCOMES:

At the end of the course student is able to

- Understand vibration systems and find the dynamic soil properties
- Find the dynamic soil properties
- Understand & Design vibration isolation.
- Understand, design & execute the machine foundations

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3		2								2	1	
CO2	3	3	3										2	1	1
CO3	3	3	3		2								2	1	
CO4	3	3	3		2								2	1	
Avg	3	3	3		2								2	1	1

UNIT – I

Theory of vibrations: Basic definitions- free and forced vibrations with and without damping for single degree freedom system- Resonance and its effect – magnification – Logarithmic decrement – Transmissibility

UNIT – II

Natural frequency of foundation – Soil system: Barkan's and IS methods – pressure bulb concept – Pauw's Analogy.

Wave propagation: Elastic waves in Rods – Waves in elastic Half space.

UNIT – III

Dynamic Soil Properties: Field and Laboratory methods of determination – Uphole, Down hole and cross hole methods – Cyclic plate load test – Block vibration test – Determination of Damping factor.

UNIT – IV

Machine Foundations: Types, Design criteria, permissible amplitudes and bearing pressure.

Block foundation: Degrees of freedom - analysis under different modes of vibration

UNIT – V

Analysis of Two Degree freedom systems under free and forced vibrations -Principles of Design of Foundations for reciprocating and impact machines as per IS code.

UNIT – VI

Vibration Isolation: Types and methods – Isolating materials and their properties

TEXT BOOKS:

1. Handbook of Machine Foundations by P.Srinivasulu and G.V.Vaidyanathan, Tata McGraw Hill
2. Soil Dynamics by Shamsher Prakash

REFERENCES:

1. Dynamics of Bases and Foundations by Barken, McGraw Hill Publishing Co.,New York
2. Vibration of Soils and Foundations by Richart, Hall and Woods, Prentice Hall, eaglewood Cliffs, New Jersy, USA

IV B.Tech, I-Sem (CE)

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(A0149197) ADVANCED LAND MEASUREMENT TECHNIQUES

(Professional Elective-III)

COURSE OBJECTIVES:

- This course exposes students to some of the advanced methods of land measurement. The course will prepare students to design and execute larger projects where mapping is an essential component using much advanced technologies. Further, it will help them see the research frontiers in land measurement.

COURSE OUTCOMES:

At the end of the course student is able to

- Understand GPS range and time measurements, errors, surveying methodologies and filed procedures.
- Knowing the idea on Laser properties and methods of range measurements
- Understand the components of LiDAR systems and INS-GPS integration
- Understand the fundamental concepts of photogrammetry
- Understand the interior and exterior orientation ,mathematical model relating image and object space

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			3								3	2	1
CO2	3	2			3								3	2	1
CO3	3	2			3								3	2	1
CO4	3	2			3								3	2	1
CO5	3	2			2								3	2	1
Avg	3	2			3								3	2	1

UNIT- I

GPS basic concepts: pseudo range and carrier phase measurements; GPS coordinate systems-WGS-84, GPS time

GPS Errors: Errors and biases in GPS- timing, orbital, ionospheric and tropospheric effects; Ambiguity resolution; Cycle slips, Multipath and other observational errors

UNIT – II

GPS Surveying procedures: Surveying with GPS- point positioning, relative positioning, static and kinematic positioning, Planning and field observations- networking

Laser physics: spectral characteristics of laser, laser interaction with objects

UNIT – III

Measurement of laser range-CW and pulse method, laser pulse, energy, pulse width and related definitions; LiDAR equation and related physics

UNIT – IV

Principle of laser scanning: Basic concept of scanning and computation; Sensor specifications, point repetition frequency, scanning frequency, maximum and minimum range, INS, GPS, and INS-GPS integration; different types of scanning sensors Topographic and bathymetric laser scanning; Footprint, Multiple return, full wave digitization for data capture;

UNIT – V

Laser applications: DEM generation algorithms and introduction to other applications

Photogrammetry: Metric and non-metric cameras; Geometry of near vertical and tilted photographs, heights and tilt distortions; Rectification and orthophotographs

UNIT – VI

Stereoscopy, parallax equation and stereo measurements for height determination

Orientation- interior, exterior, relative, and absolute; Mathematical model relating image, model and object space; Collinearity and coplanarity conditions, Bundle block triangulation

TEXT BOOKS & REFERENCE:

1. GPS Satellite Surveying, Alfred Leick, John Wiley
2. GPS for Land Surveyors, Sickle, J. V. Ann Arbor Press
3. David F. Maune(2002): Digital elevation model technologies and applications: The DEM users manual:; Manual of Remote Sensing: ASPRS; 2002
4. George Vosselman and Hans-Gerd Maas(2010), Airborne and Terrestrial laser scanning, CRC Press, New York
5. Jie Shan and Charles K Toth (2009) Topographic laser ranging and scanning: principle and processing, CRC Press, New York
6. Moffit, Francis H. and Mikhail, Edward M. Photogrammetry. Third Ed., New York:Harper& Row, 1980.
7. Wolf, Paul, R. Elements of Photogrammetry. Second Ed., McGraw-Hill, 1982.

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT CIVIL ENGINEERING

IV B.Tech, I-Sem (CE)

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(A0150197) GROUND WATER DEVELOPMENT AND MANAGEMENT

(Professional Elective-III)

COURSE OBJECTIVES:

- There is a need to integrate groundwater and surface water management to ensure better overall water management and allocation due to the fact that management and protection of groundwater has been seriously neglected, potentially endangering the resource. Hence Engineers require complete understanding of ground water development and its management. This course discusses the occurrence of ground water & its movement, steady & unsteady flow estimations through confined & unconfined aquifers, surface & subsurface investigation methods, artificial recharging methods, concepts of conjunction use & some case studies.

COURSE OUTCOMES:

- a general framework of aquifer characterization
- Overview of groundwater and estimations through confined & unconfined aquifers, surface & subsurface investigation methods, artificial recharging methods
- knowledge to effectively carry out the Groundwater Resources development and management
- Broaden skills in teamwork, communication and planning through small projects.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			3								3	2	1
CO2	3	2			3								3	2	1
CO3	3	2			3								3	2	1
CO4	3	2			3								3	2	1
Avg	3	2			3								3	2	1

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

UNIT – II : Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT – III : Analysis of Pumping Test Data – I: Steady flow groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests. Analysis of Pumping Test Data – II: Unsteady flow towards a well – Non equilibrium equations – Thesis solution – Jocob and Chow's simplifications

UNIT – IV : Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

UNIT – V : Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies. Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion.

UNIT – VI : Groundwater Basin Management: Concepts of conjunction use, Case studies.

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

REFERENCES :

1. Groundwater by Bawvwr, John Wiley & sons.
2. Groundwater Syatem Planning & Managemnet – R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers

IV B.Tech, I-Sem (CE)

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(A0135197) PAVEMENT ANALYSIS AND DESIGN

(Professional Elective - IV)

Pre-Requisites: Geotechnical Engineering-I, Engineering Geology and Transportation Engineering.

COURSE OBJECTIVES:

- The course objective covers the design of flexible pavements, design of Rigid pavements, Highway materials, Highway construction.

COURSE OUTCOMES:

At the end of the course student is able to

- Characterize the response characteristics of soil, Aggregate, Bitumen
- Analyse flexible and rigid pavements
- Design a flexible and rigid pavement using IRC and AASHTO methods
- Understand the principles of construction and maintains of highways

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-		-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
Avg.	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-

UNIT– I

PAVEMENT

Types of pavements – Factors affecting design of pavements – wheel loads –ESWL Concept-tyre pressure –contact pressure, Material characteristics– Environmental and other factors.

UNIT–II

STRESSES IN FLEXIBLE PAVEMENT

Layered systems concept – one layer system – Boussinesq Two-layer system –Burmeister Theory for Pavement Design.

UNIT– III

STRESSES IN RIGID PAVEMENTS

Relative stiffness of slab, modulus of sub-grade reaction – stresses due to warping, stresses due to loads, stresses due to friction.

UNIT–IV

PAVEMENT DESIGN

CBR Method of Flexible Pavement Design- IRC method of flexible pavement design. AASHO Method of Flexible Pavement design. IRC method of Rigid pavement design – Importance of Joints in Rigid Pavements- Types of Joints – Use of Tie Bars and Dowell Bars.

UNIT– V

HIGHWAY CONSTRUCTION

Construction of Earth Roads- Gravel Roads – WBM Roads- Bituminous Pavements- Cement Concrete Roads- Steps in Construction- Reinforced Concrete Pavements – Soil Stabilization – Methods and Course Objectives-Soil- cement Stabilization and Soil-lime Stabilization.

UNIT– VI

NEED FOR HIGHWAY MAINTENANCE

Pavement Failures - Failures in Flexible Pavements - Types and Causes - Rigid Pavement Failures - Types and causes - Pavement Evaluation - Benkelman Beam method - Strengthening of Existing Pavements – Overlays - Modern pavement Management systems.

TEXTBOOKS

1. Pavement Analysis and Design,-Yang H.Huang, 2nd Edition, Prentice Hall,2020
2. Highway Engineering–S.K.Khanna & C.E.G.Justo, Nemchand & Bros, 10th Edition, 2020.

REFERENCES

1. Pavement Design and Materials-A.T.Papagiannakis and E.A.Masad; Wiley & Sons, 2020
2. Pavement Engineering: Principles and Practices - Rajib B.Mallick and Tahar ElKorchi, CRC Press, 2020.
3. Principles of Pavement Design-E.J.Yoder and, M.W.Witzack, Johnwiley & Sons, 2021.

INDIAN ROADS CONGRESS (IRC) SPECIFICATIONS

1. IRC Specification:IRC:37-2018-Guidelines for Design of flexible pavement.
2. IRC Specification:IRC:58-2015-Guidelines for Design of plain jointed & Rigid pavement for Highways.
3. IRC Specification:IRC:81-1997-Guidelines for Strengthening of flexible road pavement.

IV B.Tech, I-Sem (CE)

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(A0136197) TRAFFIC ENGINEERING

(Professional Elective - IV)

Pre-requisites: Transportation Engineering**.**

COURSE OBJECTIVES:

- The course objective covers the traffic characteristics, traffic measurements, Highway capacity, parking studies, Traffic signs and road markings.

COURSE OUTCOMES:

At the end of the course student is able to

- Identify traffic stream characteristics
- Implement traffic studies, traffic regulations and control
- Identify various types of sign boards and road markings on Indian National highways
- Understand elements of highway safety and approaches to accident studies.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3													3	
CO2	3								3					3	
CO3	3													3	
CO4	3													3	

UNIT-I

TRAFFIC CHARACTERISTICS

Basic characteristics of Traffic, Vehicles, road users Relationship among Traffic parameters.

UNIT-II

TRAFFIC ENGINEERING

Basic Parameters of Traffic-Volume, Speed and Density – Definitions and the inter relation - Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation-Origin &Destination(O&D) studies, Speed and Delay studies; Axle load studies; Capacity studies - Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams

UNIT-III

PARKING STUDIES

Types of parking facilities–On street and Off - Street Parking Facilities – Parking Studies-Parking Inventory Study– Parking Survey by Patrolling Method- Analysis of Parking Data and parking characteristics – Multi Story Car Parking Facility- Design standards.

UNIT-IV

TRAFFIC CONTROL & REGULATION

Traffic Problems in Urban areas – Importance of Traffic Control and regulation-Traffic Regulatory Measures – Channelization.

UNIT-V

TRAFFICSIGNSANDROADMARKINGS

Types of Traffic Signs - cautionary, Regulatory and Informative Signs – Specifications – Pavement Markings – Types of Markings – Lane markings and Object Markings –Standards and Specifications for Road Markings.

UNIT-VI

HIGHWAY SAFETY

Introduction to Highway Safety – Types of Road accidents- Causes – Engineering Measures to reduce Accidents – Enforcement Measures – Educational Measures – Road Safety Audit-Principles of Road Safety Audit.

TEXTBOOKS

1. Highway Engineering–S.K.Khanna & C.E.G.Justo,Nemchand &Bros,10th Edition, 2021.
2. Dr.Kadiyali L. R., Traffic Engineering and Transport Planning, Khanna Publishers, 2020.

REFERNCEBOOKS

1. Practice and Design of Highway Engineering (Including Airports), Dr. Sharma S. K., Principles, S. Chand & Company Ltd, 2019.
2. Principles of Transportation Engineering Chakraborty Partho, Das Animesh, PHI, 2019.
3. A course in Highway Engineering Bindra S.P., Dhanpat Rai Publications, 2020.
4. Principles & Practice of Highway Engineering, Kadiyali L. R. and Lal, N. B.,Khanna Publishers, Delhi, 2020.
5. Principles of Transportation Engineering, Chakraborty Partha, Das Animesh, 2016.
6. Indo-Highway Capacity Manual, 2018
7. Martin Whol, Brian V Martin, Traffic system Analysis for Engineers and Planners, McGraw Hill, NY, 1967

IRC CODEBOOKS

1. IRC-SP -12 2015 Parking facilities in Urban Roads
2. IRC SP - 41 Guidelines for the Design of At-Grade Intersection
3. IRC 35 - 2015 Code of Practice for Road Markings – Second Revision
4. IRC 67 - 2001 Road Signs
5. IRC 108 - 2015 Guidelines for traffic forecast on Highways
6. IRC 119 - 2015 Guidelines for traffic safety Barriers
7. IRC 65 - 1976 Traffic Rotaries
8. IRC 93 - 1985 Design & Installation of Road Traffic Signals

IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0137197) FIRE SAFETY ENGINEERING DESIGN OF STRUCTURES

(Professional Elective - IV)

Pre-Requisites: CONCRETE TECHNOLOGY

COURSE OBJECTIVES

This course enables the students to know about design concerns – Regulatory control – Fire precautions during construction and maintenance. Students can also learn behaviors of fires, behavior of different materials at different temperatures

COURSE OUTCOMES

After completion of the course the student will be able to

- Understand about fire protection
- Understand the prevention of fire using different protection methods
- Design of building elements corresponding to fire protection
- To know the application of fire protection in other disciples

MAPPING WITH COs & POs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	-	1	-	1	-	1	-	3	2	-
CO2	3	3	2	2	3	-	1	-	1	-	1	-	3	2	-
CO3	2	3	2	3	2	-	1	-	1	-	1	-	3	2	-
CO4	3	2	3	2	3	-	1	-	1	-	1	-	3	2	-

UNIT-I

WHAT IS FIRE PROTECTION ENGINEERING?

The Discipline, The Professional Society, What FPEs Do, How Fire Protection Engineering Differs

UNIT-II

FUNCTIONS OF FIRE PROTECTION SYSTEMS

Preventing and Protecting Against Fire, Reasons for Installing Fire Protection Systems, Protecting Assets, Relating Design Features to Function

UNIT-III

DESIGN ELEMENTS

Performance-Based Fire Protection Design, Design Elements, Fire Science, Design Fire Scenarios, Other Design Considerations, Examples of Performance-Based Design

UNIT-IV

PRESCRIPTIVE FIRE PROTECTION DESIGN

Desirability of Prescriptive Design, Prescriptive Codes, Inherent Risk, Design Coordination

UNIT-V

INTERFACING WITH THE OTHER DISCIPLINES

Architectural, Chemical, Electrical, Mechanical, Structural

UNIT-VI

FIRE PROTECTION FOR NEW AND EXISTING BUILDINGS

The Design Process, New Construction, Existing Buildings

TEXTBOOKS:

1) Fire protection Engineering in Building Design,Jane N Lataille, (2003),Butterworth-Heinemann Publishers.
2) Fire Safety Engineering Design of Structures, John A. Purkiss, (2014), CRC Press.

IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0138197) ROAD SAFETY AUDIT

(Professional Elective-IV)

COURSE OBJECTIVES

- The main objective is to develop highway professionals as Road Safety Auditors who should be able to bring-in safety engineering elements in planning, design, construction, operation and maintenance stages systematically ensuring safety for the road users. They will also be used for the network in operation for identifying safety deficiencies and to suggest improvements based on thorough analysis & audit

COURSE OUTCOMES

At the end of the course, the student will be able to

- Study feasibility of the Indian National Highways
- Study the accident scenario in India
- Learn the checklist of the different stages of the road constructions
- Learn the audit process of different organizations.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2				2	2	2			2	2		1	1	1
CO2	2	2			2	2	2			2	2		1	1	1
CO3	2				2	2	2			2	2		1	1	1
CO4	2				2	2	2			2	2		1	1	1

UNIT-I

ROAD SAFETY SITUATION IN INDIA

General-Road safety situation in India, Accident Prevention, Road safety Audit-Part of Road SafetyStrategy.

UNIT-II

ROAD SAFETY AUDIT

Road Safety Audit and Quality Assurance, Why Road Safety Audit, Organizations involved in Road safetyAudit, Road safety Auditors and key Personnel in RSA.

UNIT-III

STAGES OF ROAD SAFETY AUDIT

During Feasibility study, Completion of preliminary design, completion of detailed design, pre-opening.

UNIT-IV

ROAD SAFETY AUDIT PROCESS

Selecting road safety audit team, Providing the background information, Assessing the documents,inspecting the team, Holding a completion meeting.

UNIT-V

SALIENT FEATURES AND PRINCIPLES FOR SAFE ROAD DESIGN

Principles of Road safety, Special safety issues related to road design, Design Context, Access control,Tress, Road signs, Sight distance, Parked vehicle

UNIT-VI

SAFETY AUDIT PROCESS IN RURAL ROADS

Context, Safety Aspects in Rural Roads, Safety Audit- Project to be audited, Audit Team, Stages of safetyaudit, Audit process, Check Lists

REFERRENCE BOOK

1. Road Safety Audit by IRC: SP:88:2010

IV B.Tech, I-Sem (CE)

L	T	C
2	1	0.5

(A0139197) NUMERICAL METHODS IN CIVIL ENGINEERING

(Skill Development Course)

Prerequisites: Mathematics and Mathematical Methods

COURSE OBJECTIVES:

- To familiarize the students with the foundations of probability and Numerical methods and applications in Civil Engineering domain**.**
- To impart probability concepts and Numerical methods in various applications in Engineering.

COURSE OUTCOMES

After completion of the course the student will be able to:

- Know the importance of probability, random variables and distributions in solving various mechanical and civil engineering problems
- Identify various numerical methods to solve linear and non-linear ordinary differential equations and its applications in non-linear analysis
- Analyse the concept of Interpolation its applications in digital image processing, computer graphics and in many engineering disciplines
- Identify various numerical methods to solve linear and non-linear ordinary differential equations and its applications in non-linear analysis

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	-	1	-	1	-	-	-	2	1	-
CO2	3	3	2	2	3	-	1	-	1	-	-	-	2	1	-
CO3	2	3	2	3	2	-	1	-	1	-	-	-	2	1	-
CO4	3	2	3	2	3	-	1	-	1	-	-	-	2	1	-

UNIT-I:

ROLE OF PROBABILITY AND STATISTICS IN ENGINEERING

Introduction – Uncertainty in engineering: Aleatory uncertainty and epistemic uncertainty – Applications in CE: Transportation infrastructures, Design of structures, Design of hydro systems, Design of geotechnical systems, Construction planning and management.

UNIT-II

ANALYTICAL MODELS OF RANDOM PHENOMENON

Random variables and random phenomenon – probability distributions: Normal, log normal, Poison, exponential, gamma, beta distributions.

UNIT-III

REGRESSION AND CORRELATION ANALYSES

Introduction – applications of regression analysis in engineering - fundamentals of linear regression analysis – correlation analysis – linear regression – multiple linear regression – nonlinear regression.

UNIT-IV

BAYESIAN APPROACH

Introduction – basic concepts – continuous case – Bayesian concept in sampling theory – Bayesian regression and correlation analysis.

UNIT-V

NUMERICAL METHODS

Introduction – Two Dimensional Integrals, stiffness integration, stress calculation.

UNIT-VI

DIFFERENTIAL EQUATIONS

Introduction – Taylor series simulations – Runge Kutta's method – partial differential equations

TEXT BOOKS

1. Probability concepts in engineering, AHS Ang, and WH Tang, Wiley publishers, 2020
2. Mathematical methods for physics and engineering, KF Riley, MP Hobson, SJ Bence (2006), Cambridge University Press,2020

REFERENCES

1. Probability concepts in engineering, AHS Ang, and WH Tang,Wiley publishers, 2020
2. Mathematical methods for physics and engineering, KF Riley, MP Hobson, SJ Bence, Cambridge University press,2021
3. Introduction to finite element in engineering, TR Chandrupatla, and AD Belegundu, Prentice Hall Publishers,2021.

IV B.Tech, I-Sem (CE) P C
3 1.5

(A0198197) TRANSPORTATION ENGINEERING LAB

Prerequisites: Transportation Engineering.

COURSE OBJECTIVES

- The objective of the course is to conduct tests on Aggregates & Bituminous materials.

COURSE OUTCOMES

At the end of the course student is able to

- Perform quality control tests on pavements and pavement materials

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3													3	3
CO2	3													3	3
CO3	3													3	3

Tests on Aggregate and Bitumen

1. Determination of strength of the aggregate by crushing test using compression testing machine.
2. Determination of toughness value of aggregate by impact test.
3. Determination of water absorption value of aggregate by using water absorption test
4. Determination of flakiness index and elongation index by shape test using thickness gauge and length gauge
5. Determination of hardness of aggregate by Los Angles Abrasion test.
6. Determination of grade of bitumen by penetration test using penetrometer.
7. Determination of ductile value of bitumen using ductility testing machine.
8. Determination of softening value of the bitumen using ring and ball test.
9. Determination of flash and fire value of the bitumen
10. Determination of Stability and flow value of bitumen mix using Marshall Stability Test.

IV B.Tech, I-Sem (CE) P C
3 1.5

(A0199197) GEOGRAPHICAL INFORMATION SYSTEMS LAB

COURSE OBJECTIVES

- The main objective of GIS Lab is to apply the spatial analysis techniques and to use applications of GIS in Civil Engineering areas.

COURSE OUTCOMES

At the end of the course student is able to

- Understand the process of mapping and measurements using GIS.
- Create elevation models and analyse the data.
- Apply GIS analysis in the civil engineering areas.
- Learn the processes of data acquisition and utilise the data as input data.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	3	3	-	3	2	1	2	2	3	1	1	-
CO2	2	2	-	3	3	-	3	2	1	2	2	3	1	1	-
CO3	2	2	-	3	3	-	3	2	1	2	2	3	1	1	-
CO4	2	3	-	3	3	-	3	2	1	2	2	3	1	1	-
Avg.	2	3	-	3	3	-	3	2	1	2	2	3	1	1	-

SOFTWARES:

1. ArcMap, ERDAS IMAGINE, GeoMedia, IDRISI
2. Open source software like GRASS GIS, ILWIS, JUMP GIS, MapWindow GIS, QGIS, SAGA GIS

EXCERCISES:

1. Digitization of Map/Toposheet
2. Creation of Thematic Maps
3. Study of features estimation
4. Developing Digital Elevation Model (DEM) using topographic information
5. Creation of TIN file
6. Application of GIS in Water Resources Engineering
7. Application of GIS in Transportation Engineering
8. Extraction of features and making measurements using Google Earth
9. Feature extraction through Open Street Map
10. Lands at Data extraction

IV B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0140198) DESIGN AND DRAWING OF IRRIGATION STRUCTURES

(Professional Elective - V)

COURSE OBJECTIVES

- Irrigation structures plays vital role in controlling and diverting water flows in the canals and reservoirs. In government sectors Engineer's should have complete understanding about various design and drawing specifications of irrigation structures like canal regulator, aqueduct, tank sluice and surplus weir. Whenever the available natural ground slope is steeper than the designed bed slope of the channel, the difference is adjusted by constructing vertical falls or drops in canal bed at suitable intervals. In this coarse student can get the complete knowledge of well-known canal falls, the straight glacis weir and trapezoidal notch fall.

COURSE OUTCOMES

At the end of the course student is able to

- Knowledge about various components of Hydraulic structures
- Flood estimation from the catchments and design of the water way of Hydraulic structure
- Design of various components like foundations, piers, walls and abutments
- Physically making the drawing charts of various irrigation structures
- Knowledge of constructional specifications and protection measures like friction blocks etc.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3			-	-	-	-	-		-	-	-	1	1	-
CO2	3	2	3	-	-	-	-	-	3	-	-	-	1	1	-
CO3		2	3	-	-	-	-	-		-	-	-	1	1	-
CO4	3	2		-	-	-	-	-		-	-	-	1	1	-
CO5	3	2	2	-	-	-	-	-		-	-	-	1	1	-
Avg.	3	2	3	-	-	-	-	-	3	-	-	-	1	1	-

Design and drawing of the following irrigation structures.

1. Canal regulator.
2. Trapezoidal notch fall.
3. Surplus weir.
4. Tank sluice with tower head
5. Straight glacis weir.
6. Type III Syphon aqueduct.

NOTE

Final Examination pattern: First question compulsory for 14 marks contains seven 2 marks questions from unit I to VI, Three Eight marks questions from all units &One Thirty-Two marks question from any of six units has to be answered by the student. The duration of examination will be four hours.

TEXT BOOKS:

1. Design of minor irrigation and canal structures C.Satyanarayana Murthy, Wiley eastern Ltd, 2020.
2. Irrigation engineering and Hydraulic structures S.K.Garg, Standard Book House, 2020.

IV B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0141198) OPEN CHANNEL HYDRAULICS

(Professional Elective - V)

COURSE OBJECTIVES

- This course finds application in the solution of problems related to several aspects of development of surface water resources. Problems in a wide variety of fields, such as the design of hydraulic structures, dispersion of pollutants, overland flow and sediment transport in rivers require the use of principles of open-channel flow.

COURSE OUTCOMES

At the end of the course student is able to

- Understand the open channel characteristics including hydraulic jump and transitions
- Get the knowledge about gradually and rapidly varied open channel flows.
- Analyse the flow characteristics in open channels
- Analyse the flow profiles using GVF Computation methods.
- Solve the hydraulic jump problems.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1											1	2	1
CO2	3	1											1	2	1
CO3	1	3	2										1	2	1
CO4	1	3	2										1	2	2
CO5	1	3	1										1	2	2

UNIT-I

INTRODUCTION

Difference between pipe flow and open channel flow, classification of flow, energy equation, momentum equation, kinetic energy and momentum factors.

UNIT-II

UNIFORM FLOW

Concepts, uniform flow equations, conveyance and hydraulic exponent for uniform flow, design of channels for uniform flow.

UNIT-III

CRITICAL FLOW

Concept of specific energy, Classification of flow, design of channel, Section factor, Hydraulic exponent for critical flow, critical depth as a flow measurement.

UNIT-IV

GRADUALLY VARIED FLOW

Concepts, GVF equation, its different forms, Basic assumptions, Dynamic equation, Characteristics of flow profile and classification. Analysis of flow profiles, Method of singular point and transitional depth, methods of computation, practical problems.

UNIT-V

GVF COMPUTATIONS

Different methods, direct integration method, Bress's solution, Chow's solution, direct method, standard step method.

UNIT-VI

RAPIDLY VARIED FLOW

Concepts, hydraulic jump in rectangular channels, classification of jumps, characteristics of jump – length, location and height, Stilling basins, shape type-2 and type-4, Hydraulic jump in - rectangular sloping channels, non-rectangular channels; application of hydraulic jump as energy dissipater.

TEXT BOOKS

2 Flow through open channel, Rangaraju R.G. Tata McGraw Hill Publishing Co Ltd, New Delhi, 2020.
3 Open Channel Hydraulics, Subramanya K, Tata McGraw Hill publishing Co Ltd, New Delhi, 2020.

REFERENCE BOOKS

1 Chow Ven Te: Open Channel Hydraulics, McGraw Hill Book Company, New Delhi, 2020.
2 French: Open Channel Hydraulics, McGraw Hill Book Company, New Delhi, 2020.
3 Modi and Seth: Fluid Mechanics, Standard House, New Delhi,2020
4 Henderson: Open Channel Hydraulics, Mr. Millan Publishing Co. Ltd, New Delhi, 2020.

IV B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0142198) INDUSTRIAL WASTE AND WASTE WATER MANAGEMENT

(Professional Elective - V)

COURSE OBJECTIVES:

- Civil engineers, apart from giving designs for construction of any industry, he must be in a position to calculate the waste produced from that industry. This course motivates the students to learn different concepts of about the different types of industrial sources for wastewater production, its quality and quantity of production, different methods to treat industrial wastewater so that the effluent will meet the discharge standards. Also, provides knowledge on quantity of solid waste from industries, its handling techniques, disposal methods etc. Also, focuses on case studies on particular industries like tanning, textile etc.

COURSE OUTCOMES:

At the end of the course, student is able to

- Understand the concepts of Industrial Waste Water.
- Gain knowledge in treatment process for Industrial waste water.
- Know the process of disposal and treatment methods, Residual Management.
- Employ the case histories of industrial manufacturing processes for relevant projects.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3					1	2	2					1	1	2
CO2	3	1				1	2	2					1	1	2
CO3	3	1				1	2	2			2		1	1	2
CO4	2					1	2	2				3	1	1	2
Avg.	3	1				1	2	2			2	3	1	1	2

UNIT-I

INTRODUCTION: Industrial scenario - Uses of Water by industry - Sources and types of industrial wastewater – Industrial waste water disposal and environmental impacts - Reasons for treatment of industrial wastewater – Regulatory requirements - Industrial waste survey - Industrial wastewater generation rates, characterization and variables -Population equivalent - Toxicity of industrial effluents and Bioassay tests - Preventing and minimizing wastes at the source.

UNIT-II

INDUSTRIAL WASTEWATER TREATMENT: Equalization - Neutralization - Oil separation - Flotation - Precipitation - Heavy metal Removal – Refractory organics separation by adsorption - Aerobic and anaerobic biological treatment - Sequencing batch reactors – High-Rate reactors

UNIT-III

ADVANCED WASTEWATER TREATMENT AND REUSE: Chemical oxidation - Ozonation - Photo catalysis - Wet Air Oxidation - Evaporation - Ion Exchange – Membrane Technologies - Nutrient removal - Land Treatment.

UNIT-IV

DISPOSAL AND TREATMENT: Industrial waste water discharges into streams. Lakes and oceans and problems, Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods

UNIT-V

RESIDUALS MANAGEMENT: Residuals of industrial wastewater treatment - Quantification and characteristics of Sludge -Thickening, digestion, conditioning, dewatering and disposal of sludge - Management of RO rejects.

UNIT-VI

CASE STUDIES

Industrial manufacturing process description, wastewater characteristics and waste treatment flow sheet for Textiles - Tanneries - Pulp and paper - metal finishing – Petroleum Refining - Chemical industries - Sugar and Distilleries -Dairy - Iron and steel - fertilizers - Industrial clusters and Industrial Estates Industrial.

TEXT BOOKS:

1. Industrial Water Pollution Control, Eckenfelder, W.W. Mc-Graw Hill, 2000
2. Wastewater Treatment for Pollution Control,Arceivala, S.J, Tata McGraw Hill, 2008.

REFERENCE:

1 Pollution Prevention and Abatement Handbook - Towards Cleaner Production World Bank Group (1998) World Bank and UNEP, Washington D, 2020.

IV B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0151198) SMART CITIES

(Professional Elective-V)

Prerequisites: Nil

COURSE OBJECTIVES:

At the end of the course, the student will be able to:

- To understand the concept of smart city and associated challenges.
- To understand latest technologies used in intelligent building.
- To understand process of planning and drafting a plan for smart city.
- To understand the importance of different smart system

COURSE OUTCOMES

At the end of the course, the student will be able to:

- Understand the necessity of infrastructural development for smart cities.
- Identify components of infrastructure and Prepare infrastructure plan for smart city.
- Understand smart transport system for smart cities and its application
- Study of water resources systems for smart city and its application.
- Understand National and Global policies to implement for smart city development.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					2	2	2	2	2	2	2	2			
CO2					2	2	2	2	2	2	2	2			
CO3					2	2	2	2	2	2	2	2			
CO4					2	2	2	2	2	2	2	2			

UNIT – I

Fundamental of smart city & Infrastructure:

Introduction of Smart City, Concept of smart city, Objective for smart cities, History of Smart city world and India. Need to develop smart city, Challenges of managing infrastructure in India and world, various types of Infrastructure systems, Infrastructures need assessment.

UNIT – II

Planning and development of Smart city Infrastructure:

Energy and ecology, solar energy for smart city, Housing, sustainable green building, safety, security, disaster management, economy, cyber security, Project management.

UNIT – III

Intelligent transport systems

Smart vehicles and fuels, GIS, GPS, Navigation system, traffic safety management, mobility services, E-ticketing.

UNIT – IV

Management of water resources and related infrastructure

Storage and conveyance system of water, sustainable water and sanitation, sewerage system, flood management, conservation system.

UNIT – V

Infrastructure Management system & Policy for Smart city

Integrated infrastructure management systems for smart city, Infrastructure management system applications for existing smart city. Worldwide policies for smart city.

Government of India - policy for smart city, Mission statement & guidelines, Smart cities in India, Case studies of smart city.

UNIT – VI

Green building in smart cities

Introduction to green buildings, Rating system, Energy saving system

TEXT BOOKS

1. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li

2. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by Nicos Komninos
3. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony Townsend
4. Grig N.S., Infrastructure engineering and management, Wiley-Interseience, 1988
5. Hudson W.R., Haas R., Uddin W., Infrastructure Management, McGraw-Hill, 1997
6. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science
7. Mission statement &guidelines on Smart City Scheme". Government of India - MinistryofUrbanDevelopment http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf

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AUTONOMOUS
DEPARTMENT CIVIL ENGINEERING

IV B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0143198) ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

(Open Elective - III)

COURSE OBJECTIVES:

- This course motivates the students to learn different concepts on methods to assess the environment quality (Air, water, soil, biota etc.) which is damaged because of different sources. Provides the important parameters to be considered in assessing environmental quality. This course imparts certain kind of decision` making knowledge in relevance with the project actions-impacts. Also focuses on methods of auditing for any project whose actions have several consequences on environmental quality over the proposed area.

COURSE OUTCOMES:

At the end of the course, student is able to

- Understand the concept of EIA and its methodology.
- Assess the quality of environmental impact on Land uses, vegetation, air and wild life.
- Prepare evaluation system for environmental impact assessment.
- Study and rectification of case studies.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3	1				1	2	2							3
CO2	2	1				1	2	2							3
CO3	2	2				1	2	2							3
CO4	2					1	2	2				2			3
Avg.	2	2				1	2	2				2			3

UNIT – I

BASIC CONCEPT OF EIA

Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, participants in EIA process and main stages of EIA process, Classification of environmental parameters.

UNIT- II

E I A METHODOLOGIES

Introduction, Criteria for the selection of EIA Methodology, E-I-A methods, Ad-hoc methods, Leopold Interaction matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT –III

QUALITY ASSESSMENT OF NATURAL SOURCES USING EIA

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives, Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT-IV

QUALITY ASSESSMENT OF POLLUTION USING EIA

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact.

UNIT –V

ENVIRONMENTAL EVALUATION SYSTEMS

Preparation of Environmental Impact statements.

UNIT-VI

CASE STUDIES

Case studies and preparation of Environmental Impact assessment statement for various Industries namely thermal power plants, steel plant, highway and pharmaceutical industries.

TEXT BOOKS:

1. EnvironmentalImpact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad, 2019.
2. Canter, L.W., "Environmental Impact Assessment ", McGraw Hill, New York, 2020.

REFERENCE BOOKS:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.Katania& Sons Publication., New Delhi,2021.
2. Handbook of Environmental Impact Assessment Vol. I and II ", Petts, J., " Blackwell Science, London, 2020.
3. Environmental Assessment Sourcebook Vol. I, II and III,The World Bank Group., The World Bank, Washington, 2020.

IV B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0144198) WATERSHED MANAGEMENT

(Open Elective - III)

COURSE OBJECTIVES:

- Watershed management is a planning and implementation process that looks at the total picture of all the water uses, demands, pollutant sources, stresses and conditions, to achieve water quality, supply, flows and ecosystem health that meet society's goals.

COURSE OUTCOMES:

At the end of the course student is able to

- Understand the Concept of watershed development.
- Understand the characteristics of watershed used in watershed management
- Practice watershed management basics, interacting with local interests and dealing with real issues in a practical manner
- Work in the water management field
- Plan watershed management activities and prepare plan of action.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1		-	-	-	-	-	-	-	-	-	1	2	-
CO2	2	2		-	-	-	-	-	-	-	-	-	1	2	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-	1	2	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	1	2	-
CO5	1	1	3	-	-	-	-	-	-	-	-	-	1	2	

UNIT-I

INTRODUCTION

Concept of watershed management, History of watershed management and its relevance in India, Integrated and multidisciplinary approach (Phase-I, Phase-II and Phase-III), Effect of watershed on community.

UNIT-II

CHARACTERISTICS OF WATERSHED

Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, Master plan, administrative aspects.

UNIT-III

PRINCIPLES OF EROSION

Factors affecting soil erosion, different types and causes of erosion, cost of soil erosion, Estimation of loss of soil from erosion, control of soil erosion, Conservative measures: Contour techniques, ploughing, furrowing, trenching, bunding, hedging, terracing, wattling and staking, gully control, pervious and impervious check dams.

UNIT-IV

RAIN WATER HARVESTING

History of proposed water Harvesting in the country by interlinking of rivers, Techniques of water harvesting, Indigenous water harvesting methods in India, Engineering methods of water harvesting, Stop dams, Farm ponds or dugout ponds.

UNIT-V

LAND MANAGEMENT

Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

UNIT-VI

ECOSYSTEM MANAGEMENT

Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

TEXT BOOKS

1. Watershed Management by MM Das and MD Saikia, PHI Learning Pvt Ltd, New Delhi, 2021.
2. Watershed Management by JVS Murthy, - New Age International Publishers, 2021.

REFERENCE

1. Water Resource Engineering R.Awurbs and WP James, - Prentice Hall Publishers, 2020.
2. Land and Water Management VVN Murthy - Kalyani Publications, 2020.
3. Irrigation and Water Management, D.K.Majumdar, Printice Hall of India, 2020.

IV B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0145198) GROUND IMPROVEMENT TECHNIQUES

(Open Elective - III)

COURSE OBJECTIVE

Ground improvement is a very essential activity in geotechnical engineering when construction occurs in problematic soils and under difficult geotechnical conditions. The state of the practice for ground improvement technologies is ahead of theory. The course focuses on concept, principles, application of design methods in ground improvements (along with few case studies).

To provide knowledge about various ground improvement, ground treatment, and ground reinforcement methods and miscellaneous methods based on latest technology.

COURSE OUTCOMES

- To recognize the importance of ground improvement methods. And, to understand the concept and principles of mechanical and hydraulic modification of problematic soils.
- Understand the concepts of physically and chemically treated, grouting technique, and thermal modification methods of soil.
- Impart the knowledge of soil-reinforcement techniques and geosynthetics for construction of civil engineering structures. Analyze, select & design the soil reinforcement based on the problem
- To know the problems associated with expansive soils in construction, their determination through laboratory studies, and potential improvement methods based on field condition.

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1		1	1	1	1	1	2	2	2
CO2	3	2	1	1	1	1	1	1	1	1	1	1	2	2	2
CO3	3	2	2	1	1	1	1	1	1	1	1	1	2	2	2
CO4	3	2	1	2	1	1	1	1	1	1	1	1	2	2	2

UNIT-I

INTRODUCTION

Typical situations where ground improvement becomes necessary, historical review of methods adopted in practice, current status and the scope in the Indian context. Methods of ground Improvement

MECHANICAL MODIFICATION

Compaction methods and compaction control, Vibro techniques (displacement/replacement), Blasting, Deep dynamic compaction, Precompression, Stone columns, lime columns.

UNIT-II

HYDRAULIC MODIFICATION

Seepage control/Dewatering Systems-opensumps and ditches, well point Systems, Vacuum consolidation, Electro osmosis, Sand Drains, Wick Drains, preloading with vertical drains.

UNIT-III

CHEMICAL MODIFICATION

Shallow and deep soil stabilization**,** mixing technologies (dry mixing, wet mixing, jet mixing, mass mixing) - stabilization using Cement, lime, bitumen and other chemicals ($CaCl_2$, Gypsum)- Grouting technologies

UNIT-IV

THERMAL MODIFICATION

Ground freezing-methods, advantages and disadvantages-Vitrification, applicability, Process, Advantages, Limitations of the Technology, Economic and Regulatory Considerations.

UNIT-V

SOIL REINFORCEMENT TECHNOLOGIES

Mechanically stabilized earth, Foundation and base reinforcement.

REINFORCED EARTH

Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls. **Geosynthetics:** Geotextiles, geogrids and geomembranes- Types, Functions and applications. Tests for geotextiles materials.

UNIT-VI

STABILIZATION OF EXPANSIVE SOILS

Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

TEXT BOOKS

1. 'Soil Improvement and ground modifications methods', Peter G. Nicholson, Elsevier, 2020.
2. 'Ground improvement Techniques', P. Purushothama Raj, Laxmi Publications, 2020.
3. Engineering Principles of Ground Modification, Hausmann M.R. (1990), McGraw-Hill International Edition, 2020.

REFERENCES

1. Designing with Geosynthetics, Robert M. Koerner, Prentice Hall New Jercy, USA,2021.
2. 'Ground Improvement Case Histories', John A. Hudson, Elsevier, 2020.
3. 'Ground and Soil Improvement', C. A. Raison, ICE publications, 20020.
4. Geosynthetics – An Introduction, Sai Master geo-environmental services,Rao, G.V.,2020.
5. "Reinforced Soil and Its Engineering Applications", Saran, S., I.K. international,2020.

E-LEARNING RESOURCES

https://archive.nptel.ac.in/courses/105/108/105108075/

IV B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0146198) CONSTRUCTION METHODS AND EQUIPMENT

(Open Elective - III)

COURSE OBJECTIVES

- Provide knowledge about various construction methods.
- Provide knowledge about various types of construction equipment.

COURSE OUTCOMES

- Understand operations of various construction equipment's
- Understand construction project control processes
- The total construction process from inspection of the idea through construction and start up
- Construction equipment should be selection and use to produce the intended quality in the most cost-effective manner

MAPPING WITH COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											3	2	1
CO2	3	2											3	2	1
CO3	3	2											3	2	1
CO4	3	2											3	2	1

UNIT-I

EQUIPMENT ECONOMICS: Equipment records, Cost of Capital, Elements of ownership Cost, Operating Cost, Replacement Decisions, Rent and Lease Considerations.

UNIT-II

PLANNING FOR EARTHWORK CONSTRUCTION: Planning, Graphical Presentation of Earthwork, Earthwork Quantities, Mass Diagram, Pricing Earthwork Operations.

UNIT-III

COMPACTION AND STABILIZATION EQUIPMENT: Compaction of Soil and rock, Types of Compacting Equipment, Dynamic Compaction, Stabilizing soils with Lime, Cement Soil Stabilization.

UNIT-IV

MOBILE EQUIPMENT POWER REQUIREMENTS: Required Power, Available power, Usable power, Performance Charts. Dozers, Scrapers, Excavators - Introduction, Performance Characteristics of Dozers, Pushing Material, Land Clearing, Scraper types, operation, Performance Charts, Production cycle, Hydraulic Excavators, Shovels, Hoes.

UNIT -V

TRUCKS AND HAULING EQUIPMENT: Finishing Equipment - Trucks, productivity, Performance Calculations, Graders, Trimmers.

UNIT-VI

CONCRETE AND CONCRETE EQUIPMENT: Cranes, Piles and Pile-Driving Equipment, Planning for Building Construction - Concrete Mixtures, Batching of Concrete, Placing of Concrete.

TEXTBOOKS

1. "Construction Planning Equipment and Methods ", Peurifoy R.L, Ledbetter W.B, and Schexnayder C, 9th Edition, McGraw Hill, Singapore, 2020.
2. "Construction Equipment and Management ", Sharma S.C, Khanna Publishers, 2020.

REFERENCES

1. "Construction Equipment and Methods: Planning, Innovation, Safety",Leonhard E. Bernold Wiley Publisher2020.

IV B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0147198) GREEN BUILDINGS

(Skill Development Course)

COURSE OBJECTIVES

- Provide knowledge about Green Buildings and their characteristics.
- Provide insight about various Green Building Rating systems.
- Provide insight about various parameters of Green Buildings
- Provide knowledge about ECBC Code.

COURSE OUTCOMES

- Understand the need of Green Buildings, their characteristics and various assessment methods.
- Understand the design parameters of Green Building like sustainable sites, water efficiency, energy &atmosphere, materials& resources, indoor environmental quality & innovation and able to assess the buildings as per IGBC & GRIHA rating systems.
- Understand the ECBC code and application to existing green building. Also understand and apply the principles and planning concepts of green buildings to design of buildings.

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	1	1
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1
CO3	3	2	1	-	-	-	-	-	-	-	-	-	2	1	1

UNIT-I

INTRODUCTION OF GREEN BUILDING: Concept of green building, History of green building, Need of green building in present scenario, Importance of green building, Merits and demerits.

UNIT-II

CLASSIFICATION OF GREEN BUILDING: Assessment methods, Global assessment and certification, BREEAM (Building Research Establishment's Environmental Assessment Method), GB Tool, LEED (Leadership in Energy and Environmental Design), CASBEE (Comprehensive Assessment System for Building Environmental Efficiency), Green Globes, Local assessment, LEED India, GRIHA (Green Rating for Integrated Habitat Assessment).

UNIT-III

DEVELOPMENT OF ENERGY EFFICIENT BUILDING: Introduction, Concept, Advantages, Design parameters, Sustainable Sites, Water Efficiency.

UNIT-IV

ENERGY & ATMOSPHERE: Materials & Resources, Indoor Environmental Quality, An additional category Innovation & Design criterion.

UNIT-V

ENERGY CONSERVATION BUILDING CODE: Study of existing green buildings.

UNIT-VI

PRINCIPLES AND PLANNING CONCEPTS OF GREEN BUILDINGS: Salient features of a Green Building, Site Integration, and Benefits of green Buildings Planning concepts of Green Buildings or Eco-housing, Environmentally Friendly, Non-Toxic Paint, Green Roofing, Use of Insulating Materials, Cost Effective Housing.

TEXTBOOKS:

1. Renewable Energy and Environment - H.Ravindranath, K UshaRao, B Nataraja n, P Monga, A Policy Analysis for India,Tata McGraw Hill, 2020.

2. "Green and Smart Buildings: Advanced Technology Options",Nilesh Y. Jadhav,Green Energy and Technology Series: Springer (Publisher), Edition-1,2021.

REFERENCES:

1. "Construction Planning, Equipment, and Methods", Robert L.Peurifoy, Clifford J. Schexnayder, Robert Schmitt, Aviad Shapira P/L CUSTOM SCORING SURVEY Ninth Edition, 2020.
2. Energy and the Environment, M Fowler, 2nd Ed, McGraw Hill, New York, 2020.
3. "Green Buildings and Sustainable Engineering", Harald Drück, Radhakrishna G. Pillai, Manoj G Tharian, Aysha Zeneeb Majeed Springer Transactions in Civil and Environmental Engineering, (1st ed).2020.