RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
**Affiliated to JNTUA-Ananthapuramu, Approved by AICTE-New Delhi,
Accredited by NBA-New Delhi, Accredited by NAAC with A+ Grade-New Delhi
Nandyal-518501, AP, India**

DEPARTMENT OF CIVIL ENGINEERING

Regulations, Course Structure and Detailed Syllabus

RGM-R-2020

(ESTD-1995)

Applicable for students admitted into
B.Tech (Regular) from 2020-2021
B.Tech (Lateral Entry Scheme) from 2021-22
ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI

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ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI
B.Tech. (Regular) from 2020-21 and B.Tech. (Lateral Entry Scheme) from 2021-22

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), Two 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 2020-21 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/EAPCET

iii) examination conducted by AP State Council for Higher Education (APSCHE) for allotment of a seat by the Convener, EAMCET/EAPCET, 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/EAPCET) seats will be filled by the Convener, EAMCET/EAPCET.

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.

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List of Programs offered
1. B.Tech – Regular & Lateral Entry
2. M.Tech – Regular
3. MBA – Regular
4. MCA – Regular

Academic Regulations for 2020-21 B. Tech. (Regular)

(Effective for the students admitted into the I year from the Academic Year 2020-2021)

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	7	Technical Seminar
2	**Mandatory Learning Courses** [Environmental Science, Environmental Engineering, Universal Human Values, Indian Heritage and Culture, Constitution of India, Induction Program, Essence of Indian Traditional Knowledge]	8	2 Months Internships - Two
3	All Practical Subjects	9	6 Month Internship
4	All Skill Oriented Courses /Skill Advanced Courses/ Soft Skill Courses	10	Main Project Work
5	Comprehensive Viva	11	Universal Human Values as 03 credits course with effective from 2021 admitted students
6	Environmental Sciences/ Universal Human Values/ Environmental Engineering/ Indian Heritage and Culture/ Constitution of India/ Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses.		

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.

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Course: and any other course as approved by the authorities of the University from time to time.

1) **Civil Engineering**
2) **Electrical and Electronics Engineering**
3) **Mechanical Engineering**
4) **Electronics and Communication Engineering**
5) **Computer Science and Engineering**
6) **Computer Science and Engineering (Data Science)**
7) **Computer Science and Engineering and Business Systems**

Table 2: Credits

Subject	Semester			
	Periods/ Week	Credits	Internal Marks (IM)	External Marks (EM)
Theory	2+1*	3	30	70
Mandatory Learning Courses (Internal Evaluation)	2	-	-	-
Practical	3	1.5	25	50
Drawing	1+4 P	3	30	70
Skill Development Courses (Internal Evaluation)	1+2*	2**	30	70
Summer Internship /CSP Two months (Mandatory) after second year (to be evaluated along with 5th Semester end examinations)/ Community Service Project (Internal Evaluation)	-	1.5	-	100 Certificate from Internship Agency/ signed by any authorized person. Evaluation will be carried as per the guidelines of APSCHE
Industrial/Research Internship Two months (Mandatory) after third year (to be evaluated along with 7th Semester end examinations)	-	3	-	100 Certificate from Internship Agency Evaluation will be carried as per the guidelines of APSCHE *40% for report, 60% Oral Presentation*
Comprehensive Viva (CV) in VII Semester	-	1	-	50
Major Project	-	6	50	100
Technical Seminar	-	1	50	-
6 Months Internship in Industry	-	5	-	Certificate from Internship Agency/ Industry

Note: * Tutorial

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

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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. Comprehensive Viva-Voce (CV) shall be evaluated for 50 marks each and the project work shall be evaluated for 100 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 2 hours. 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 (*only online submission of Assignments will be accepted*) 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). *Out of these two internal tests one internal test for 20 marks will be conducted in online mode.*

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/ Mandatory Learning 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/ Mandatory Learning 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 first semester onwards. The open elective offered in 3-1 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 a 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 I 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 I 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. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept. / Branch & Innovations etc., shall be included in the guidelines issued by AICTE.

4.11. All undergraduate students shall register for Extra - Academic Activity (EAA) such as

a) NCC/NSS

b) Games and Sports

c) Yoga/Meditation

d) Extension Activities

e) Literary/ Cultural Activities

f) Any other which may be offered in future.

A student will be required to participate in an activity for two hours in a week during second and third semesters. 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 behaviour. 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 Semester / year.

4.12. Courses like Environmental Sciences, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as

mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses. **Universal Human Values course** shall be included in the curriculum as credit course in place of any open elective as per the convenience of department.

4.13. Students shall undergo **two mandatory summer internships for a minimum of two months** duration at the end of **second and third** year of the Programme. There shall also be **mandatory 6 months internship** in the **final semester** of the Programme along with the project work and seminar.

4.14. **Curricular Framework for Skill oriented**

i) For skill oriented/skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.

ii) Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

iii) A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

iv) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/ Professional bodies /APSSDC or any other accredited bodies as approved by the concerned BoS.

v) The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.

vi) If a student chooses to take a Certificate Course offered by industries/ Professional bodies/ APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.

vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory

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attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

viii) A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and appropriate grades/marks are to be approved by the University/Academic Council.

4.15. Curricular Framework for Honours Programme

i) Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

ii) A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

iii) Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

iv) In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

v) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

vi) It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

vii) The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

viii) Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

ix) MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

x) The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

xi) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xii) In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiii) Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

4.16. Curricular Framework for Minor Programme:

i) **a)** Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering.

b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IoT track, Machine learning track etc.

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ii) The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc. or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

iii) The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

iv) There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

v) The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

vi) A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) up to the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA up to 3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

vii) A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

viii) Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

ix) In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

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x) Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

xi) A committee should be formed at the level of College/Universities/department to evaluate the Grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

xii) If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xiii) In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiv) Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

INDUSTRIAL COLLABORATIONS (CASE STUDY)

University-Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Universities in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Universities/Institutions (Autonomous) are permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the Universities/Institutions can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs.

Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Universities/Institutions shall also explore the possibilities of collaborations with major Industries in the core sectors and professional bodies to create specialized domain skills.

4.17. All the students have to undergo three mandatory internships namely

    i)   Summer internship (During 2nd year break)

    ii)   Industrial/ Research internship (During 3rd year break)

    iii) 6 Months internship in industry (During 8th Semester)

        The student has to (mandatory) undergo summer internship in II year–II Sem break in a reputed organization for two months. The finalization of the internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the principal for approval. The outcome of the summer internship will be evaluated during the 5th semester which carries 1.5 credits. The student has to undergo research/ industry internship in III year –II Semester break for a period of two months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the principal for approval. The outcome of the research/industry internship will be evaluated during 7th semester which carries 3 credits. The student has to undergo 6 months internship in IV Year, II Semester for a complete period of 6 months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the principal for approval. The outcome of the research/industry internship will be evaluated during 7th semester which carries 3 credits. Certificate from the organization has to be submitted to this effect attested by HOD and Internship in charge to the academic section before the commencement of 3-2 semester.

4.18. 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 answer 5 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 comprehensive Viva-Voce examination at the end of 7th semester. Comprehensive Viva 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.

5.7. The project topic should be approved by Internal Department Committee (IDC) / Identified by organization where the student is carrying out 6 months internship. Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 marks for the End Semester Examination. The evaluation of project work shall be conducted at the end of the IV Year, II-Semester. The external 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 one technical seminar (25 marks) and remaining 25 for main project related activities. 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.

5.8. For all practical /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.

5.9. **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

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maximum of revaluation and regular end examination grade will be awarded for that subject. Student can apply for revaluation in a subject only once.

Table 4: Distribution of weightages for examination and evaluation

S.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	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.
4	Comprehensive Viva (CV)	50	External evaluation		This end viva-voce examination in all the subjects for 50 marks
5	Project work	50	Internal evaluation		Project work for 50 marks
		100	External evaluation		This end viva-voce in project work for 100 marks
6	Skill Oriented Courses/ Skill Advanced Courses/ Soft Skill Courses	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.

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		70	Internal Evaluation	Based on the performance in the end examination.
7	Internship/ Internal Project/ Study Report/ Work shop	100	Internal evaluation	As per the Guidelines of APSCHE
8	Mandatory Learning Courses	-	-	No examinations. Attendance minimum is required.
9	EAA	-	Internal evaluation	Based on performance and committee report.
10	Technical Seminar	50	Internal Evaluation	Based on Seminar Report, performance and committee report.

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 <u>NO</u> 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 to the college.

6.7. A student is eligible to write the University examinations if he acquires a minimum of 50% in each subject and 75% of attendance in aggregate of all the subjects after Condonation. In case of the student having less than 50% of attendance in any one of the courses (**One subject / lab only**) during that particular semester, he/she will not be permitted to register and appear for that particular course in that particular semester end examinations. In such cases, the students need to register for makeup classes which will be notified by the CoE office after the completion of that particular semester or at appropriate time whichever is applicable. The students need to secure **90%** of the attendance in the make-up classes to appear for the supplementary examinations thereafter and this will be treated as a second attempt. The number of makeup classes to be conducted will be at least 35% of the regular class work taken in that particular course. **If the attendance is less than 50% in more than one subject/lab he/she will be completely detained in that semester.**

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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 Courses or project if he secures not less than 35% of marks in the End Examination (If applicable)) 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 50% (41 credits out of 82) 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 50% (62.5 credits out of 125) 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 year to III year	82	41
III year to IV year	125	62.5

7.4. The student shall register and put up minimum attendance in all 160 credits and earn 160 credits. Grades obtained in 160 credits 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	Sem	No. of Subjects — CSE/ CSE(DS) /CSE&BS/ EEE	No. of Subjects — ECE/ CE/ Mech.	Number of Labs — CSE/ CSE(DS) / CSE&BS/ EEE	Number of Labs — ECE/ CE/ Mech.	Total credits	
First	I	1) BSC - LA&AC 2) BSC - AP 3) ESC - PSP 4) ESC - BEE/BEE/BEE/FED 5) ESC - ED	1) BSC - LA &DE/ LA&AC/ LA&AC 2) BSC - MEC/AC/AC 3) ESC - PSP 4) ESC - FEE/EM /ED 5) HSS - English	1) ESC Lab - E&ITW 2) BSC Lab – EP Lab 3) ESC Lab - PSP	1) HSS Lab - DEL Lab 2) BSC Lab - EC Lab 3) ESC Lab - PSP Lab	Subjects - 5X3 = 15 Labs - 3X1.5 = 4.5	19.5
	II	1) BSC - DE&VC 2) BSC - MEC 3) ESC - DS 4) ESC - MFCS/MFCS/MFCS/BEE 5) HSS - English 6) ML - ES	1) BSC - AC&TT/ DE&VC 2) BSC - AP/ EP/ EP 3) ESC - DS 4) ESC - NWA/ BEEE/ MS 5) ESC - ED/ ED/ BEM 6) ML - ES	1) HSS Lab - DEL Lab 2) BSC Lab - EC Lab 3) ESC Lab - DS Lab	1) ESC Lab - E&ITW 2) BSC Lab - EP Lab 3) ESC Lab - DS Lab	Subjects - 5X3 = 15 ML – No Credits Labs - 3X1.5 = 4.5	19.5
Second	I	1) BSC 2) PCC 3) PCC 4) PCC 5) PCC 6) SOC 7) ML	1) BSC 2) PCC 3) PCC 4) PCC 5) PCC 6) SOC 7) ML	1) PCC Lab 2) PCC Lab 3) PCC Lab	1) PCC Lab 2) PCC Lab 3) PCC Lab	Subjects - 5X3 = 15 SOC - 1x2 = 2 ML – No Credits Labs - 3X1.5 = 4.5 EAA - No Credits	21.5
	II	1) ESC 2) BSC/PCC 3) PCC 4) PCC 5) HSS 6) SOC	1) ESC 2) BSC/PCC 3) PCC 4) PCC 5) HSS 6) SOC	1) ESC/PCC - Interdisciplinary Lab 2) PCC Lab 3) PCC Lab	1) ESC/PCC – Interdisciplinary Lab 2) PCC Lab 3) PCC Lab	Subjects - 4X3 = 12 HSS – 1X3 =3 SOC - 1x2 = 2 ML – No Credits Labs - 3X1.5 = 4.5	21.5
Third	I	1) PCC 2) PCC 3) PCC 4) OEC/JOE 5) PEC 6) SAC/SSC 7) ML	1) PCC 2) PCC 3) PCC 4) OEC/JOE 5) PEC 6) SAC/SSC 7) ML	1) PCC Lab 2) PCC Lab 3) Summer Internship/CSP	1) PCC Lab 2) PCC Lab 3) Summer Internship/CSP	Subjects - 3X3 = 9 OEC/JOE - 1X3 = 3 PEC – 1X3 = 3 SAC/SSC - 1x2 = 2 ML – No Credits Labs - 2X1.5 = 3 Internship - 1X1.5=1.5	21.5
	II	1) PCC 2) PCC 3) PCC 4) PEC 5) OEC/JOE 6) SAC/SSC 7) ML	1) PCC 2) PCC 3) PCC 4) PEC 5) OEC/JOE 6) SAC/SSC 7) ML	1) PCC Lab 2) PCC Lab 3) PCC Lab	1) PCC Lab 2) PCC Lab 3) PCC Lab	Subjects - 3X3 = 9 PEC – 1X3 = 3 OEC/JOE - 1X3 = 3 SAC/SSC - 1x2 = 2 ML - No Credits Labs - 3x1.5 = 4.5	21.5
Fourth	I	1) PEC 2) PEC 3) PEC 4) OEC/JOE 5) OEC/JOE 6) SAC/SSC 7) HSSE	1) PEC 2) PEC 3) PEC 4) OEC/JOE 5) OEC/JOE 6) SAC/SSC 7) HSSE	1) Industrial/ Research Internship 2) CVV	1) Industrial/ Research Internship 2) CVV	PEC - 3X3 = 9 OEC/JOE - 2X3 = 6 SAC/SSC - 1X2 = 2 HSSE - 1X2 = 2 Internship - 1X3 = 3 CVV - 1X1 = 1	23
	II	1) Technical Seminar 2) Internship in Industry 3) Major Project	1) Technical Seminar 2) Internship in Industry 3) Major Project			Seminar - 1X1 = 1 Internship - 1X5 = 5 Project - 1X6 = 6	12
						Total Credits	160

Note-1:
1) BSC – Basic Science Course
2) ESC – Engineering Science Course
3) HSS – Humanities and Social Science
4) ML – Mandatory Learning Course
5) SOC – Skill Oriented Course
6) SAC – Skill Advanced Course
7) PCC – Professional Core Courses
8) PEC – Professional Elective Course
9) OEC – Open Elective Course
10) JOE – Job Oriented Elective
11) SSC – Soft Skill Course
12) CSP – Community Service Project

Note-2: **Mandatory Learning Courses**
1) EC - Environmental Science
2) UHV - Universal Human Values
3) IHC - Indian Heritage and Culture
4) CI - Constitution of India

Note-3: 1) Summer Internship Two months (Mandatory) after Second Year (to be evaluated during 5th Semester).

2) Industrial/Research Internship Two months (Mandatory) after Third Year (to be evaluated during 7th Semester).

3) Internship in Industry (during 8th Semester)

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.

10.0 With-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.

11.0 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:

Table 7: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	CGPA Secured from 160 Credits
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 to < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 to < 6.5	
Pass Class	Below 50% but not less than 40%	Pass	≥ 4 to < 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.

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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	Outstanding
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 Oriented/ Skill Advanced/ 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.

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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 semesters under consideration. TC_j the total number of credits for a jth semester and GPA_j is the Grade Point Average of the jth 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 / ML / 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.

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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".

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Academic Regulations for B.Tech. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2021-2022 onwards)

1.0 The students have to acquire a minimum of 121 credits out of 121 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 43 credits out of 86 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 121 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	
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	CGPA secured from 121 Credits
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 to < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 to < 6.5	
Pass Class	Below 50% but not less than 40%	Pass	≥ 4 to < 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).

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INSTITUTE VISION

❖ To develop this rural based engineering college into an institute of technical education with global standards

❖ To become an institute of excellence which contributes to the needs of society

❖ To inculcate value based education with noble goal of "Education for peace and progress"

INSTITUTE MISSION

❖ To build a world class undergraduate program with all required infrastructure that provides strong theoretical knowledge supplemented by the state of art skills

❖ To establish postgraduate programs in basic and cutting edge technologies

❖ To create conductive ambiance to induce and nurture research

❖ To turn young graduates to success oriented entrepreneurs

❖ To develop linkage with industries to have strong industry institute interaction

❖ To offer demand driven courses to meet the needs of the industry and society

❖ To inculcate human values and ethos into the education system for an all-round development of students

INSTITUTE QUALITY POLICY

❖ To improve the teaching and learning

❖ To evaluate the performance of students at regular intervals and take necessary steps for betterment

❖ To establish and develop centers of excellence for research and consultancy

❖ To prepare students to face the competition in the market globally and realize the responsibilities as true citizen to serve the nation and uplift the country's pride.

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VISION OF THE DEPARTMENT

❖ To be an outstanding department devoted to provide value based education in Civil Engineering which will produce socially aware professionals to provide solutions of global standards.

MISSION OF THE DEPARTMENT

❖ To impart quality education that develops innovative professionals with research orientation and entrepreneurs.

❖ To prepare professionals with emphasizes on leadership, team work and ethical conduct.

❖ To undertake collaborative projects and consultancy works with academia and industry.

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<u>Program Outcomes (POs)</u>

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Program Educational Objectives (PEOs)

PEO-1: Assessing societal needs and plan suitable infrastructure.

PEO-2: Excel in Civil Engineering and in other allied fields.

PEO-3: Develop team spirit and inter personal dynamics for effective execution and management of projects.

PEO-4: Adhering life-long learning skills and adopt to changing professional and societal needs.

Program Specific outcomes (PSOs)

PSO-I: Capability to investigate, plan, analyze and design buildings for different purposes such as residential, commercial, public office, recreational etc. using STAAD Pro and relevant software.

PSO-II: Competency in preliminary engineering surveys, planning and design of infrastructure viz. roads, bridges and designing traffic control systems etc. using Mx-Roads and other relevant software programs.

PSO-III: Conduct field and laboratory tests for analysis and quality control of civil engineering projects.

Note: Program Outcomes (POs) and Program Specific Outcomes (PSOs) are mapped with Course Outcomes (COs) and they are correlated in following levels

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

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I B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Theory	Tutorial	Lab	Credits	Internal	External	Total
		Hours/Week				Marks		
THEORY SUBJECTS								
A0001201	Linear Algebra and Advanced Calculus	2	1	0	3	30	70	100
A0002201	Applied Chemistry	2	1	0	3	30	70	100
A0501201	Problem Solving and Programming	2	1	0	3	30	70	100
A0101201	Engineering Mechanics	2	1	0	3	30	70	100
A0003201	English for Engineers	2	1	0	3	30	70	100
PRACTICALS								
A0091201	Digital English Language Lab	0	0	3	1.5	25	50	75
A0092201	Engineering Chemistry Lab	0	0	3	1.5	25	50	75
A0591201	Problem Solving and Programming Lab	0	0	3	1.5	25	50	75
	Total	**10**	**5**	**9**	**19.5**	**225**	**500**	**725**

I B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Theory	Tutorial	Lab	Credits	Internal	External	Total
		Hours/Week				Marks		
THEORY SUBJECTS								
A0007202	Differential Equations and Vector Calculus	2	1	0	3	30	70	100
A0009202	Engineering Physics	2	1	0	3	30	70	100
A0502202	Data Structures	2	1	0	3	30	70	100
A0203202	Basics Electrical & Electronics Engineering	2	1	0	3	30	70	100
A0301201	Engineering Drawing	1	0	4	3	30	70	100
MANDATORY LEARNING COURSE								
A0010202	Environmental Science	2	0	0	0	0	0	0
PRACTICALS								
A0592201	Engineering Workshop & IT Workshop	0	0	3	1.5	25	50	75
A0093201	Engineering Physics lab	0	0	3	1.5	25	50	75
A0593202	Data Structures Lab	0	0	3	1.5	25	50	75
	Total	**11**	**4**	**13**	**19.5**	**225**	**500**	**725**

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II B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Theory	Tutorial	Lab	Credits	Internal	External	Total
THEORY SUBJECTS								
A0011203	Numerical Methods & Probability Theory	2	1	0	3	30	70	100
A0102203	Strength of Materials	2	1	0	3	30	70	100
A0103203	Surveying	2	1	0	3	30	70	100
A0104203	Fluid Mechanics	2	1	0	3	30	70	100
A0105203	Building Materials & Constructions	2	1	0	3	30	70	100
SKILL DEVELOPMENT COURSE								
A0012203	Design Thinking and Innovations	1	2	0	2	30	70	100
MANDATORY LEARNING COURSE								
A0022203	Constitution of India	2	0	0	0	0	0	0
PRACTICALS								
A0191203	Surveying Lab	0	0	3	1.5	25	50	75
A0192203	Strength of Materials Lab	0	0	3	1.5	25	50	75
A0193203	Building Planning & Drawing Lab	0	0	3	1.5	25	50	75
	Total	13	7	9	21.5	255	570	825

II B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Theory	Tutorial	Lab	Credits	Internal	External	Total
THEORY SUBJECTS								
A0504203	Python Programming	2	1	0	3	30	70	100
A0106204	Hydraulics and Hydraulic Machines	2	1	0	3	30	70	100
A0107204	Structural Analysis	2	1	0	3	30	70	100
A0108204	Concrete Technology	2	1	0	3	30	70	100
A0017203	Managerial Economics and Financial Analysis	2	1	0	3	30	70	100
SKILL DEVELOPMENT COURSE								
A0019203	Aptitude Arithmetic Reasoning and Comprehension	1	2	0	2	30	70	100
PRACTICALS								
A0571203	Python Programming Lab	0	0	3	1.5	25	50	75
A0393203	Fluid Mechanics and Hydraulic Machines Lab	0	0	3	1.5	25	50	75
A0194204	Concrete Technology Lab	0	0	3	1.5	25	50	75
	Total	11	7	9	21.5	255	570	825

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III B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Theory	Tutorial	Lab	Credits	Internal	External	Total
		Hours/Week				Marks		
THEORY SUBJECTS								
A0109205	Design of Reinforced Concrete Structural Elements	2	1	0	3	30	70	100
A0110205	Hydrology and Water Resources Engineering	2	1	0	3	30	70	100
A0111205	Geotechnical Engineering	2	1	0	3	30	70	100
OPEN ELECTIVE-I/JOB ORIENTED COURSE								
A0112205	Geo informatics							
A0113205	Smart Cities	2	1	0	3	30	70	100
A0114205	Road Safety Audit							
A0115205	Building Information Modelling							
PROFESSIONAL ELECTIVE-I								
A0116205	Advanced Structural Analysis							
A0117205	Open Channel Hydraulics	2	1	0	3	30	70	100
A0118205	Advanced Land Measurement Techniques							
A0119205	Experimental Stress Analysis							
SKILL DEVELOPMENT COURSE								
A0120205	Construction Technology and Planning Management	1	2	0	2	30	70	100
PRACTICALS								
A0195205	CAD Lab	0	0	3	1.5	25	50	75
A0196205	Geotechnical Engineering Lab	0	0	3	1.5	25	50	75
A0023205	Community Service Project/Summer Internship	0	0	3	1.5	0	100	100
	Total	**11**	**7**	**9**	**21.5**	**230**	**620**	**850**

III B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Theory	Tutorial	Lab	Credits	Internal	External	Total
		Hours/Week				Marks		
THEORY SUBJECTS								
A0121206	Design of Steel Structural Elements	2	1	0	3	30	70	100
A0122206	Environmental Engineering	2	1	0	3	30	70	100
A0123206	Transportation Engineering	2	1	0	3	30	70	100
OPEN ELECTIVE-II/JOB ORIENTED COURSE/MOOCs								
A0124206	Maintenance and Repair of Buildings							
A0151207	Soil Dynamics and Machine Foundations	2	1	0	3	30	70	100
A0152207	Ground Water Development and Management							
A0153207	Cost Effective Housing Techniques							
PROFESSIONAL ELECTIVE-II								
A0125206	Advanced Geotechnical Engineering							
A0126206	Prestressed Concrete	2	1	0	3	30	70	100
A0127206	Hydraulic Structures							
A0128206	Bridge Engineering							
SKILL DEVELOPMENT COURSE								
A0529206	Basics of Java Programming	1	2	0	2	30	70	100
MANDATORY LEARNING COURSE								
A0014203	Indian Heritage and Culture	2	0	0	0	0	0	0
PRACTICALS								
A0197206	Geographical Information System Lab	0	0	3	1.5	25	50	75
A0198206	Environmental Engineering Lab	0	0	3	1.5	25	50	75
A0199206	Transportation Engineering Lab	0	0	3	1.5	25	50	75
	Total	**13**	**7**	**9**	**21.5**	**255**	**570**	**825**

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IV B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Theory	Tutorial	Lab	Credits	Internal	External	Total
PROFESSIONAL ELECTIVE-III								
A0129207	Design and Drawing of Irrigation Structures	2	1	0	3	30	70	100
A0130207	Railways, Docks & Harbor Engineering							
A0131207	Intelligent Transportation System							
A0132207	Ground Improvement Techniques							
PROFESSIONAL ELECTIVE-IV								
A0133207	Estimation, Costing & Valuation	2	1	0	3	30	70	100
A0145207	Pavement Analysis and Design							
A0136207	Rehabilitation of Structures							
A0144207	Advanced Structural Design							
PROFESSIONAL ELECTIVE-V/MOOCs								
A0137207	Industrial Waste and Waste Water Management	2	1	0	3	30	70	100
A0138207	Fire Safety Engineering Design of Structures							
A0140207	Water Resources System Planning and Management							
A0143207	Earthquake Resistant Design							
OPEN ELECTIVE-III/JOB ORIENTED COURSE								
A0141207	Finite Element Methods in Civil Engineering	2	1	0	3	30	70	100
A0142207	Global Warming and Climate change							
A0134207	Disaster Preparedness and Planning Management							
A0135207	Environmental Impact Assessment and Management							
OPEN ELECTIVE-IV/JOB ORIENTED COURSE								
A0139207	Water Shed Management	2	1	0	3	30	70	100
A0146207	Construction Methods & Equipment							
A0147207	Urban Transportation Planning							
A0148207	Traffic Engineering							
SKILL DEVELOPMENT COURSE								
A0149207	Numerical Methods in Civil Engineering	1	2	0	2	30	70	100
HUMANITIES AND SOCIAL SCIENCE								
A0150207	Green Buildings	2	0	0	2	30	70	100
MANDATORY LEARNING COURSE								
A0015203	Universal Human Values	2	0	0	0	0	0	0
A0094207	Comprehensive Viva	0	0	0	1	0	50	50
A0095207	Industrial / Research Internship	0	0	0	3	0	100	100
	Total	**15**	**7**	**0**	**23**	**210**	**640**	**850**

IV B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject Hours/Week	Theory	Tutorial	Lab	Credits	Internal	External	Total
A0096208	Technical Seminar	0	0	0	1	50	0	50
A0097208	Internship in Industry	0	0	0	5	0	100	100
A0098208	Major Project	0	0	0	6	50	100	150
	Total	**0**	**0**	**0**	**12**	**100**	**200**	**300**

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DEPARTMENT OF CIVIL ENGINEERING

I B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0001201) LINEAR ALGEBRA AND ADVANCED CALCULUS
For branches: CE, EEE, ME, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- ❖ To familiarize the concepts of matrices and mean value theorems and their applications in engineering.
- ❖ To equip the students to solve various application problems in engineering through evaluation of Gamma, Beta functions and multiple integrals etc.,

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 Network analysis, encoding and decoding in Cryptography and Quantum mechanics problems.
- ❖ Apply the concept of Gamma and Beta functions in 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 OF COs & POs:

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

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

UNIT-II
Eigen Values, Eigen vectors-Properties-Cayley-Hamilton Theorem-Inverse and Power of a matrix by Cayley-Hamilton theorem.

UNIT-III
Quadratic forms: Linear Transformation-Reduction of quadratic form to canonical form and their nature (Rank, Signature and Index).

UNIT-IV
Mean value theorems: Rolle's Theorem-Lagrange's Mean Value Theorem-(excluding proof). Simple examples of Taylor's and Maclaurin's Series.
Functions of several variables-Jacobian-Maxima and Minima of functions of two variables - Lagrange method of Multipliers with three variables only.

UNIT-V
Multiple integrals:-Evaluation of Double integrals (Cartesian and Polar)-Change of Variables-Change of order of Integration-Changing into Polar coordinates-Evaluation of triple integrals.

UNIT-VI
Special functions: Gamma function-Properties-Beta function-properties-Relation between

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Gamma and Beta functions-Evaluation of Integrals using Gamma & Beta functions.

TEXTBOOKS
1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
2) R. K. Jain, S. R .K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
3) T.K.V. Iyengar, B. Krishna Gandhi, A Text Book of Engineering Mathematics, Vol-I, S. Chand & Company.

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) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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DEPARTMENT OF CIVIL ENGINEERING

I B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0002201) APPLIED CHEMISTRY
For branches: CE & ME

COURSE OBJECTIVES:
- ❖ To impart the concept of soft and hard waters, softening methods of hard water.
- ❖ To train the students on the concepts and applications of electrochemistry.
- ❖ To provide an understanding of the corrosion principles and engineering methods used to minimize and prevent the corrosion.
- ❖ To learn about the properties of refractory materials.
- ❖ The course provides an introduction to polymer chemistry based on synthesis mechanisms associated with chain-growth and step-growth.
- ❖ To acquire knowledge about types of fuels, liquid and gaseous fuels.

COURSE OUTCOMES:
At the end of the course, the students will be able to
- ❖ Identify and apply suitable water softening techniques (L1)
- ❖ Apply the principles of some electrochemical techniques and electrodes (L3)
- ❖ Demonstrate the corrosion prevention methods and factors affecting corrosion (L2)
- ❖ Explain the preparation, properties, thermoplastics & elastomers (L2)
- ❖ Explain the preparation, setting and hardening of cement (L2)
- ❖ Explain calorific value, octane number, refining of petroleum (L2)

MAPPING OF COs & POs:

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

UNIT-I   WATER TECHNOLOGY
Introduction-Soft Water 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)–Boiler troubles (Priming and foaming, scale and sludge, Boiler Corrosion, Caustic Embrittlement).

UNIT-II   ELECTROCHEMISTRY AND APPLICATIONS:
Introduction– Conductance, Specific conductance, Equivalent Conductance and molar conductance-Determination of equivalent conductance by Wheatstone bridge method-Conductometric titrations (acid-base titrations) –Numerical Problems on conductance – Electrodes –Reference electrode (Standard hydrogen electrode)-Daniel Cell.

UNIT-III   CORROSION:
Definition –Theories of Corrosion (Direct chemical attack type of corrosion, electrochemical type of corrosion and their mechanisms)-Types of corrosion: (galvanic & pitting)-Factors affecting the rate of the corrosion-proper design and material selection –Cathodic protection.

UNIT-IV   ADVANCED ENGINEERING MATERIALS
Refractories- Classification, Properties and its Applications, Reasons for failure of the refractory materials. Cement: Introduction, classification, Types of cement, Composition of cement, Preparation of Portland cement, setting and hardening of the cement.

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UNIT-V   POLYMER TECHNOLOGY

Classification of polymers-Functionality-Chain growth, step growth polymerization and Copolymerization with specific examples-Mechanisms of additional polymerization.

Plastics**:** Preparation, properties and applications of PVC, Teflon and Bakelite. Elastomers: Buna-S and Buna-N preparation, properties and applications.

UNIT-VI   CHEMISTRY OF FUELS:

Introduction –Types of fuels-Calorific value-Numerical problems based on calorific value. Solid Fuels: Analysis of coal-Proximate and Ultimate analysis.

Liquid Fuels: Extraction of petroleum, knocking, Octane and Cetane number. Gaseous Fuels: Producer gas, water gas and biogas.

TEXT BOOKS
1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 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. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

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I B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0501201) PROBLEM SOLVING AND PROGRAMMING
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- ❖ Introduce the internal parts of a computer, and peripherals.
- ❖ Introduce the Concept of Algorithm and use it to solve computational problems
- ❖ Identify the computational and non-computational problems
- ❖ Teach the syntax and semantics of a C Programming language
- ❖ Demonstrate the use of Control structures of C Programming language
- ❖ Illustrate the methodology for solving Computational problems

COURSE OUTCOMES:
- ❖ Construct his own computer using parts (L6).
- ❖ Recognize the importance of programming language independent constructs (L2)
- ❖ Solve computational problems (L3)
- ❖ Select the features of C language appropriate for solving a problem (L4)
- ❖ Design computer programs for real world problems (L6)
- ❖ Organize the data which is more appropriated for solving a problem (L6)

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-I
Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Learning Outcomes:
Student should be able to:
1. Identify the different peripherals, ports and connecting cables in a PC (L2)
2. Illustrate the working of a Computer (L3)
3. Select the components of a computer in the market and assemble a computer (L4)
4. Solve complex problems using language independent notations (L3)

UNIT-II
Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

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Learning Outcomes:
Student should be able to:
1. Solve Computational problems (L3)
2. Apply Algorithmic approach to solving problems (L3)
3. Analyze the algorithms (L4)

UNIT-III

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

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.

Learning Outcomes: Student should be able to
1. Understand keywords, data types in C (L2)
2. Use various operators in C program (L6)
3. Apply type conversions and also understand, Analyze precedence and associativity (L2)

UNIT-IV

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.

Learning Outcomes:
Student should be able to:
1. Select the control structures for solving the problem (L4)
2. Apply statements for solving the problem (L3)
3. Understand the statements in C language (L2)

UNIT-V

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 and functions.

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

Learning Outcomes:
Student should be able to:
1. Design and develop C programs using functions and arrays. (L6)
2. Apply modular approach for solving the problem (L3)
3. Understand and apply various string handling functions (L2)

UNIT-VI

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.
Storage Classes, pre-processor directives.

Learning Outcomes:
Student should be able to:
1. Describe the Files types and File operations. (L2)
2. Practice Command line arguments. (L3)
3. Perform Error handling in Filerelated programming in C.(L4)

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TEXT BOOKS

1. PradipDey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.

REFERENCE BOOKS

1) P.Chenna Reddy, " Computer Fundamentals and C Programming" 2018, BS Publications
2) RS Bichkar" Programming with C", 2012, Universities Press.
3) PelinAksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.

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

(A0101201) ENGINEERING MECHANICS

COURSE OBJECTIVES:
- ❖ To provide an insight in analyzing force systems (including dry frictional forces) to find resultant, reactions, if the force system is in equilibrium or motion of the particle or system of particles.
- ❖ To provide an insight in analyzing perfect frames.
- ❖ To provide an insight in evaluation of Centroid of lines, areas & volumes and moment of inertia & product of inertia of areas.
- ❖ To provide an insight in evaluation of center of gravity of bodies.

COURSE OUTCOMES:
After the completion of the course the students will be able to:
- ❖ Analyze the force system (including dry frictional forces) acting on body to find resultant or reactions, if the force system is in equilibrium.
- ❖ Analyze perfect frame or truss to find the unknown forces in all the members.
- ❖ Analyze force system involving dry friction.
- ❖ Find Centroid of given line, area & volume. Find moment of inertia of composite areas.
- ❖ 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-I   INTRODUCTION
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-II   ANALYSIS OF PERFECT FRAMES
Introduction, Perfect, Deficit and Redundant Trusses, Assumptions, Nature of Forces in Members, Methods of Analysis, Method of Joints, Method of Sections.

UNIT-III   FRICTION
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-IV   CENTROID AND CENTER OF GRAVITY
Centroid, Center of Gravity, Difference between Centroid & Center of Gravity, Centroid of simple figures: Rectangle, Triangle, Semi & Quarter circle. Centroid of composite figures - T Section, I Section, Angle Section, Hollow Section. Center of Gravity of Bodies: Cone, Solid Hemisphere. Center of Gravity of Composite figures using Pappu's theorem. (Simple problems).

UNIT-V   MOMENT OF INERTIA
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.

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UNIT-VI   DYNAMICS

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

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I B.Tech, I-Sem (CE)

	L	T	C
	2	1	3

(A0003201) ENGLISH FOR ENGINEERS
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- ❖ English for Engineers is prescribed to make students communicate their thoughts, opinions and ideas freely in real life situations.
- ❖ To improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- ❖ To equip students with professional skills & soft skills
- ❖ Develop Communication skills in formal and informal situations.

COURSE OUTCOMES:
- ❖ Students will be able to use creativity in writing such as E-mails, Reports, Resume writing and Info- Graphics to enhance engineering abilities
- ❖ Students will analyze the concepts of critical and analytical Reading skills to understand needs of engineering in society by using modern tools
- ❖ Students will be able to develop flair for any kind of writing with rich vocabulary to enhance communicative skills
- ❖ Students will understand the basic Grammar techniques and utilize it for language development
- ❖ Students will apply the strategies of Soft skills & Ethical components

MAPPING OF COs & POs:

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

UNIT- I
a) Reading: Skimming the text for theme
   Reading Text: Engineering in Society by Sarah Bell
b) Grammar: Types of Sentences - Demonstratives- Articles- Prepositions
c) Writing: Paragraph Writing & Practice
d) Vocabulary: Root words - Word lists from Word power Made Easy by Norman Lewis
   Method of Teaching: Analyzing the theme of Reading Prescribed Text, Worksheets on Articles & Prepositions, Assignment on Short paragraphs, Vocabulary activities through worksheets.

UNIT-II
a) Reading: Scanning the text for specific details Reading Text: Sultana's Dream by Begum Rokeya
b) Grammar: Tenses & Usage
c) Writing: Formal Letters and E-mail writing-Tips & Practice
d) Vocabulary: Homonyms - Word lists & Practice
   Method of Teaching: Classroom discussion &critical appreciation of the Reading Lesson, Worksheets on Tenses, Practice of Formal Letters, Vocabulary Quizzes-Assignment.

UNIT-III
a) Reading: Note-making (identifying the main ideas and making notes) Reading text: Satya Nadella: When Empathy is Good for Business https://www.morningfuture.com

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    b) Grammar: Framing questions –Wh Qs - Yes/No questions - Question Tags
    c) Writing: Resume & Cover letter Writing- Tips &Practice
    d) Vocabulary: Synonyms & Antonyms
       Method of teaching: Class room Discussions, Student Activity on Questions, E-mail writing, Vocabulary activities through games- Practice- Assignment.

UNIT-IV
    a) Reading: Summarizing
       Reading Text: Life is a Pizza by Richard Templar from Rules of Life
    b) Grammar: If Clauses-Usage & Practice
    c) Writing: Writing Definitions-Process of Writing - Tips & Practice
    d) Vocabulary: Idioms & Phrases- Practice
       Method of Teaching: Discussion & Assignment, If Clauses from Newspapers, Preparing profiles for Resume, Vocabulary activities through worksheets

UNIT-V
    a) Reading: Intensive reading (reading for every detail)
       Reading text: What is a Drone: Main Features & Applications of Today's Drones by Jack Brown
    b) Grammar: Active Voice –Passive Voice- Usage
    c) Writing: Report Writing- Types - Practice
    d) Vocabulary: Technical Terms- Word Lists- Practice
       Method of Teaching: Assignment on Drones, Worksheets on Active/ Passive voice, watch a Documentary on social issues and draft a Report, Technical Terms- Quiz.

UNIT-VI
    a) Reading: Appreciating a poem (focus on genre)
       Reading text: Where the mind is without fear by Rabindranath Tagore
    b) Grammar: Direct & Indirect Speech - Common Errors- Practice
    c) Writing: Info-Graphics- Types- Practice
    d) Vocabulary: Foreign Derived Words- Word Lists from Norman Lewis Word Power Made Easy Method of teaching: Learner's interaction on the poem, Practicing Grammar through on-line tests, practice reading and understanding graphs, Quiz & worksheets.

REFERENCE TEXTS
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) Technical Communication, Principles and Practice by Meenakshi Raman & Sangeetha Sharama, Oxford University Press, 2016
4) Word Power Made Easy by Norman Lewis, Goyal Publications.
5) 4000 Essential English Words 3 by Paul Nation, Compass Publishing, 2009.
6) GRE/TOEFL Sources to teach vocabulary

ONLINE SOURCES FOR PRESCRIBED READING TEXTS
1) https://www.morningfuture.com
2) https://www.raeng.org.uk/publications/reports/engineering-in-society
3) https://digital.library.upenn.edu/women/sultana/dream/dream.html, https://www.mydronelab.com/blog/what-is-a-drone.html
4) https://www. Freealbaab.free.fr › The Rules of Life PDF
5) https://www.poetryfoundation.org ›Gitanjali 35 by Rabindranath Tagore | Poetry Foundation

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ONLINE SOURCES FOR PRESCRIBED LISTENING SKILLS

1) https://learnenglish.britishcouncil.org/skills/listening
2) https://agendaweb.org/listening/comprehension-exercises.html
3) https://www.123listening.com/
4) https://www.linguahouse.com/learning-english/skill-4-learners/listening
5) https://www.talkenglish.com/listening/listen.aspx
6) https://ed.ted.com/

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I B.Tech, I-Sem (CE)

P	C
3	1.5

(A0091201) DIGITAL ENGLISH LANGUAGE LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

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

EXERCISE-II
a) Diphthongs - Consonants - Phonetic Transcription - CALL Lab
b) Just A Minute (JAM) - ICS Lab

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

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

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EXERCISE-V
   a) Situational Dialogues - CALL Lab
   b) Role Play **-** ICS Lab

EXERCISE-VI
   a) Pronunciation Evaluation Testing Exercises through EPD - CALL Lab
   b) Group Discussion **-** ICS Lab
      • Any student-based activities

PRESCRIBED SOFTWARE
K-VAN Solutions (licensed software)
   1) Advance Communication Skills Lab
   2) English Language Communication Skills Lab
   3) Cambridge Advanced Learners' English Dictionary with CD
   4) 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.

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DEPARTMENT OF CIVIL ENGINEERING

I B.Tech, I-Sem (CE)

P	C
3	1.5

(A0092201) ENGINEERING CHEMISTRY LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- ❖ 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)
- ❖ prepare simple and advanced polymer materials (L2)
- ❖ Measure the concentration of the solutions by conductometric titrations (L3)
- ❖ Analyze the IR and UV-Visible Spectra of some organic compounds (L3)

MAPPING OF COs & POs:

:CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	1	-	-	-	-	1	-	-	1
CO2	-	2	1	-	2	1	1	1	-	-	1	-
CO3	-	1	-	-	1	-	1	-	1	-	-	1
CO4	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 Ferrous Ion by Dichrometry.

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) Preparation of a simple polymer (PVC)

12) Preparation of Bakelite

13) Thin layer chromatography

14) Identification of simple organic compounds by IR and UV-Visible Spectroscopy graphs.

15) HPLC method in separation of liquid mixtures.

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DEPARTMENT OF CIVIL ENGINEERING

I B.Tech, I-Sem (CE)

	P	C
	3	1.5

(A0591201) PROBLEM SOLVING AND PROGRAMMING LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
❖ 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:

	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 REQUIREMENTS:
Intel based desktop PC with ANSI C Compiler and Supporting Editors

EXERCISE 1
a) Write a C program to demonstrate various operators used in C language.

EXERCISE 2
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 3
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 4
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)]

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EXERCISE 5
   a) Write a C Program to mask the most significant digit of the given number.
   b) Write a program which Prints the following pattern

EXERCISE 6
   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 7
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 8
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 9
   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 10
   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 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.

EXERCISE 13
   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.

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

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I B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0007202) DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
For branches: CE, EEE, ME, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- ❖ To familiarize the concepts of ordinary and partial differential equations.
- ❖ To equip the students to analyze vector differentiation and the evaluation of line, surface and volume integrals and their applications in electromagnetic theory, transmission lines etc.,

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:

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

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

UNIT-IV
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-V
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-Properties of Grad, Div and Curl.

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UNIT-VI

Vector integration: Line integral - Potential function-Area, Surface and volume integrals. Vector integral theorems: Green's theorem-Stoke's and Gauss Divergence Theorem (excluding their proof), Verification of Green's, Stoke's and Gauss Theorems.

TEXTBOOKS
1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
2) R. K. Jain, S. R.K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
3) T.K.V. Iyengar, B. Krishna Gandhi, A Text Book of Engineering Mathematics, Vol-1, S. Chand & Company.

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) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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I B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0009202) ENGINEERING PHYSICS
For branches: CE & ME

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 student will be able to:
- ❖ Apply the concept of light to test the material properties
- ❖ Construct a quantum mechanical model to explain the behavior 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-I   WAVE OPTICS
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-II   QUANTUM MECHANICS
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-III   THE CRYSTAL STRUCTURE OF SOLIDS
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-IV   ULTRASONICS
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-V   NANOMATERIALS
Introduction-Properties of nanomaterials: Surface area to volume ratio and Quantum confinement-Synthesis of nanomaterials-Ball milling-Sol-gel-chemical vapor deposition (CVD) techniques– Carbon nanotubes (CNTs) –Applications.

UNIT-VI   FUNCTIONAL MATERIALS
Introduction –Fiber reinforced plastics (FRPs), Constituents of FRP reinforcement, Properties, Applications; Shape memory alloys (SMAs), Different phases, SAME (one-way and two-way),

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Applications.   52

TEXT BOOKS
1) M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text 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", Arthus Beiser, 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, 4theds.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.

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

(A0502202) DATA STRUCTURES
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

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.

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.
- ❖ Analyze 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-I
Pointers: Pointer variable and its importance, Pointer variable declaration, initialization of pointer variables, how to access a value from a memory location through its 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.

Learning Outcomes: Student should be able to:
1) Explain different types of pointers and their usage. (L2)
2) Understand, solving of arithmetic operations on pointer variables (L2)
3) Apply pointers on functions, arrays and strings (L4)

UNIT-II
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.

Learning Outcomes: Student should be able to:
1) Use Structures and Unions in applications using C programming. (L3)
2) Apply the structures and union concepts to solve real world problems. (L2)

UNIT-III
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.

Learning Outcomes: Student should be able to:
1) Apply the concepts of Data structures to solve the real world problems (L4)
2) Understand the concepts of Stacks and also its applications (L2)
3) Describe the operations of Stacks. (L2)

UNIT-IV
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.

Learning Outcomes: Student should be able to:
1) Understand the concepts of Queues and also its applications (L2)
2) Describe the operations of Queues. (L2)

UNIT-V
Linked Lists: Definition, Various representation methods, operations on linked lists and their implementation in C language.

Learning Outcomes: Student should be able to:
1) Understand the concepts of Linked list (L2)
2) Use the linked lists in various operations. (L3)

UNIT-VI
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.

Learning Outcomes: Student should be able to:
1) Design the different sorting techniques (L6)
2) Use Linear search and Binary search methods. (L3)

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

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.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT OF CIVIL ENGINEERING

I B.Tech, II-Sem (CE)

L	T	C
2	1	3

(A0203202) BASICS ELECTRICAL & ELECTRONICS ENGINEERING
For branches: CE & ME

COURSE OBJECTIVE:
- ❖ 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
- ❖ 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.
- ❖ Observe the different tests and calculations of all machines.
- ❖ Applications of dc machines, transformers and rectifiers.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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
Avg.	3	3	2	2	-	-	-	-	2	-	2	2

UNIT-I 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-II 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-III 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 on types and torque equation.

UNIT-IV 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

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transformers, induced emf equation, transformation ratio's-losses in a transformer-efficiency of transformer- transformer on no-load & R-load –simple problems.

UNIT-V   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-VI   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) Electrical and Electronic Technology-10th Edition –Edward Hughes, Pearson Publications
2) Engineering Circuit Analysis-8th Edition-W.Hayt&J.E.Kemmerly, McGraw Hill Publications
3) Basic Electrical Engineering-2nd Edition-Kothari &Nagrath, TMH Publications
4) Principles of Electrical & Electronics Engineering-1st Edition-V.K.Mehta, S.Chand Publications

REFERENCES
1) Introduction to Electrical Engineering-3rd Edition-M.SNaidu&S.Kamakshaiah, TMH Publ.
2) Electrical Circuit Analysis-3rdEdition-Sudhakar&Shyam Mohan, TMH Publications
3) A Text Book of Electrical Technology–8thEdition-B.L.Theraja &A.K.Theraja, S.Chand Publications.

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DEPARTMENT OF CIVIL ENGINEERING

I B.Tech, II-Sem (CE)

	L	P	C
	1	4	3

(A0301201) ENGINEERING DRAWING
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- ❖ Understand and appreciate the importance of basic concepts and principles of Engineering Drawing
- ❖ Realize and appreciate the importance of engineering drawing as a medium of communication to covey ideas in engineering field
- ❖ Enable the students to be aquatint with various basic engineering drawing formats
- ❖ Learn to take data and transform in to graphic drawings.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- ❖ Understand the conventions and the methods adopted in engineering drawing.
- ❖ Understand the concepts of orthographic projection.
- ❖ Improve their visualization skills and to apply this skill in developing new products
- ❖ Improve technical communicative skills in the form of communicative drawings

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	-	2	2	3	2	-	3	2	3	2
CO2	3	2	3	2	3	-	-	2	2	3	-	-	3	2	2	2
CO3	3	2	2	1	3	-	-	2	2	3	-	1	1	2	2	2
CO4	3	2	2	2	3	-	-	2	2	3	1	-	1	2	3	2

UNIT-I
Geometrical Constructions: 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-II
Projection of Points and Lines: 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-III
Projections of Planes: Regular Planes, Plane Perpendicular to one plane and Parallel to another Reference plane, Plane inclined to one Reference Plane.

UNIT-IV
Projections of Solids: Prisms, Pyramids, Cones and Cylinders with the axis perpendicular to one plane and parallel to the reference plane, Plane inclined to one reference Plane only.

UNIT-V
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-VI
Orthographic and Isometric Projections: Introduction to Isometric projections/ views, Construction of Isometric view/ projections of simple solids. Conversion of Isometric Views

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

TEXT BOOK

1) Engineering Drawing. K.L Narayana, P. Kannaiah, Scitech Publications, 2011
2) Engineering Drawing by N.D. Bhatt, Chariot Publications,2014

REFERENCE BOOKS

1) Engineering Drawing, B.V.R Gupta, J.K. Publishers,2008
2) Engineering Drawing and Graphics, Venugopal /New age publications,2007
3) Engineering Drawing by M.B. Shah and B.C. Rana, Pearson Publishers,2009
4) Engineering Drawing, Johle, Tata Mc Graw-Hill, 2008
5) K.V. Natarajan, 'A text book of Engineering Graphics', Dhanalakshmi publishers, Chennai, 2006.

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DEPARTMENT OF CIVIL ENGINEERING

I B.Tech, II-Sem (CE)

L	T	C
2	0	0

(A0010202) ENVIRONMENTAL SCIENCE
(Mandatory Learning Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

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.
* ❖ 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.

COURSE OUTCOMES:
* ❖ 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 of environment.
* ❖ Identify the environmental pollutants and abatement devices.
* ❖ Adopt practices that help in promoting balance in nature by making judicious utilization of recourses.

UNIT-I MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL SCIENCE
Environment -Definition, Scope, Importance and Need for public awareness. Segments of Environment (Atmosphere, Lithosphere, Hydrosphere and Biosphere).

UNIT-II RESOURCES AND UTILIZATION
Renewable and Non-renewable resources.
a) Natural Resources: Soil &Water sources (conflicts of over utilization of water Resources - Hydro power project-problems), forest & mineral resources-Utilization-problems.
b) Non-conventional resources of energy (Solar Energy, wind energy and their applications)

UNIT-III
a) CONCEPTS OF ECO-SYSTEM
Structure and functions of an ecosystem: Producers, Consumers and Decomposers-Interaction between biotic and abiotic factors in an ecosystem- Trophic levels- Food chain- Food web –Ecological Pyramid.
b) TYPES OF ECO-SYSTEM
Understanding the types of ecosystems: (i) Terrestrial (forest)(ii) Aquatic-(Marine)

UNIT-IV BIODIVERSITY
Introduction-Definition-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 (Insitu and Exsitu conservation methods).

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UNIT-V   ENVIRONMENTAL POLLUTION

Introduction- Causes, effects and control measures of
   a) Air pollution
   b) Water pollution
   c) Soil pollution
   d) Noise pollution
   e) Plastic pollution
      Disaster management: Floods, Earthquake.

UNIT-VI
HUMAN POPULATION ISSUES
   a) Demography-problems related to Population explosion- Age Structure-Family welfare and family planning program
   b) Diseases- AIDS, Malaria, COVID, Cancer.
   c) Human rights, Fundamental duties and Value of education.

ENVIRONMENTAL ISSUES
   a) Climatic changes
   b) Greenhouse effect and global warming.
   c) Ozone layer depletion.
   d) Acid rain.

TEXT BOOKS
   1) Deswal, S and Deswal A., (2004), A Basic Course in Environmental Studies, DhanpatRai & Co. Delhi.
   2) Anubha Kousik and C P Kousik., New age international publishers.

REFERENCES
   1) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
   2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,
   3) Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
   4) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
   5) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

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DEPARTMENT OF CIVIL ENGINEERING

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

(A0592201) ENGINEERING WORKSHOP & IT WORKSHOP
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS
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
CO1	-	1	2	2	1	-	-	-	2	-	2	1	1	-	-
CO2	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-
CO3	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-
CO4	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-

Note: At least two exercises should 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.
5. Gas Welding

F] **Soldering**
1. Soldering & Desoldering 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, 2013
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas, 2009
4. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House, 1999.

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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 OF 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	-	-

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 Windows.

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

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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.

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DEPARTMENT OF CIVIL ENGINEERING

I B.Tech, II-Sem (CE)

P	C
3	1.5

(A0093201) ENGINEERING PHYSICS LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

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
- ❖ Estimate the wavelength of different colors using diffraction grating
- ❖ Study the variation of intensity of the magnetic field due to circular coil carrying current with distance
- ❖ 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	2	-	-	-	-	-	-	1
CO2	3	-	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	1	1	-	-	-	-	-	-	1
CO4	2	3	-	1	2	-	-	-	-	-	-	1

LIST OF EXPERIMENTS: (Any10 Experiments)
1) Determination of radius of curvature of a given Plano-Convex lens using Newton's rings method.
2) Determination of thickness of a thin wire/film by Wedge shape method.
3) Determination of wavelength of spectral lines using Transmission Grating and Spectrometer.
4) Determination of wavelength of a sodium light by normal incidence method.
5) Determination of dispersive power of a prism using spectrometer.
6) Determination of wavelength of a laser using transmission grating.
7) Determination of particle size by laser diffraction.
8) Determination of numerical aperture of an optical fiber.
9) Study of variation of magnetic field along the axis of a circular coil carrying current using Stewart and Gee's method.
10) Determination of rigidity modulus of a given wire using Torsional Pendulum.
11) Determination of energy band gap of a Si or Ge semiconductor by four probe method.
12) Study of B-H Curve of a ferromagnetic material.
13) Determination of carrier density and Hall coefficient or magnetic flux density of an extrinsic semiconductor using Hall Effect.
14) Study current (I) and voltage (V) characteristics of a Solar Cell.
15) Measurement of Curie temperature of a given ferroelectric material by studying the temperature dependence of dielectric constant.

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

(A0593202) DATA STRUCTURES LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

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	-	-	-	2	-	-	2
CO2	3	-	3	-	-	2	-	-	-	-	2	-
CO3	3	2	-	-	-	-	3	-	-	-	-	-
CO4	-	3	-	-	-	-	2	-	-	-	-	-
CO5	3	3	2	-	-	2	3	-	-	-	-	-

RECOMMENDED SYSTEMS /SOFTWARE REQUIREMENTS
Intel based desktop PC with ANSI C Compiler and Supporting Editors

EXERCISE-1
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-2
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-3
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-4
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.)

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EXERCISE-5
- 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-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.

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AUTONOMOUS
DEPARTMENT OF CIVIL ENGINEERING

II B.Tech, I-Sem (CE)

	L	T	C
	2	1	3

(A0011203) NUMERICAL METHODS & PROBABILITY THEORY
For branches: CE & ME

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 OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
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-I
Solution of Algebraic and Transcendental Equations: Introduction-The Bisection Method-The Method of False Position-The Iteration Method-Newton-Raphson Method.

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

UNIT-IV
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 –Euler's Modified Method- Runge-Kutta Method.

UNIT-V
Basic concept of probability-Random variables-Discrete and continuous Random variables – Moment generating function - Expectation

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UNIT-VI

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

TEXTBOOKS
1) T.K.V. Iyengar, B. Krishna Gandhi and Others, Probability and Statistics, S. Chand & Company
2) S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

REFERENCES
1) R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Alpha science International limited,2016
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) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

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

(A0102203) STRENGTH OF MATERIALS

Prerequisites: Physics, Mathematics II, and Engineering Mechanics

COURSE OBJECTIVES:
- ❖ The course provides knowledge about stress, strain, SF, BM. It provides understanding and estimation of bending and shear stresses in beams. Also learning about compression members and buckling phenomenon.

COURSE OUTCOMES:
At the end of the course student is able to
- ❖ Apply basic mechanics principles on structural members subjected to various loading.
- ❖ Understand from simple stresses to complex stresses and strains.
- ❖ Analyze the structural members subjected to various types of loading.
- ❖ Evaluate shear force, bending moment, slope, deflection of structural members for different loading.

MAPPING OF COs & POs:

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

UNIT-I
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-II
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-III
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-IV
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.

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UNIT-V

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-VI

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.

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.

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, Cengage Learning, USA.
3) Popov E.P., (2012), Engineering Mechanics of Solids, PHI Learning Private Limited, New Delhi.
4) Hibbeler, R. C., (2004), Mechanics of Materials, East Rutherford, NJ: Pearson Prentice Hall, USA.

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II B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0103203) 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;
- ❖ To interpret horizontal measurements with the help of chain and compass surveying in the field
- ❖ Apply the knowledge of theodolite in different operations in Civil Engineering
- ❖ Able to apply Total Station and Electronic Distance Measurements in Traversing, Distance measurements
- ❖ Formulate the setting out of curve by Linear measurements
- ❖ Summarize the basic principles of GPS

MAPPING OF COs & POs:

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

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

UNIT-III
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-IV
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-V
Curves: Types of curves–Terminology - Elements of simple circular curve - Setting out methods - Elements of compound curve - Transition curve-Types - Methods of determination

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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-VI

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, (2016), Surveying Vol. I, II, Laxmi Publications (P) Ltd., New Delhi.
2) N.N. Basak, (2017), Surveying and Levelling, Mc.Graw Hill, New Delhi.

REFERENCE BOOKS
1) Venkatramaiah C., (2011), Surveying, Universities Press, India.
2) Arora K.R, (2015), Surveying vol. I, II& III, standard book house, New Delhi.
3) Subramanyam R., (2012), Surveying and Levelling, Oxford University Press, New Delhi.
4) Basak N.N., (1994), Surveying and Levelling, Tata McGraw Hill Publishers, New Delhi.
5) Agor R., A (1980), Surveying & Levelling, Khanna Publishers, New Delhi.
6) Satheesh Gopi., Sathi Kumar R., and Madhu N., (2006), Advanced Surveying, Pearson Education, Dorling Kindersley (India) Pvt. Ltd, New Delhi.

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(A0104203) 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 properties of fluids and their behavior under static and dynamics conditions
- ❖ Apply the knowledge of conservation laws to solve the fluid related problems
- ❖ Applications of Bernoulli's equation for flow measuring devices
- ❖ Computing discharge through pipes considering losses.
- ❖ Analyze laminar and turbulent flows.

MAPPING OF COs & POs:

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

UNIT-I

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-II

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-III

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-IV

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-V

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.

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UNIT-VI

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, Standard Book House, New Delhi.
2) Frank. M. White., (2015), Fluid Mechanics, Tata Mc. Grawhill Pvt. Ltd., USA.

REFERENCES
1) Bansal R.K., (2018), Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P) Ltd., New Delhi.
2) Douglas, J.F., Gaserek, J.M. and Swaffirld, J.A., (2005), Fluid Mechanics, 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

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(A0105203) BUILDING MATERIALS & CONSTURCTIONS

COURSE OBJECTIVES:
- ❖ Principles & bye-laws in planning public and residential buildings.
- ❖ Properties & application of various building materials.
- ❖ Principles and methods of construction of building components.
- ❖ Building services required with respect to safety and other requirements.

COURSE OUTCOMES:
At the end of the course student is able to:
- ❖ Ability to identify types of building and basic requirements of building components.
- ❖ Ability to Explain types of masonry, wood, formwork, casting procedure and necessity of underpinning and scaffolding.
- ❖ Ability to elucidate different types of flooring and roofing materials.
- ❖ Ability to Describe types of doors, windows, arches and lintel.
- ❖ Ability to illuminate means of vertical circulation and protective coatings.
- ❖ Ability to Explain different materials especially eco-friendly materials and safety measures to be adopted at any construction site.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3					1						1	3	1	
CO2	3	1				1						1	3	2	3
CO3	3					1						1	3		
CO4	3					1						1	3		
CO5	3					1						1	3		
CO6	3					1						1	3		

UNIT-I
Building Planning -Introduction, Principles of Building Planning, Classification of buildings, Selection of site, Minimum standards for various Components of building, Open space requirements, Built-up area limitations, Height of the buildings, Wall thickness.
Building Bye–laws and Regulations - Introduction, Objectives of building bye-laws, Principles underlying building bye-laws.

UNIT-II
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, Testing of stones.
Bricks - Composition of good brick earth, Methods of manufacturing of bricks, Qualities of a good brick, Testing of bricks.
Cement: Properties of cement-types of cements-Testing of cements.

UNIT-III
Wood: Structure, Seasoning of timber, Defects in timber, Industrial forms of Timber. Tiles: Characteristics of good tile, Manufacturing methods, Types of tiles.
Other Materials: Properties and uses of iron, glass, ceramics, plastics, steel, aluminum, fly ash, fiber-reinforced plastics.

UNIT-IV
Building Construction -Foundations, Types of Shallow foundations, Types of deep foundations, Masonry - Bonds in Stone & brick masonry, Cavity walls and Partition walls.

Floors - Different types of floors, Roofs-types of roofs, types of roof trusses, Stair cases - Terminology, Types of stairs.

UNIT-V

Form work-Requirements and standards of form work, Scaffolding-Design of scaffolding, Shoring, Underpinning; Surface Finishes - Plastering, Pointing, White washing, distempering and Painting, Cladding, Damp proofing.

UNIT-VI

Building Services: Plumbing services-Water distribution, Sanitary lines and fittings; Ventilations-Necessity, Functional requirements; Lighting - Day and artificial lighting, Types of lighting in working places. Fire Protection: Causes, Fire hazards, General fire safety requirements, Fire resistant materials and construction. Acoustics-characteristics, absorption, Acoustic design.

TEXT BOOKS

1) S.C.Rangwala, K.S. Rangwala and P.S. Rangwala, (2012) Engineering materials, Charotar Publishers.
2) N. Kumara Swamy, and A. Kameswara Rao, (2012), Building Planning and Drawing, Charotar Publishers.
3) B.C. Punmia, (2016), Building construction, Laxmi Publications (P) Ltd., New Delhi.

REFERENCE BOOKS

1) S.K. Duggal, (2012), Building materials, New Age international (P) Ltd., New Delhi.
2) N.L. Arora and B.L. Gupta, (2014), Building construction, Satya prakshan publications, New Delhi.
3) Bureau of Indian Standards, (2005), National Building Code of India, New Delhi.

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II B.Tech, I-Sem (CE)

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(A0012203) DESIGN THINKING AND INNOVATIONS
(Skill Development Course)
For branches: CE, EEE, ME, ECE, CSE(DS) & CSE&BS

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 instill 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.

UNIT-I
Introduction, *what is design thinking*, the traditional model of innovation, The model of design thinking, Design thinking is not old, Design thinking is to innovation, The sweet spot of design thinking.
Why design thinking now?: Products & Services, Multifaceted problems, fast becoming B2C, wide spread digitization, Customer knowledgeable, Clash of business models, Challenging markets.

UNIT-II
Key tenets of Design thinking, Human centric, focus on subject not object, Problem solving with the customer not for the customer, thinking beyond products, striking balance, Think Broad, Solution Generation, validation, root causes, what else, visualize your thinking, Fail often.
Inspire: Create a stretch, Get the design brief right, Adopt the power of metaphors, Widen the aperture, Bring on diversity, The learning personas, the organizing personas, the building personas.

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UNIT-III

Empathize and Define: The traditional market research is broken, create new channels to listen to customers, Be the customer you wish to serve, Leverage technology, get to the customers, do not limit empathy to customers, Engineering empathy, Mind mapping, Stake holder map, Customer journey map, Empathy map, picking problem worth solving, framing problem sharply, Innovating in absence of customer.

UNIT-IV

Ideate: Ideas are like Lego blocks, Hybrid brain storming, Intersection of disciplines, imitate with grace, Breaking the pattern, Challenging assumptions, Value chain, looking beyond current users, designing for extreme, Analogous design, Triggering ideation.

Prototype and Test: The high cost of just doing it, seeking clarity, be quick and dirty, Manageable hypotheses, Doing last experiment first, Visualize through storyboarding and scenarios, Engaging through stories, Is dogfooding enough? Solicit feedback, Inventory prototypes.

UNIT-V

Scale: Keep the main thing as the main thing, cut some slack, Leaders must show up, provide 'air cover', cultivate innovation evangelists, Measure for impact, Don't confuse empathy with good business sense.

Design Thinking in action: A two-day Design thinking workshop, session objectives, Ground rules, workshop flow, mentoring program, build your own version of design thinking program, offer avenues to practice design thinking, think beyond, Juggad, pay attention to the physical space, trust the process

UNIT-VI

How to be a Design Thinker Live curious, listen with intent, observe with purpose, defer your judgement, Hone multiple affiliations, Be a T-shaped person, develop failure tolerance.

Case studies of Design thinking like Chota Cool, Indian post box, Big Bazar, Reliance, royal Enfield etc. (Any other case studies may also be considered).

TEXT BOOKS

1. Pavan Soni, Design your thinking, Penguin Random house India, 2020.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", John Wiley & Sons (2012) (ISBN: 978-1118083468)
3. 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
4. B. K. Chakravarthy, Janaki Krishnamoorthi, Innovation By Design: Lessons from Post Box Design & Development, Springer India, 2013
5. Donald A. Norman, "The Design of Everyday Things", MIT Press, 2013 (ISBN: 978-0262525671)
6. Tom Kelly, Jonathan Littman, "The Art of Innovation", HarperCollins Business, 2002 (ISBN: 978- 0007102938)

REFERENCE BOOKS

1. Kishore Biyani, It happened in India: The story of Pantaloons, Big Bazar, Central and the Great Indian Consumer, Rupa Publications, New Delhi, 2007.
2. V. Kasturi Rangan and Mona Sinha, Hindustan Unilever's "Pureit" water purifier, a Harvard Business School case Study, 1 February 2011.
3. Kelley and Littman, The Ten Faces of Innovation: IDEO's Strategies for Beating the Devil's Advocate and Driving Creativity Throughout Your Organization
4. Ravi Arora, Igniting Innovation: The Tata Way, Harper Business, New Delhi, 2019.

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5. Ashton, How to fly a Horse: The Secret History of Creation, Invention, and Discovery.
6. Kelley, The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm.
7. Rishika T. Krishnan, From Juggad to Systematic innovation: the challenge for India, The Utpreraka Foundation, 2010.
8. Eric Schmidt and Jonathan Rosenberg, How Google Works, Grand Central Publising, New York, 2014.

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II B.Tech, I-Sem (CE)

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(A0022203) CONSTITUTION OF INDIA
(Mandatory Learning Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- ❖ To understand the structure and composition of Indian Constitution
- ❖ To understand and analyze federalism in the Indian context.
- ❖ To study the Panchayati Raj institutions as a medium of decentralization
- ❖ To study and analyze the three organs of the governance in the contemporary scenario.

COURSE OUTCOMES:
Students will be able to
- ❖ Be aware of historical background of the constitutional making and its importance for building a democratic India.
- ❖ Possess the knowledge of the History, features of Indian constitution, the role of Governor and Chief Minister, role of state election commission, the decentralization of power between central, state and local self-government.
- ❖ Know the status of Indian government, the structure of state government, the local Administration.
- ❖ Able to know the functioning of governments at the rural and national level and role of the electoral bodies.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1															
CO2															
CO3															
CO4															
CO5															
CO6															

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 Panchayati raj: Role and Importance Zilla Panchayat: Position and role - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

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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

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II B.Tech, I-Sem (CE)	P	C
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(A0191203) 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, Leveling & Contouring, Tachometric Surveying, Trigonometric Surveying, and Curve Setting.

COURSE OUTCOMES:
At the end of the course student is able to;
- ❖ identify different survey instruments, tools and their applications
- ❖ Handle survey instruments, taking measurements, computation and interpretations like chain, compass, levelling, theodolite
- ❖ Analyze different methods of surveying, triangulation, traversing etc.,
- ❖ Interpret different modern techniques using surveying instrument such as Total Station, EDM & GPS etc.

MAPPING OF COs & POs:

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

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

TEXT BOOKS
1. B.C. Punmia B.C. and Jain A.K, (2016), Surveying Vol. I, II, Laxmi Publications (P) Ltd., New Delhi.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT OF CIVIL ENGINEERING

II B.Tech, I-Sem (CE)

	P	C
	3	1.5

(A0192203) 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;
- ❖ Application of loads on materials to test the strength of materials.
- ❖ Understand the deflection profile of beam members subjected to loads.
- ❖ Analyze the behavior of metals subjected to various loads.
- ❖ Evaluate the properties of material.

MAPPING OF COs & POs:

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

EXPERIMENTS
1) Tension test
2) Deflection test on (Steel / Wood) Overhanging beam.
3) Deflection test on simply supported beam.
4) Compression test on steel
5) Torsion test
6) Hardness test
7) Spring test
8) Impact test
9) Verification of Maxwell's Reciprocal theorem on beams.

TEXT/REFERENCE BOOKS
1. Timoshenko and Gere, (2018), Mechanics of Materials, CBS Publishers, New Delhi.

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II B.Tech, I-Sem (CE)

	P	C
	3	1.5

(A0193203) 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) including components.

COURSE OUTCOMES:
At the end of the course student is able to:
- ❖ Apply basic commands to draw a building component and its plan using Auto CAD.
- ❖ Understand building bye-laws to draw building plans.
- ❖ Draw plan, elevation and sectional view of buildings as per requirements.
- ❖ Create effective and efficient plan as per requirement of client.

MAPPING OF COs & POs:

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

SOFTWARE: AutoCAD EXERCISES:
1. Basics of AutoCAD and practice on Drawing and Editing Tools (simple drawing using tools).
2. Conventional signs &symbols used in Civil Engineering drawings.
3. Draw the given Building components using AutoCAD.
   a. Door
   b. Window
   c. Staircase
   d. Simple Roof trusses
4. Line plan and dimensional plan of a residential building using AutoCAD as per building bye-laws.
5. Dimensional plan, elevation and sectional plan of a residential building using AutoCAD as per building bye-laws.
6. Dimensional plan, elevation and sectional plan of any commercial building like Office building, School building, Hospital building etc., using AutoCAD as per building bye-laws.
7. Drawing of Footing Foundation using AutoCAD.

NOTE
1) Students should draw all the drawings as per the dimensions in a lab observation book /A4 sheet before performing in laboratory.
2) At least two building components to be drawn from Exercise-03.

TEXT BOOKS
1) S.C.Rangwala, K.S. Rangwala and P.S. Rangwala, (2012) Engineering materials, Charotar Publishers.
2) N. Kumara Swamy, and A. Kameswara Rao, (2012), Building Planning and Drawing, Charotar Publishers.
3) B.C. Punmia, (2016), Building construction, Laxmi Publications (P) Ltd., New Delhi.

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

(A0504203) PYTHON PROGRAMMING
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
This course will enable students to:
- ❖ Learn Syntax and Semantics of various Operators used in Python.
- ❖ Understand about Various Input, Output and Control flow statements of Python.
- ❖ Understand Strings, List, Tuple, Set and Dictionary in Python.
- ❖ Implement Object Oriented Programming concepts in Python.
- ❖ Understand Exception handling and File I/O in Python.
- ❖ Understand Functions, Modules and Regular Expressions in Python.

COURSE OUTCOMES:
The students should be able to:
- ❖ Examine Python syntax and semantics and be fluent in the use of various Operators of Python.
- ❖ Make use of Flow Control statements, Input / Output functions and Strings of Python.
- ❖ Demonstrate proficiency in handling of data structures like List, Tuple, Set and Dictionary.
- ❖ Demonstrate the use of Functions, Modules and File I/O operations in in Python.
- ❖ Interpret the Concepts of Object-Oriented Programming in Python.
- ❖ Interpret the various issues of Exception handling mechanisms and Regular Expressions in Python.

MAPPING OF COs & POs:

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

UNIT-I
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 Fundamental data types of Pythons.
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-II
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 ({}).
Control flow statements: Conditional statements. Iterative statements. Transfer statements.
Strings: Operations on string, String slicing, important methods used on string.

UNIT-III
Lists: Operations on List, important methods used on list. List comprehensions
Tuples: Operations on tuples, important methods used on tuple.
Sets: Operations on sets, important methods used on set.

Dictionaries: Operations on Dictionaries, important methods used on dictionaries.

UNIT-IV
Functions - Defining Functions, Calling Functions, Types of Arguments - Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful functions, Scope of the Variables in a Function. Recursive functions.
Modules: Creating modules, import statement, from Import statement.
File I/O: Need of files concept, Types of files, Opening and Closing a Text file, Reading & Writing operations on files, setting offsets in a file, Traversing a Text file.

UNIT-V
Object Oriented Programming (OOP) in Python: Classes and Objects, 'self-variable', Types of Variables and Methods used in Classes, Constructor Method, Inheritance, Overriding Methods, Abstract Classes, Data hiding.

UNIT-VI
Error and Exceptions: Difference between an Error and Exception, Types of Exceptions, Handling Exceptions, try, except, else and finally blocks, control flow in try-except-else-finally blocks, Raising Exceptions, Customized Exceptions.
Regular Expressions: Character matching in regular expressions, extracting data using regular expressions.

TEXT BOOKS
1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.

REFERENCE BOOKS
1) R.Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019Core Python Programming, 2016 W.Chun, Pearson.
2) Introduction to Python, 2015 Kenneth A. Lambert, Cengages
3) https://www.w3schools.com/python/python_reference.asp
4) https://www.python.org/doc/

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II B.Tech, II-Sem (CE)

	L	T	C
	2	1	3

(A0106204) 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, forces on submerged bodies.
- ❖ To visualize the flow transitions mathematically in open channels.
- ❖ To prepare models for prototypes of hydraulic structures.
- ❖ To evaluate the forces exerted by the jet of fluid on vanes.
- ❖ To evaluate the performance of pumps and turbines.

MAPPING OF COs & POs:

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

UNIT-I
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-II
Open Channel Flow:
Uniform Flow: Introduction, Classification of flows, Types of channels; Chezy's, 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-III
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-IV
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-V
Hydraulic Turbines: Layout of a typical Hydropower installation-Heads and efficiencies-classification of turbines- Pelton wheel-Franci's 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-VI

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, Standard Book House, New Delhi.
2) Bansal R.K., (2018), Fluid mechanics and hydraulic machines, 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 Mc. Grawhill Publishers, New Delhi.
5) Ramamrutham S, (2014), Hydraulics, Fluid Mechanics and Fluid Machines, Dhanapat Rai Publishing Company, India.

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

(A0107204) STRUCTURAL ANALYSIS

PREREQUISITES: Engineering Mechanics and Solid Mechanics.

COURSE OBJECTIVES:
- ❖ The course objective of this subject consists of Analysis of fixed & continuous beams with differing loading and support settlements with theorem of three moments. 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
- ❖ Apply basic mechanics principles to beams and frames subjected to loading.
- ❖ Understand the shear force and bending moment for beams and frames.
- ❖ Analyze the structural members when subjected to moving loads.
- ❖ Evaluate the beams and frames by various methods like slope-deflection, Kani's, moment distribution methods.

MAPPING OF COs & POs:

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

UNIT-I
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-II
CONTINOUS 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-III
SLOPE-DEFLECTION METHOD: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports and portal frames

UNIT-IV
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-V
KANI'S METHOD: Basic concepts- Analysis of continuous beams-including settlement of supports - portal frames (single bay-single storey) with and without sway.

UNIT-VI
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

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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/REFERENCE BOOKS

1) LS Negi, RS Jangid, (2004), Structural Analysis, Tata Mcgraw Hill Publishing Co Ltd.
2) R. C Hibbeler, (2017), Structural Analysis, Pearson Publishers, India.
3) Wang C.K. (2010), Intermediate Structural Analaysis, Tata Mc Graw Hill Publishing Co Ltd.
4) S.Ramamrutham, R.Narayan, (2014), Theory of structures, Dhanpat Rai Publishing Co Ltd.

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

(A0108204) 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 OF 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

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UNIT-VI

SPECIAL CONCRETES: Light weight aggregates-Lightweight aggregate concrete-Cellular concrete-No-fines concrete-High density concrete-Fiber reinforced concrete-Different types of fibers-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.

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II B.Tech, II-Sem (CE)

	L	T	C
	2	1	3

(A0017203) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
For branches: CE, EEE & ECE

COURSE OBJECTIVE:
- ❖ To impart the students with fundamental concepts of economics, budgeting and accounts and its relevance in business management.

COURSE OUTCOMES:
The student will be able to:
- ❖ Identify managerial problems with optimum solutions.
- ❖ Analyze the demand factors on a product that may be existed/new.
- ❖ Know various methods of Demand forecasting
- ❖ Understand different business organizations.
- ❖ Know techniques and evaluation of capital budgeting.
- ❖ Understand financial performance through financial statements

MAPPING OF COs & POs:

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

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).

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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
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

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

(A0019203) APTITUDE ARITHMETIC REASONING AND COMPREHENSION
(Skill Development Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

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

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

UNIT-III
Permutations and Combinations, Probability, Data Interpretation & Data Sufficiency.

UNIT-IV
Number & Letter Series, Analogies, Coding and Decoding, Odd Man Out, Blood Relations.

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

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

TEXTBOOKS & REFERENCES
1) R.S.Agarwal, (2016), Quantitative Techniques, S.Chand Publishers.
2) Shankuntala Devi, (2003), Techniques of Reasoning. S.Chand Publishers.

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DEPARTMENT OF CIVIL ENGINEERING

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

(A0571203) PYTHON PROGRAMMING LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- ❖ To be able to introduce core programming basics and various Operators and flow control statements of Python programming language through proper practice.
- ❖ To demonstrate about various Python fundamental data structures such as int, float, complex, bool and strings.
- ❖ To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
- ❖ To demonstrate about Functions, Modules and File Input - Output operations in Python programming language.
- ❖ To demonstrate about Object Oriented Programming in Python Programming.
- ❖ To understand about and Exception handling mechanisms 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.
- ❖ Student should be able to explore Fundamental data structures in Python.
- ❖ Student should be able to explore python data structures like Lists, Tuples, Sets and dictionaries.
- ❖ Student should be able to explore Functions, Modules and File input-Output Operations in Python programming language.
- ❖ Student should be able to explore Object Oriented Programming in Python Programming.
- ❖ Student should be able to create practical and contemporary applications using Exception handling mechanisms and Regular Expressions.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1			1				1	1		1	2	1	1
CO 2	3	3	2		2				1	1		1	1	1	1
CO 3	3	2	2	1	2				1	1		2	1	2	1
CO 4	3	2	1		2				1	1		1	1	2	
CO 5	3	3	1	1	1				1	1		2	2	2	2
CO 6	3	3	1	1	1				1	1		2	2	2	2

S.No	Name of the Experiment
1	a) Demonstrate about Basics of Python Programming.
	b) Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
	c) Demonstrate the working of following functions in Python. i) id( ) ii) type( ) iii) range( )
	d) Write a Python program to demonstrate various base conversion functions.
	e) Write a Python program to demonstrate various type conversion functions.
2	a) Demonstrate the following Operators in Python with suitable examples. i) Arithmetic Operators ii) Relational Operators iii) Assignment Operator iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
3	a) Write Python programs to demonstrate the following: i) input( ) ii) print( ) iii) 'sep' attribute iv) 'end' attribute

	v) replacement Operator ({ })
	b) Demonstrate the following Conditional statements in Python with suitable examples. i) if statement ii) if else statement iii) if-elif-else statement
	c) Demonstrate the following Iterative statements in Python with suitable examples. i) while loop ii) for loop
	d) Demonstrate the following control transfer statements in Python with suitable examples. i) break ii) continue iii) pass
4	Write Python programs to print the following Patterns:
	i) A A B A B C A B C D A B C D E
	ii) * * * * * * * * * * * * * * *
	iii) E E E E E E E E D D D D D D D C C C C C B B B A
	iv) 4 4 3 4 3 2 4 3 2 1 4 3 2 1 0 4 3 2 1 4 3 2 4 3 4
	v) 4 3 4 2 3 4 1 2 3 4 0 1 2 3 4 1 2 3 4 2 3 4 3 4 4

| vi) | ```
   *       *
  * *     * *
 * * *   * * *
* * * * * * * *
* * * * * * * * *
``` |
| vii) | ```
    * *
    * *
   * * * *
   * * * *
  * * * * * *
  * * * * * *
 * * * * * * * *
 * * * * * * * *
* * * * * * * * * *
* * * * * * * * * *
``` |
| viii) | ```
        E
      D E
    C D E
  B C D E
A B C D E
  B C D E
    C D E
      D E
        E
``` |
5	a) Write a Python program to demonstrate various ways of accessing the string.
	   i) By using Indexing (Both Positive and Negative)
	   ii) By using Slice Operator

	b) Demonstrate the following functions/methods which operates on strings in Python with suitable examples: i) len( ) ii) strip( ) iii) rstrip( ) iv) lstrip( ) v) find( ) vi) rfind( ) vii) index( ) viii) rindex() ix) count( ) x) replace( ) xi) split( ) xii) join( ) xiii) upper( ) xiv) lower( ) xv) swapcase( ) xvi) title( ) xvii) capitalize( ) xviii) startswith() xix) endswith()
6	a) Demonstrate the different ways of creating list objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on lists in Python with suitable examples: i) list( ) ii) split( ) iii) len( ) iv) count( ) v) index ( ) vi) append( ) vii) insert( ) viii) extend() ix) remove( ) x) pop( ) xi) reverse( ) xii) sort( ) xiii) copy( ) xiv) clear( )
	c) Demonstrate the following with suitable example programs: i) List slicing ii) List Comprehensions
7	a) Demonstrate the different ways of creating tuple objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on tuples in Python with suitable examples: i) len( ) ii) count( ) iii) index( ) iv) sorted( ) v) min ( ) vi)max( ) vii) cmp( ) viii) extend() ix) remove( ) x) pop( ) xi) reverse( ) xii) sort( ) xiii) copy( ) xiv) clear( )

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8	a) Demonstrate the different ways of creating set objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on sets in Python with suitable examples: i) add( ) ii) update( ) iii) copy( ) iv) pop( ) v) remove( ) vi)discard( ) vii) clear( ) viii) union() ix) intersection( ) x) difference( )
9	a) Demonstrate the different ways of creating dictionary objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on dictionary in Python with suitable examples: i) dict( ) ii) len( ) iii) clear( ) iv) get( ) v) pop( ) vi)popitem( ) vii) keys( ) viii) values() ix) items( ) x) copy( ) xi) update( )
10	a) Demonstrate the following kinds of Parameters used while writing functions in Python. i) Positional Parameters ii) Default Parameters iii)Keyword Parameters iv) Variable length Parameters
	b) Write a Python program to return multiple values at a time using a return statement.
	c) Write a Python program to demonstrate Local and Global variables.
	d) Demonstrate lambda functions in Python with suitable example programs.
11	a) Python program to perform read and write operations on a file.
	b) Python program to copy the contents of a file to another file.
	c) Python program to count frequency of characters in a given file.
	d) Python program to print each line of a file in reverse order.
	e) Python program to compute the number of characters, words and lines in a file.
12	Demonstrate various Object-Oriented Programming Concepts in Python Programming with illustrative examples.
13	Demonstrate about Exception Handling in Python Programming with illustrative examples.
14	a) Demonstrate the following in-built functions to use Regular Expressions very easily in our applications. i) compile( ) ii) finditer( ) iii) match( ) iv) fullmatch( ) v) search ( ) vi) findall ( ) vii) sub( ) viii) subn ( ) ix) split ( )

	b) Write a Regular Expression to represent all RGM language (Your own language) identifiers.
	Rules:
	  1. The allowed characters are a-z, A-Z,0-9, #.
	  2. The first character should be a lower-case alphabet symbol from a to k.
	  3. The second character should be a digit divisible by 3.
	  4. The length of identifier should be at least 2.
	Write a python program to check whether the given string is RGM language identifier or not?

	c) Write a Regular Expression to represent all 10-digit mobile numbers.
	Rules:
	  1. Every number should contain exactly 10 digits.
	  2. The first digit should be 7 or 8 or 9
	Write a Python Program to check whether the given number is valid mobile number or not?

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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/

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II B.Tech, II-Sem (CE)	P	C
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(A0393203) FLUID MECHANICS AND HYDRAULIC MACHINES LAB
For branches: CE & ME

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 the head loss in pipes.
- ❖ Examine the energy equation.
- ❖ Determine the performance characteristics of various fluid machines like pumps, turbines etc.
- ❖ Determine Energy loss in Hydraulic jump

MAPPING OF COs & POs:

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

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(A0194204) 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 OF 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.

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III B.Tech, I-Sem (CE)

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(A0109205) 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
❖ Understand the design philosophies of various methods of design.
❖ Design the Reinforced Concrete beams using limit state.
❖ Design Reinforced Concrete slabs.
❖ Design the Reinforced Concrete Columns and footings.
❖ Design structures for serviceability

MAPPING OF 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	-	-		-	-			3	2	-
CO3	3	1	3	-	2	-	-	3	-	-	1	3	3	2	-
CO4	3	1	3	-	2	-	-	3	-	-	1	3	3	2	-
CO5	3	1	3	-	2	-	-	3	-	-	1	3	3	2	-
Avg.	3	1	3		2			3			1	3	3	2	

UNIT-I 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 behavior of Steel and Concrete- Stress block parameters- General idea about working stress method.

UNIT-II 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.

UNIT-III 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.

UNIT-IV BEAMS
Analysis and Design of Singly Reinforced Beams, doubly reinforced beams, continuous beams and T beams.

UNIT-V 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.

UNIT-VI FOOTINGS
Introduction to footings- Types of footing - Design of Rectangular Footing, Square Footing and Combined Footing.

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

TEXT BOOKS
1. Limit State Design Of Reinforced Concrete, P.C.Varghese, Printice Hall of India, New Delhi, 2020.
2. Limit State Design of Reinforced Concrete, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain,Laxmi, publications Pvt. Ltd., New Delhi,2020.

REFERENCE BOOKS
1. Reinforced concrete design, S.Unnikrishna Pillai and Devdas Menon, Tata Mc.Graw Hill, New Delhi,2020.

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(A0110205) 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 OF 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 GROUND 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

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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 ofcutting, canal lining, types of canal lining.

TEXT BOOKS
1. Irrigation and water power engineering, B. C. Punmia and Lal, Laxmi publications pvt. Ltd., NewDelhi, 2021.
2. Engineering Hydrology, K. Subramanya, The Tata Mc graw Hill Company, Delhi, 2020.

REFERENCE BOOKS
1. Irrigation engineering and hydraulic structures, S.K Garg, Khanna publishers, 2020.
2. Engineering Hydrology, Jaya Rami Reddy, Laxmi publications Pvt. Ltd., New Delhi, 2020.
3. Irrigation and Water Resources & Water Power, P.N. Modi, Standard Book House, 2020.
4. Irrigation Water Management, D.K. Majumdar, Prentice Hall of India, 2020.
5. Engineering Hydrology, C.S.P. Ojha, Oxford Publishers, New Delhi, 2020.

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	L	T	C
	2	1	3

(A0111205) 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:
At the end of the course student is able to:
- ❖ Understand various properties of soil, classify the soil given 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. Determine soil deformation parameters, and calculate settlement magnitude and rate of settlement. Able understand soil compaction and Specify compaction requirements.
- ❖ Appreciate the difference between total and effective stress approaches in soil strength determination, and discriminate between drained and undrained conditions.
- ❖ Analyze and select appropriate foundation based on site condition & type of structure.

MAPPING OF 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	2		-	-	-	1	1	1	-	1	3	2	1
CO3	3	2	2	1	-	1	1	1	1	1	1	1	3	2	3
CO4	3	2	1		-	-	-	1	1	1	1	1	3	2	2
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.

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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 of Soil investigation-Sub Surface exploration-Depth of exploration-Methods of exploration (Open excavation and Boring methods)-Types of soil samples.

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. Basic and Applied Soil Mechanics, Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi, 2020.
2. An Introduction to Geotechnical Engineering, Robert D Hodtz, Pearson Education India, 2020.

REFERENCES

1. Soil Mechanics, T.W. Lambe and Whitman, Wiley India Pvt Ltd, 2020.
2. Principles of Geotechnical Engineering, Braja. M. Das & Khaled Sobhan, Cengage Publications, New Delhi, 2020.
3. Soil Mechanics and Foundation Engineering, P. Purushotham Raj, edition 10th, Pearson Publishers, 2020.
4. Geotechnical Engineering, Gulati S. K & Manoj Dutta, Tata M.C. Graw hill Publishers New Delhi, 2020.
5. Modern Geotechnical Engineering, Alam Singh, CBS Publishers & Distributors, 2020.
6. Geotechnical Engineering, V.N.S. Murthy, CRC Press, New York, 2020.
7. Soil Mechanics and Foundation, B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi, 2020.
8. Soil Mechanics and Foundation Eng., K.R. Arora, 15th edition, Standard Publishers and Distributors, Delhi, 2021.
9. Geotechnical Engineering, C. Venkataramiah, 15th edition, new age International Pvt. Ltd, 2021.

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III B.Tech, I-Sem (CE)

L	T	C
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(A0112205) GEOINFORMATICS
(Open Elective-I)

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. Therapid 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 solvingengineering problems.
- ❖ Know the basics of remote sensing, understand electromagnetic radiation interaction and variousfundamental 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 OF 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 APPLICATIONS

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. Publications, New Delhi, 2020.

REFERENCES
1. Principals of Geographical Information Systems-Peter A Burragh and Rachael Mc Donnell, OxfordPublishers, 2020.
2. Remote Sensing and Image Interpretation by Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman,John Wiley & Sons Publications, 2020.
3. Remote Sensing and its applications by LRA Narayana University Press, 2020.
4. Advanced surveying: Total station GIS and remote sensing-Satheesh Gopi-Pearson publication,2020.
5. Geographical Information Science, Narayana Panigrahi, University press, New Delhi, 2020.
6. GIS by Kang-Tsung Chang, TMH Publications & Co., 2021.
7. Basics of Remote sensing & GIS S.Kumar, Laxmi Publications, 2021.
8. Geoinformation for Development by Zeil/Kienberger (Eds)-Univ. Science Press, New Delhi, 2020.

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

(A0113205) SMART CITIES
(Open Elective-I)

COURSE OBJECTIVES:
- ❖ 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 OF 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 Smartcity 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 systemapplications 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.

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TEXT BOOKS
1. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li, 2020.
2. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by Nicos Komninos, 2020.

REFERENCE BOOKS
1. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony Townsend, 2020.
2. Grig N.S., Infrastructure engineering and management, Wiley-Interseience, 2020.
3. Hudson W.R., Haas R., Uddin W., Infrastructure Management, McGraw-Hill, 2020.
4. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers. "Smart cities-Ranking of European medium-sized cities". Smart Cities. Vienna: Center of Regional Science, 2020.
5. Mission statement & guidelines on Smart City Scheme. Government of India-Ministry of Urban Development
http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines.pdf

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(A0114205) ROAD SAFETY AUDIT
(Open Elective-I)

COURSE OBJECTIVES:
❖ The main objective is to develop highway professionals as Road Safety Auditors who should be able to bring-insafety 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 OF COs & POs:

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

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

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(A0115205) BUILDING INFORMATION MODELLING
(Open Elective-I)

COURSE OBJECTIVES:
- ❖ Building Information Modelling (BIM) is argued to be a catalyst for change poised to reduce industry'sfragmentation, 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 OF COs & POs:

	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
Learning BIM, Introduction, Learning Methods, Skill Set, The learners

UNIT V   CASE STUDIES OF BIM
Case Studies, DPR Construction, RQ Construction,

UNIT VI   CASE STUDIES
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, Spinger, 2021.

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(A0116205) ADVANCED STRUCTURAL ANALYSIS
(Professional Elective-I)

Prerequisites: Strength of Materials, Structural Analysis.

COURSE OBJECTIVES:
❖ To analyze continuous beams, portal frames, arches using various methods.

COURSE OUTCOMES:
At the end of the course student is able to
❖ Analyze two hinge and three hinged arches
❖ Analyze continuous beams using plastic analysis
❖ Analyze frames using flexibility, stiffness, and approximate methods
❖ Apply strain energy method for beams and frames

MAPPING OF COs & POs:

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

UNIT-I   ARCHES

THREE HINGED ARCHES
Elastic theory of arches-Eddy's theorem-Determination of horizontal thrust, bending moment, normal thrustand radial shear-effect of temperature.

TWO HINGED ARCHES
Determination of horizontal thrust, bending moment, normal thrust and radial shear- Rib shortening andtemperature 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 andportal frames.

UNIT-V   STIFFNESS METHOD
Introduction to the structural analysis by stiffness concept using Matrix approach and application to beams andportal frames.
UNIT-VI   APPROXIMATE METHODS
Analysis of building frames using portal frame method, cantilever method.

TEXT BOOKS
1. Structural Analysis (Vol-1&II), Bhavikatti S.S., Vikas Publishing House, India,2020.
2. Structural Analysis (Vol-1&II), Vaidyanathan R., and Perumal., Laxmi Publications (pvt) Limited,India, 2020.

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REFERENCE BOOKS
1. Structural Analysis, Negi L.S., Jangid R.S., Tata Mcgraw Hill Publishing Co Ltd, New Delhi, 2020.
2. Structural Analysis, Hibbeler, R.C., 10th edition, Pearson, India, 2020.
3. Intermediate Structural Analysis, Wang C.K., Tata McGraw Hill Publishing Co Ltd, New Delhi, 2020.
4. Theory of structures, Ramamrutham S., Narayan R., 12th edition, Dhanpat Rai Publishing Co Ltd,India, 2020.
5. Structural Analysis, Devdas Menon, Narosa Publishing House, India, 2020.

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(A0117205) OPEN CHANNEL HYDRAULICS
(Professional Elective-I)

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.
- ❖ Analyze the flow characteristics in open channels
- ❖ Analyze the flow profiles using GVF Computation methods.
- ❖ Solve the hydraulic jump problems.

MAPPING OF COs & POs:

	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 foruniform 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
1 Flow through open channel: Rangaraju R G, Tata McGraw Hill, 10th edition, Publishing Co Ltd, NewDelhi, 2020.

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2 Open Channel Hydraulics: Subramanya K, Tata McGraw Hill, 12th edition, Publishing Co Ltd, NewDelhi, 2021.

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 Fluid Mechanics: Modi and Seth, Standard House, New Delhi, 2020.
4 Open Channel Hydraulics: Henderson, Mr. Millan Publishing Co. Ltd, New Delhi, 2020.

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	2	1	3

(A0118205) ADVANCED LAND MEASUREMENT TECHNIQUES
(Professional Elective-I)

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 field 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 OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
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			3								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   GNSS (GLOBAL NAVIGATION SATELLITE SYSTEM)
Data collection methods, DGPS, Errors in observations and corrections, principles used, Components of GNSS.

UNIT-IV   MEASUREMENT OF LASER RANGE
CW and pulse method, laser pulse, energy, pulse width and related definitions; LiDAR equation and related physics.

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   MEASUREMENTS FOR HEIGHT DETERMINATION
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.

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TEXT BOOKS
1. GPS Satellite Surveying, Alfred Leick, John Wiley, 2020.
2. Elements of Photogrammetry, Wolf, Paul, R. Second Ed., McGraw-Hill, 2020.

REFERENCES
1. GPS for Land Surveyors, Sickle, J. V. Ann Arbor Press, 2020.
2. Digital elevation model technologies and applications, David F. Maune the DEM user's manual; Manual of Remote Sensing: ASPRS; 2020.
3. Airborne and Terrestrial laser scanning, George Vosselman and Hans-Gerd Maas, CRC Press, New York, 2020.
4. Topographic laser ranging and scanning: principle and processing, Jie Shan and Charles K Toth, CRCPress, New York, 2020.
5. Photogrammetry, Moffit, Francis H. and Mikhail, Edward M. Third Ed., New York: Harper& Row, 2020.

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	2	1	3

(A0119205) EXPERIMENTAL STRESS ANALYSIS
(Professional 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 theanalysis of problems

COURSE OUTCOMES:
At the end of the course student is able to:
- ❖ Apply principles of elasticity theory to determine stresses and strains
- ❖ Apply theory of elasticity and formulate plane stress and plane strain problems
- ❖ Apply experimental techniques using strain gauges to solve field problems
- ❖ Understand the concept and application of NDT techniques
- ❖ Understand the concept of brittle coating methods and photo-elasticity
- ❖ Determine the stresses using strain rosette concept

MAPPING OF COs & POs:

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

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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-Iso-chromic 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 BOOKS
1. Experimental stress analysis, J.W.Dally and W.F.Riley, Printice Hall of India, New Delhi, 2020.
2. Experimental stress analysis, Sadhu Singh, Tata Mc.Graw Hill, New Delhi, 2020.

REFERENCE BOOKS
1. Experimental stress analysis, Vazrani and Ratwani, Laxmi, publications Pvt. Ltd., New Delhi, 2020.

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	L	T	C
	1	2	2

(A0120205) CONSTRUCTION TECHNOLOGY AND PLANNING MANAGEMENT
(Skill Development Course)

COURSE OBJECTIVES:
- ❖ Objectives, need, functions, types, resources and stages of project management.
- ❖ PERT-CPM network formulation and analysis
- ❖ Types- documentation- procedures of tenders
- ❖ Causes- classification- accident report- safety measures

COURSE OUTCOMES:
At the end of the course student is able to:
- ❖ Understand the methods of planning, scheduling and principles of construction management.
- ❖ Formulate, solve CPM&PERT networks.
- ❖ Understand the concepts of quality control and safety management.
- ❖ Understand the procedure of documentation of tenders, contracts & time-cost analysis

MAPPING OF COs & POs:

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

UNIT-I   PROJECT MANAGEMENT
Introduction, 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**.**

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DEPARTMENT OF CIVIL ENGINEERING

CONSTRUCTION SAFETY MANAGEMENT

Importance of safety, Causes, Classification, Measurement, cost of accidents, Accident report, General safety programs, and Safety measures for different construction works.

TEXT BOOKS

1 Project Planning & Control- with PERT & CPM, Dr. B.C. Punmia & K.K. Kandelwal, 10th edition, 2020.

2 Construction Management and Accounts, J.L. Sharma - Satya Prakasan, 2020.

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III B.Tech, I-Sem (CE)

P	C
3	1.5

(A0195205) CAD LAB

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 OF 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.

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	3	1.5

(A0196205) 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 andinterpret the results for the given soil.
- ❖ Determine engineering properties of soil from laboratory (shear parameters) and field tests.

MAPPING OF 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

TEXT BOOKS
1. K.V.S. Appa Rao &V.C.C. Rao, Soil Testing Lab Manual, University Science Press, LaxmiPublication, 2016.
2. S. Mittal and J.P. Shukla, Soil Testing for Engineers, Khanna Publishers, New Delhi, 2008.

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

(A0121206) DESIGN OF STEEL STRUCTURAL ELEMENTS

Prerequisites: Mechanics of Materials.

COURSE OBJECTIVES:
- 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:
- Design of bolt and welded connection.
- Design of tension and compression member.
- Design of gusseted base, column base and slab base.
- Design of plate girder.

MAPPING OF COs & POs:

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

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TEXT BOOKS

1. Design of Steel Structures, S.K. Duggal, Tata McGraw Hill, 12th edition, New Delhi, 2021.
2. Design of Steel Structures, N. Subramanian, 12th edition, Oxford Publishers, New Delhi, 2021.

REFERENCE BOOKS

1. Design of Steel Structures, Arya and Azmani, PHI Publishers, New Delhi, 2020.

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III B.Tech, II-Sem (CE)
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(A0122206) 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:
At the end of the course student is able to:
- ❖ Forecast the water demand according to population, Analyze characteristics of water, understand and Analyze water quality testing and have knowledge about different source of water.
- ❖ Adopt and design suitable treatment technology to treat the raw water, and Analyze design thedistribution network using hydraulics.
- ❖ Identify the characteristics and quality of sewage and have knowledge about the waste water collectionsystem and design of sewers.
- ❖ Suggest and design suitable treatment methods to treat waste water and sludge based on their qualityand suitable methods for effluents disposals.
- ❖ Understand human interaction with the Environment and have knowledge about sources of pollutionand their effects on (human beings/Plants/Materials).
- ❖ Gain knowledge of controlling methods for Environmental Pollution (air/noise/hazardous waste) andhave knowledge about solid waste and hazardous waste and their collection and disposal.

MAPPING OF COs & POs:

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

UNIT-I   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.

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UNIT-II   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-III   INTRODUCTION OF WASTE WATER

Fundamental Definitions of Refuse, Garbage, Rubbish, Sewage, Sullage, Storm Water, Systems of Sewerage, 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-IV   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-V   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-VI   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) Water supply and sanitary engineering by Garg, 10th edition, 2020.
2) Elements of environmental engineering by K.N.Duggal, S Chand Publishers, 2020.
3) Water supply engineering vol 1, waste water engineering vol 2, B.C. Punmia, Ashok Jain &Arun Jain, Laxmi publications pvt.ltd. New Delhi, 2020.
4) Environmental engineering by Basak, Tata Mc. Graw Hill edition, New Delhi, 2020.
5) Environmental pollution control engineering by C.S.Rao, 2020.

REFERRENCE BOOKS

1) Water and waste water technology by Mark J Hammer and Mark J Hammer Jr., 2020.
2) Water and waste water technology by steel, 2020.
3) Water and waste water engineering by Fair Geyer and Okun, 2020.
4) Waste water engineering by Metcalf Eddy, 2020.
5) Physico - chemical process for water quality control by Weber, 2020.
6) Environmental engineering by Gerard kiely, Tata Mc. Graw Hill edition, New Delhi, 2020.
7) Air pollution and control by M.N. Rao & H.N. Rao, 2020.

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III B.Tech, II-Sem (CE)   L   T   C
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(A0123206) TRANSPORTATION ENGINEERING

COURSE OBJECTIVES:
  ❖ The course objective covers the traffic characteristics, traffic measurements, Highway capacity, parkingstudies, Traffic signs and road markings.

COURSE OUTCOMES:
At the end of the course student is able to:
  ❖ Carry out surveys involved in planning and high way alignment
  ❖ Determine the characteristics of pavement materials
  ❖ Design cross section elements, sight distance, horizontal and vertical alignment.
  ❖ Design flexible and rigid pavements as per IRC
  ❖ Understand the principles of construction and maintains of highway
  ❖ Implement traffic studies, traffic regulations and control, and Intersection Design.

MAPPING OF 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	
CO6	3	2	3		2									3	

UNIT-I   INTRODUCTION TO TRANSPORTATION ENGINEERING
Transportation as system, modes of transportation systems.

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

HIGHWAY MATERIALS: Tests on Soil- CBR, Field CBR, modulus of sub-grade reaction, Tests on aggregates- Aggregate Impact test, Crushing Test, Los Angles Abrasion Test, Shape Test Tests on Bitumen-Ductility Test, Flash and fire point Test, Penetration Test, Softening point test Ductility Test, Marshall Stability test.

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- Subgrade, Subbase, base and wearing course-Functions of pavement components. Design Factors-Flexible pavement. Design methods-G.I method, CBR Method, IRC: 37-2018 -Guidelines for the design of flexible pavement.

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: 58-2015 method of plain jointed rigid pavement Design.

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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. Highway Engineering-S.K. Khanna & C.E.G. Justo, Nemchand & Bros, 10th Edition., 2021.
2. Transportation Engineering-Introduction - C. Jotin Khisty and B. Kent Lall, 3rd Edition. Prentice HallIndia, 2021.

REFERENCE BOOKS
1. Principles of Transportation Engineering-Chakraborty Partha and Animesh Das, 2nd Edition; Prentice HallIndia, 2020.
2. IRC: 37-2018-Guidelines for Design of Flexible Pavements; (4th Revision) Indian Road Congress, NewDelhi.
3. IRC: 58-2015-Guidelines for Design of Plain Jointed Rigid Pavements; (4th Revision) Indian RoadCongress, New Delhi.
4. IS:73-2013, Paving Bitumen - Specification, Bureau of Indian Standards, New Delhi.

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	2	1	3

(A0124206) MAINTENANCE AND REPAIR OF BUILDINGS
(Open Elective-II)

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 orrepair technique to suit the situation.
- ❖ Basic knowledge of using modern tools in maintenance process.
- ❖ Understand long-term durability characteristics of structures.

MAPPING OF 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 ofDamage.

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. Repair & Rehabilitation and Minor Works of Buildings, P.C. Varghese -Maintenance, PHI, 2020.
2. Deterioration, Maintenance and Repair of Structures, Sidney M. Johnson- Mc Graw Hill, 2020.

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REFERENCES
1. B.L. Gupta and Amit Gupta- Maintenance and Repair of Civil Structures, 10th edition,- Standard Publications, 2020.
2. Failure and Repair of Concrete Structures, Champion.S, 2020.
3. Concrete Repair and Maintenance, Peter H. Emmons - Galgotia Publishers, 2020.
4. Building Failures, Mckaig T.M.-Applied Science Publications, 2020.
5. Concrete Structures - Repair, Water Proofing and Protection, Philip. H. Perkins, 2020.
6. Durable Structures- Through Planning for Preventive Maintenance, Raikar- - R and D Center Structural Designers and Consultants Pvt Ltd, Vashi, New Bombay, 2020.

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III B.Tech, II-Sem (CE)

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	2	1	3

(A0151207) SOIL DYNAMICS AND MACHINE FOUNDATIONS
(Open Elective-II)

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 OF COs & POs:

	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-Up hole, 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

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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.

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III B.Tech, II-Sem (CE)

	L	T	C
	2	1	3

(A0152207) GROUND WATER DEVELOPMENT AND MANAGEMENT
(Open Elective-II)

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 team work, communication and planning through small projects.

MAPPING OF 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-Jacob 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.

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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.

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DEPARTMENT OF CIVIL ENGINEERING

III B.Tech, II-Sem (CE)

	L	T	C
	2	1	3

(A0153207) COST EFFECTIVE HOUSING TECHNIQUES
(Open Elective-II)

COURSE OBJECTIVES:

This Course will enable students:

❖ To possess comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.

❖ To focuses on cost effective construction materials and methods.

❖ To understand on the principles of sustainable housing policies and programmes.

❖ To adopt the suitable techniques in rural and disaster-prone areas by using locally available materials.

COURSE OUTCOMES:

Student will be able to:

❖ Development of construction technology and innovative techniques as tools to address demand mass construction

❖ Knowledge of eco-friendly material with their application

❖ Learn the use of locally available material according to their availability and maintenance

MAPPING OF 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

A) Housing Scenario

Introduction - Status of Urban Housing - Status of Rural Housing

B) Housing Finance:

Introducing - Existing Finance System in India - Government Role as Facilitator - Status at Rural Housing Finance - Impedimental in Housing Finance and Related Issues

C) Land Use and Physical Planning for Housing

Introduction - Planning of Urban Land - Urban Land Ceiling and Regulation Act - Efficiency of Building Bye Lass - Residential Densities

D) Housing The Urban Poor

Introduction - Living Conditions in Slums - Approaches and Strategies for Housing Urban Poor

UNIT-II   DEVELOPMENT AND ADOPTION OF LOW-COST HOUSING TECHNOLOGY

Introduction - Adoption Of Innovative Cost Effective Construction Techniques - Adoption Of Precast Elements In Partial Predatoriness - Adopting Of Total Prefixation Of Mass Housing In India- General Remarks On Pre Cast Rooting/Flooring Systems -Economical Wall System - Single Brick Thick Loading Bearing Wall - 19cm Thick Load Bearing Masonry Walls - Half Brick Thick Load Bearing Wall - Fly ash Gypsum Thick For Masonry - Stone Block Masonry - Adoption Of Precast R.C. Plank And Join System For Roof/Floor In The Building

UNIT-III   ALTERNATIVE BUILDING MATERIALS FOR LOW-COST HOUSING

Introduction - Substitute for Scarce Materials-Ferrocement - Gypsum Boards – Timber Substitutions - Industrial Wastes - Agricultural Wastes - Fitire Starateru; For, P,Topm of

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Alternative Building Maintenance

UNIT-IV   LOW-COST INFRASTRUCTURE SERVICES

Introduce - Present Status - Technological Options - Low-Cost Sanitation - Domestic Wall - Water Supply, Energy.

UNIT-V   RURAL HOUSING

Introduction Traditional Practice of Rural Housing Continuous - Mud Housing Technology. Mud Roofs - Characteristics of Mud - Fire Treatment For Thatch Roof - Soil Stabilization - Rural Housing Programs

UNIT-VI   HOUSING IN DISASTER PRONE AREAS

Introduction-Earthquake - Damages to Houses - Traditional Prone Areas - Type of Damages and Railways Of Non-Engineered Buildings - Repair And Restore Action Of Earthquake Damaged Non-Engineered Buildings Recommendations For Future Constructions. Requirements Of Structural Safety of Thin Precast Roofing Units Against Earthquake Forces Status Of R& D In Earthquake Strengthening Measures - Floods, Cyclone, Future Safety

TEXT BOOKS
1) Building Materials for Low –Income Houses-International Council for Building Research Studies and Documentation.
2) Hand Book of Low Cost Housing by A.K.Lal-Newage International Publishers.
3) Properties of Concrete-Neville A.M. Pitman Publishing Limited, London.

REFERENCES
1) Light Weight Concrete, Academic Kiado, Rudhai.G-Publishing Home of Hungarian Academy of Sciences 1963.
2) Low-Cost Housing-G.C. Mathur.
3) Modern Trends In Housing In Developing Countries-A.G. Madhava Rao, D.S. Ramachandra Murthy & G.Annamalai.

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III B.Tech, II-Sem (CE)
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(A0125206) ADVANCED GEOTECHNICAL ENGINEERING
(Professional Elective-II)

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:
At the end of the course, student is able to:
- ❖ Able to design & execute the soil exploration scheme.
- ❖ Able to find allowable bearing pressure based on different field tests and to find the settlement ofshallow 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 pilewall)

MAPPING OF 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
Avg.	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   SHALLOW FOUNDATIONS
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   DEEP FOUNDATIONS
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.

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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) Soil Mechanics and Foundation Eng., K.R. Arora, 12th edition, Standard Publishers and Distributors, Delhi, 2021.
2) Foundation Engineering, Varghese, P.C. 10th edition, Prentice Hall of India., New Delhi, 2020.

REFERENCES:
1) Principles of Foundation Engineering, Bajra M. Das, Cengage India Pvt Ltd, 2020.
2) Foundation Analysis and Design, Joseph E Bowles, (2017), McGraw - Hill Publishing company, Newyork, 2020.
3) Analysis and Design of Substructures, Swami Saran, Oxford and IBH Publishing company Pvt Ltd, 2020.
4) Geotechnical Engineering, Gulati S. K & Manoj Dutta, Tata Mc. Grawhill Publishers New Delhi, 2020.
5) Geotechnical Engineering, C. Venkataramiah, 15th edition, new age International Pvt. Ltd, 2021.
6) Geotechnical Engineering, V.N.S. Murthy, CRC Press, New york, 2020.
7) Soil Mechanics and Foundation, B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi, 2020.

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(A0126206) PRESTRESSED CONCRETE
(Professional Elective-II)

Pre-requisites: Design of concrete structures.

COURSE OBJECTIVES:
- ❖ The main objective of the course is to design the pre-tensioned and post-tensioned members.

COURSE OUTCOMES:
At the end of the course student is able to:
- ❖ Get the knowledge on basic concepts of prestressed concrete
- ❖ Evaluate the losses that occur in pre-tensioning and post-tensioning members
- ❖ Difference between methods of pre-stressing systems
- ❖ Determine limit state of serviceability of members
- ❖ Understand the short-term deflections
- ❖ Design the pre-stressed concrete members for flexure and shear

MAPPING OF COs & POs:

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

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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   Prestressed Concrete, Krishna Raju, 10th edition, Tata McGraw Hill Publications, 2020.
2   Prestressed Concrete, N. Rajasekharan, 10th edition, Narosa publications, 2020.

REFERENCE:
1. Prestressed Concrete, Ramamrutham, 10th edition, Dhanpatrai Publications, 2020.
2. Design of Prestressed concrete structures, 10thn edition, T.Y. Lin, and Ned H. Burns, John Wiley andSons, 2020.

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

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(A0127206) 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 OF COs & POs:

	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, 2020.

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.

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(A0128206) BRIDGE ENGINEERING
(Professional Elective-II)

Pre-requisites: 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:
- ❖ Have knowledge of types and components of bridges
- ❖ Understand IRC loading that act on RCC bridge and its effects
- ❖ Design RCC deck slab and T-Beam bridge girders
- ❖ Design sub-structure like piers and abutments
- ❖ Design various types of bearings

MAPPING OF COs & POs:

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

UNIT-I   INTRODUCTION
Definitions, components of a bridge, classification, importance and standard specifications.

UNIT-II   IRC LOADING STANDARD
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.

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TEXT BOOKS:
1. Design of Bridges, N. Krishna Raju, 10th edition, Oxford & IBH Publishing Co. Pvt Ltd, 2020.
2. Essentials of bridge engineering, Johnson Victor D, Oxford & IBH Publishing Co. Pvt Ltd, 2019.

REFERENCE BOOKS:
1. Standard specifications and code of practice for road bridges IRC: 06 - 2017, Bureau of IndianStandards, India
2. Standard Specifications and Code of Practice for Road Bridges Section: III Cement Concrete (Plainand 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

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(A0529206) BASICS OF JAVA PROGRAMMING
(Skill Development Course)

COURSE OBJECTIVES:
- ❖ Java was designed with the principle of "write once, run anywhere" (WORA).
- ❖ Java is built around the concept of objects and classes, promoting modular and reusable code

COURSE OUTCOMES:
- ❖ Students should be able to understand and use fundamental Java syntax, data types, variables, and operators
- ❖ Students should be able to implement decision-making (if-else, switch) and looping (for, while) structures in Java programs
- ❖ Students should understand and apply concepts like classes, objects, inheritance, and polymorphism to design and implement simple object-oriented programs.

MAPPING OF COs & POs:

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

UNIT-I
INTRODUCTION TO JAVA: Introduction to OOP, OOP Concepts, The History and Evolution of Java, Differences from C, C++ and JAVA, The Java Buzzwords, Simple Program, Compiling the Program, Structure of Java Program, data types, variables, constants, type conversion and casting, enumerated types, scope and life time of variables, operators, expressions, control statements, arrays.

INTRODUCTIONS TO CLASS AND OBJECTS: Overview of classes, creations of objects, instant variables and methods, constructors, access controls, usage of this, Garbage Collection and finalize.

UNIT-II
MORE ON CLASSES AND METHODS: Objects as arguments, returning objects, Recursion, overloading methods and constructors, understanding static, Introducing Nested and Inner Classes, Using Command-Line Arguments.

INHERITANCE: Overview, Super and Sub classes, Member access rules, types of Inheritance, super uses, method overriding, Dynamic method dispatch, abstract classes and methods, use of final, the Object class and its methods.

UNIT-III
PACKAGES: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, access protection.

INTERFACES: Interfaces vs. Abstract classes, defining interfaces, implementing interfaces, Nested Interfaces, Interfaces Can Be Extended, Default Interface Methods, and Use static Methods in an Interface.

UNIT-IV
STRING HANDLING: Strings, String Constructors, string functions: Special String Operations, string functions, String Comparison, Searching Strings, modifying a String, Data Conversion Using Value Of, Joining Strings, String Buffer, String Builder.

Primitive Type Wrappers, **some java. util package classes:** String Tokenizer, Date, Calendar, Random, and Scanner.

UNIT-V
INPUT /OUTPUT EXPLORING OF JAVA.IO: I/O Basics, Streams, Byte Streams and Character Streams, The Predefined Streams, Reading Console Input, Writing Console Output, Print Writer Class, Reading and Writing Files, File class, The Auto Closeable, Closeable, and Flushable Interfaces, File zipping and unzipping, Serialization, Static Import.

UNIT-VI   EXCEPTION HANDLING: Fundamentals, exception types, usage of try, catch, multiple catch Clauses, Nested try Statements, Usage of throw, throws and finally, built in exceptions, creating your own exceptions subclasses.

MULTITHREADING: Overview, difference between process and thread, Main thread, creating threads, thread life cycle, creating multiple threads, use of is Alive () & join (), thread priorities, thread synchronization, interthread communication, deadlock.

TEXT BOOKS
1. Java, the complete reference, 9th Editon, Herbert schildt, Oracle Press, MGHE, 2020.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education, 2020.

REFERENCES
1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons, 2020.
2. Programming in Java, Sachin Malhotra, Saurabh Choudhary, Second Edition, 2019.
3. An Introduction to OOP, T. Budd, second edition, Pearson education, 2020.
4. Introduction to Java programming, Y. Daniel Liang 6th edition, Pearson education, 2020.
5. An introduction to Java programming and object-oriented application development, R.A. Johnson-Thomson, 2020.
6. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, seventh Edition, PearsonEducation, 2020.
7. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, Seventh Edition,Pearson Education, 2020.

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(A0014203) INDIAN HERITAGE & CULTURE
(Mandatory Learning Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

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 revived by erudite writers. The glory of Indian Heritage & culture have been ignored or distorted in wake of western culture. The present generation ought to know their indigenous culture and heritage and apply the wisdom to the current core working aspects.

COURSE OBJECTIVES:
- ❖ To enable the students to have an insight into and understanding of the great heritage and culture of India.
- ❖ To sensitize them towards preservation and progression of the composite culture of India
- ❖ To make students learn soft skills and life skills from ancient treatise
- ❖ Relevance of architecture & ancient principle to the current engineering scenario

COURSE OUTCOMES:
- ❖ Equip learners with knowledge of the heritage and culture of India.
- ❖ Acquire Leadership & Soft skills from great leaders of India
- ❖ Apply the ancient wisdom to become successful professionals
- ❖ To make them understand diversity of culture and national integrity

UNIT-I
Origin of Indian Culture & Heritage –Indus valley Civilization - Time line of Indian empires - Cultural & social conditions of India under Mauryas, Guptas & the Sathavahanas

UNIT-II
Influence of Islam on Indian Culture - Leadership skills from Akbar the Great & Krishnadeva Raya -World Heritage Sites in India

UNIT-III
Great Indian Epics-Life skills from Ramayana and Mahabharata-Ethics from Upanishads &-Vedas - Patanjali Yoga -Principles of Jainism, Buddhism & Sufism

UNIT-IV
Indian Art Forms –Literature - Rabindranath Tagore - RK.Narayan - Sri Sri - Jashuva-Music - Saint Tyagaraja, Annamayya -Purandhara Das - Kabir Das- Dance Forms of India

UNIT-V
Social awakening and social reform movements -Theosophical Society - Emancipation of Women inpre-independent era

UNIT-VI
Mahatma Gandhi - Non-violence and Satyagraha - Great leaders of Freedom struggle-Subhash Chandra Bose-Bhagath Singh –Moulana Abul Kalam Azad-B.R.Ambedkar - Post Independent Era.

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TEXT BOOK

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

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.

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(A0197206) 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 CivilEngineering 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 analyze the data.
- ❖ Apply GIS analysis in the civil engineering areas.
- ❖ Learn the processes of data acquisition and utilize the data as input data.

MAPPING OF COs & POs:

	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, Geo Media, IDRISI
2. Open source software like GRASS GIS, ILWIS, JUMP GIS, Map Window 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. Landsat Data extraction

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AUTONOMOUS
DEPARTMENT OF CIVIL ENGINEERING

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

(A0198206) 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 Analyze 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 OF 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 Odor
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 PointChlorination 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, settle able 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. Chemistry for Environmental Engineering, Sawyer, N.C., and McCarty, P.L., McGraw-Hill Book Co.,New York, 2020.

REFERENCE BOOK
1. Standard Methods for the Examination of Water and Waste Water, APHA-AWWAWPCF, 25thEdition., Washington (D.C), 2021.

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

(A0199206) 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

MAPPING OF COs & POs:

	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.

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IV B.Tech, I-Sem (CE)

L	2
T	1
C	3

(A0129207) DESIGN AND DRAWING OF IRRIGATION STRUCTURES
(Professional Elective-III)

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 OF 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. Under Tunnel

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.

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IV B.Tech, I-Sem (CE)

L	T	C
2	1	3

(A0130207) RAILWAYS, DOCKS & HARBOUR ENGINEERING
(Professional Elective-III)

Pre-requisites: Transportation Engineering.

COURSE OBJECTIVES:
❖ The course objective covers the Railway Track Alignment, 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.
❖ In case 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 OFCOs & 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
Introduction-Importance of Railways in National Development-Factors Controlling alignment-Engineering Surveys for Track Alignment-Railway Track (Permanent Way)-Components and Functions

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– underground 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.

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

(A0131207) INTELLIGENT TRANSPORTATION SYSTEM
(Professional Elective-III)

COURSE OBJECTIVES:
- ❖ Impart knowledge on advanced transportation concepts in the field of ITS
- ❖ Introduce the technologies of ITS in solving transportation problems

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- ❖ Understand the sensor technologies
- ❖ Understand the communication techniques
- ❖ Apply the various ITS methodologies
- ❖ Understand the User Needs
- ❖ Define the significance of ITS under Indian conditions

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	3									2	
CO2	2	2	2	1	3									2	
CO3	2	2	2	1	3									2	
CO4	2	2	2	1	3									2	
C05	2	2	2	1	3									2	

UNIT I
Introduction: Objectives- Advantages - Data Collection Techniques - Detectors – Automatic Vehicle Location - Automatic Vehicle Identification - Geographical Information Systems - Video Data Collection.

UNIT II
Telecommunications in ITS: Importance of telecommunications in the ITS system - Information Management - Traffic Management Centers (TMC) - Vehicle–Road side communication – Vehicle Positioning System.

UNIT III
ITS functional areas: Advanced Traffic Management Systems (ATMS) - Advanced Traveler Information Systems (ATIS) - Commercial Vehicle Operations (CVO) - Advanced Vehicle Control Systems (AVCS) - Advanced Public Transportation Systems (APTS) - Advanced Rural Transportation Systems (ARTS).

UNIT IV
ITS User Needs and Services: Travel and Traffic management - Public Transportation Management - Electronic Payment - Commercial Vehicle Operations – Emergency Management - Advanced Vehicle safety systems - Information Management.

UNIT V
Automated Highway Systems: Vehicles in Platoons – Integration of Automated Highway Systems - ITS Programs in the World – Overview of ITS implementations in developed countries - Case studies

UNIT VI
ITS applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing

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TEXT BOOK:
1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC), Kan Paul
2. Sussman, J. M., *Perspective on ITS*, Artech House Publishers, 2005.
3. National ITS Architecture Documentation, US Department of Transportation, 2007 (CDROM).

REFERENCE BOOKS:
1. Chowdhary, M.A. and A Sadek, Fundamentals of Intelligent Transportation systems planning, Artech House Inc., US, 2003.
2. Lawrence A. Klein, Sensor technologies and Data requirements of ITS

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

(A0132207) GROUND IMPROVEMENT TECHNIQUES
(Professional Elective-III)

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 OF 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	2	2	2
CO3	3	2	2	1		1	1	1	1		1			2	2
CO4	3	2	1		1	1	1		1	1	1	1		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.

HYDRAULIC MODIFICATION: De-Watering Systems- open sumps and ditches, well point Systems, Vacuum consolidation, Electro osmosis, Sand Drains, Wick Drains, preloading with vertical drains.

UNIT-II
GROUTING TECHNIQUE: 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

THERMAL MODIFICATION: Ground freezing-methods, advantages and disadvantages-Vitrification, applicability, Process, Advantages, Limitations of the Technology, Economic and Regulatory Considerations.

UNIT-III
MECHANICAL TECHNIQUE: Compaction methods and compaction control, Vibro techniques (displacement/replacement), Blasting, Deep dynamic compaction, Precompression, Stone columns, lime columns.

UNIT-IV
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.

UNIT-V
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.

UNIT-VI
Geosynthetics: Geotextiles, geogrids and geomembranes- Types, Functions and applications.
Tests for geotextiles materials.

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.

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

(A0133207) ESTIMATION, COSTING & VALUATION
(Professional Elective-IV)

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 OF 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: Philosophy of estimation, purpose of estimation, Different types of estimates- their function and preparation, **estimation quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining wall,** 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. (Single storey with two rooms)

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

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. **Calculation of quantity of shuttering for different items of RCC work.**

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, canals, roads**, Overhead 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, **lintel** and Footing.

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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, **Encrypting, decrypting, reverse Auctions.**

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

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.

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	2	1	3

(A0145207) 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 Maintenance, Road side development.

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

MAPPING OF 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	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 MAINTENANCE
Importance of Highway Maintenance Works-Deterioration and Damages in Road Infrastruture-Maintance Requirement in Different Road Components-Distresses in Flexible Pavement and Maintenance

UNIT-VI   ROAD SIDE DEVELOPMENT
Environmental and Social Issues in Highway Development-Road side Development and Arboriculture-Control of Soil Erosion.

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.

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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.

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

(A0136207) REHABILITATION OF STRUCTURES
(Professional Elective-IV)

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 OF 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 – Importance-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 of cracks & investigation.

UNIT-III   INSPECTION AND TESTING
Symptoms and Diagnosis of Distress -Damage Assessment -NDT – RCPT –PUDIT-Advantages and disadvantages.

UNIT-IV   TECHNIQUES FOR REPAIR
General techniques-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
General strengthening techniques -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 – Applications-Advantages and disadvantages-Building Instrumentation.

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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

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(A0144207) ADVANCED STRUCTURAL DESIGN
(Professional Elective-IV)

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 OF 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
Introduction – types of retaining walls – stability checks – behaviour of cantilever and counterfort retaining wall - design and detailing of cantilever and counterfort retaining wall – design of shear key – design of counterfort Design Example of Cantilever retaining wall and Counter fort retaining wall.

UNIT-II   RC WATER TANKS
Introduction – types of water tanks- Analysis for Self Weight, Water Pressure and Earth Pressure, Design and Detailing of Underground – Square, Rectangle. Design Example of Rectangular water tank and Circular water tank resting on ground.

UNIT-III   FLAT-SLAB
Introduction - behaviour and modes of failure - analysis for gravity loads – design and detailing of interior and exterior panel with and without drop. Design Example of interior panel and exterior panel of Flat slab.

UNIT-IV   COMPOSITE SLAB
Introduction – design and detailing of composite slab as per IS: 11384-1985 – design of shear connectors. Design example of composite slab

UNIT-V   CHIMNEYS
Introduction - stresses due to self-weight, wind, temperature, and combinations of stresses – design and detailing of chimney Design Examples of chimneys and silos using Janssen's theory and Airy's theory.

SILOS
Introduction – design and detailing of circular silo using Janssen's theory and Airy's theory

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UNIT-VI   TUBULAR MEMBERS

Introduction – design of steel tubular members as per API RP 2A code. 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.

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(A0137207) 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 and types of industrial sources for waste water production, its quality and quantity of production, different methods to treat industrial waste water so that the effluent will meet the discharge standards.

COURSE OUTCOMES:
At the end of the course, student is able to:
- ❖ Understand the basic concepts of industrial waste water.
- ❖ Gain knowledge in treatment process for industrial waste water.
- ❖ Know the process of disposal, treatment methods and residual management.
- ❖ Employ the case studies of industrial manufacturing processes for relevant projects.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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, **Standards of Disposal**. Reasons for treatment of industrial wastewater – Regulatory requirements - Industrial waste survey, Characterization and variables. Toxicity of industrial effluents. Preventing and minimizing wastes at the source.

UNIT-II   INDUSTRIAL WASTE WATER TREATMENT
Equalisation, Neutralisation - Oil Separation, Flotation – Precipitation, Aerobic and Anaerobic biological treatment, Sequencing Batch Reactors. **Waste Reduction-Volume Reduction-Strength Reduction.**

UNIT-III   ADVANCE WASTE WATER TREATMENT
Chemical oxidation – Ozonation, Photo Catalysis - Wet Air Oxidation, Evaporation - Ion Exchange - Membrane Technologies - Nutrient removal, **Heavy Metal Removal, Nitrification and De-nitrification**.

UNIT-IV   DISPOSAL AND TREATMENT
Industrial waste water discharges into streams, Lakes and oceans and problems, Common Effluent Treatment Plants, Advantages and Suitability, Limitations. **Disposal of Treated Waste Water**, Effluent Disposal Methods.

UNIT-V   RESIDUAL MANAGEMENT
Residuals of industrial wastewater treatment, Quantification and characteristics of Sludge, Thickening, digestion, conditioning, dewatering and disposal of sludge, **Ultimate Disposal.**

UNIT-VI   CASE STUDIES
Industrial manufacturing process description, Characteristics and Composition of waste water and Manufacturing Processes of Industries like Textiles, Tanneries, Pulp and paper, Chemical

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industries, Food processing industries, Steel and Sugar.

TEXT BOOKS:
1) Industrial Water Pollution Control, Eckenfelder, W.W. Mc-Graw Hill, 2000
2) Waste Water Treatment, M.N.Rao & A.K.Datta, Oxford & IBH Publishing Co Pvt. Ltd, 2020

REFERENCES:
1) Wastewater Engineering: Treatment Disposal and Reuse, Metcalf & Eddy, 4th Edition, Tata McGraw Hill, 2017.
2) Pollution Prevention and Abatement Handbook – Towards Cleaner Production World Bank Group (1998) World Bank and UNEP, Washington D, 2020.
3) Wastewater Treatment – Concepts and Design Approach, G L Karia and R A Christian, Prentice Hall of India, 2006.
4) Environmental Engineering, Gerard Kiely, McGraw Hill Education (India) Pvt Ltd, 2013.
5) Wastewater Treatment for Pollution Control, Arceivala, S.J, Tata McGraw Hill, 2008.

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(A0138207) FIRE SAFETY ENGINEERING DESIGN OF STRUCTURES
(Professional Elective-V)

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 OF 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   THE FIRE PROCESS
Fire Triangle, Fire Tetrahydran, Fuels, Smouldering, Metal Fires, Combustion and Dusts, Ease of Ignition, Heat, Ignition Processes, Fire Stages, Structure of Flames

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
Basics of Detectors and Alarms, Types of Detectors, 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 Design Constraints

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) Principles Of Fire Safety Engineering: Understanding Fire And Fire Protection By Das, Akhil Kumar
2) Fire protection Engineering in Building Design,Jane N Lataille, (2003),Butterworth-Heinemann Publishers.
3) Fire Safety Engineering Design of Structures, John A. Purkiss, (2014), CRC Press.

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(A0140207) WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT
(Professional Elective-V)

COURSE OBJECTIVES:
- ❖ Water resource systems deals with modelling techniques for optimum utilization of the available water resources in a system. This course emphasison 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 OF COs & POs:

	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, Principles and need for system planning & management, planning & management aspects, types of a systems, systems approach, system analysis, basic problems in systems analysis and example problems.Techniques of water Resources system Analysis.

UNIT – II   SYSTEM TECHNIQUES IN WATER RESOURCES
Optimization using calculus, function of a single and multiple variables:Unconstrained Optimization, Constrained Optimization; 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. Introduction to Non-linear Programming and Genetic Algorithms.

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, benefitcost analysis, Benefits and Costs, Cost and benefits curves, cost and benefits estimation. Introduction of how to dealing the multi objective planning.

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, multireservoir operation, stationary policy, simulation of reservoir operation for hydropower generation.

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UNIT – V   RESERVOIR SYSTEMS-RANDOM INFLOW

Review of basic probability theory, probability distributions, 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, crop yield optimization, multi reservoir system for irrigation planning, realiability capacity tradeoff for multicrop irrigation, 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.Introduction to Artificial Intelligence (AI) tools: ANN and some Fuzzylogic, Fuzzy optimization techniques

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.
5) Chaturvedi, M.C. "Water Resources Systems Planning and Management", Tata McGraw Hill Pub.Co., N Delhi, 1987.

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(A0143207) EARTHQUAKE RESISTANT DESIGN
(Professional Elective-V)

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 OF COs & POs:

	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 – 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 - Half-power band width – 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 – 2023 (draft)Part-I&II 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 multi-storey building using Seismic Coefficient method.

CODAL DETAILING PROVISIONS
Review of the latest Indian codes IS: 13920 -2016 Provisions for ductile detailing of R.C buildings – Beam, column and joints- Example Problem on ductile detailing of Multi-storey Building.

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 – Pounding

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UNIT-V   ANALYSIS FOR EARTHQUAKE LOADS

IS: 1893-2023(draft) Part-I&II - Seismic Coefficient method- modal analysis- Applications to multi-storied building frames.

UNIT-VI   SHEAR WALLS

Types – Design of Shear walls with Boundary Element as per IS: 13920-2016 – 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.

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(A0141207) FINITE ELEMENT METHODS IN CIVIL ENGINEERING
(Open Elective-III)

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 OF COs & POs:

	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-Boundary Conditions- Equilibrium equations derivation - Strain displacement relationship derivation-Stress-strain relationship derivation-plane stress and plane strain-Temperature effects-potential energy-Equilibrium-Rayleigh-Ritz method-Saint venant's principle - Problems

UNIT-II   ONE DIMENSIONAL FEM
Introduction-Bar element: construction of shape functions, generation of stiffness matrix, stress strain calculations and related problems. Finite element modeling-Coordinates and shape functions-Potential Energy Approach-Problems

UNIT-III   TWO-DIMENSIONAL FEM
Introduction-Finite element modelling-Constant Strain Triangle-shape functions-Iso-parametric representation-potential energy approach-Element Stiffness-Force Terms-Stress calculations-problems

UNIT-IV   ISOPARAMETRIC ELEMENTS (2D)
Introduction-Four node Quadrilateral-numerical Integration- Four node Quadrilateral-higher order elements Eight node Quadrilateral

UNIT-V   BEAMS AND FRAMES
Introduction-Potential Energy Approach-Finite element formulation- Hermite shape functions-Load Vector-Boundary Conditions-Shear force and Bending moment-problems

UNIT-VI   AXISYMMETRIC SOLIDS
Introduction-Axisymmetric Formulation-Finite element modeling-Triangular Element-Potential Energy Approach-Body force term- Surface Traction-Stress calculations

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.

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(A0142207) GLOBAL WARMING AND CLIMATE CHANGE
(Open Elective-III)

COURSE OBJECTIVES:
- ❖ To know the basics, importance of global warming
- ❖ To know the concept of mitigation measures against global warming
- ❖ To know the impacts of climate changes

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.
- ❖ Analyse the protocols with observed changes along with its causes
- ❖ Evaluate the climate changes and mitigation measures.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	-	2	3	1	1	1	1	2	1	1	-
CO2	3	1	1	1	-	2	3	1	1	1	1	2	1	1	-
CO3	3	1	1	1	-	2	3	1	2	1	1	2	1	1	-
CO4	2	1	1	1	-	2	3	1	2	1	1	2	1	1	-
Avg.	3	1	1	1	-	2	3	1	2	1	1	2	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. Global warming impacts, Vienna convention and Montreal protocol

UNIT II   ATMOSPHERE AND ITS COMPONENTS
Atmosphere and its layers, 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 and 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– Risk of Irreversible Changes. Effects of climate change on plants and animals.

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. Separate human and natural influences on climate

UNIT V   CLIMATE CHANGE MEASURES
Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Solar Energy – Wind – Hydroelectric Power, Bio power and geothermal energy.

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UNIT VI   MITIGATION MEASURES

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

TEXT BOOK:
1. Dash Sushil Kumar, Climate Change – An Indian Perspective, Cambridge University Press India Pvt. Ltd., 2007.
2. Jerry Silver , Global Warming and Climate Change Demystified, McGraw-Hill Professional, 2008.

REFERENCE BOOKS:
1. J.M. Wallace and P.V. Hobbs, Atmospheric Science, Academic Press, 2006.
2. Frances Drake, Global Warming: The Science of Climate Change, Hodder Arnold Publication, 2000.
3. Jan C. van Dam, Impacts of Climate Change and Climate Variability on Hydrological Regimes, Cambridge University Press, 2003.
4. Adaptation and mitigation of climate change – Scientific Technical Analysis. Cambridge University Press, Cambridge,2006.
5. R.T. Watson, M.C. Zinyowera and R.H. Moss, Climate Change Impacts, Adaptations and Mitigation of Climate Change - Scientific-Technical Analysis, Cambridge University Press, 1996.

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(A0134207) DISASTER PREPAREDNESS AND PLANNING MANAGEMENT
(Open Elective-III)

COURSE OBJECTIVES:
- ❖ To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters.
- ❖ To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
- ❖ To understand Impacts of Disasters Key Skills.

COURSE OUTCOMES:
At the end of this course, students will be able to:
- ❖ To understand the basic concepts of disaster, Economic Damage & losses & types of disasters.
- ❖ A comprehensive study of disaster-prone areas in India various aspects etc, including post-disaster diseases and epidemics.
- ❖ To monitoring the disaster and Evaluation of Risk, Application of Remote Sensing. Data collecting from various Agencies & Governmental and Community Preparedness.
- ❖ Learn to demonstrate a critical understanding of key concepts in disaster risk reduction & Assessments, Strategies of Disaster Mitigation.
- ❖ Adoption of sustainable development methods & factors affecting vulnerability.

MAPPING OF COS & POS:

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

UNIT-I
Introduction: Concepts & Definitions of Disaster, Vulnerability, Resilience, Hazard Risks Severity, Frequency and Details, Capacity, Impact, Prevention, Mitigation. Factors and Significance; Difference Between Hazard and Disaster.

UNIT-II
Effects of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem.
Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches,
Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III
Disasters Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-IV
Disaster Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk, Application of Remote Sensing. Data from Meteorological and Other Agencies, Media Reports, Governmental and Community Preparedness.

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UNIT-V

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Strategies for Survival. Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation. Programs of Disaster Mitigation in India.

UNIT-VI

Disasters, Environment and Development: Factors affecting vulnerability such as impact of developmental projects and environmental modifications, sustainable and environmental friendly recovery; reconstruction and development methods.

TEXTBOOKS:
1) R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal Book Company, 2021.
2) Sahni, Pardeep (Eds.), "Disaster Mitigation Experiences and Reflections", PHI, New Delhi, 2004.

REFERENCE BOOKS:
1) Ghosh G.K., Disaster Management, APH Publishing Corporation, 2006
2) Larry R. Collins, Disaster Management and Preparedness, Kindle Edition, 2000.
3) Goel S. L., Disaster Administration and Management: Text and Case Studies, Deep & Deep Publication Pvt. Ltd., New Delhi, 2007.
4) Singh B.K., Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication, 2008
5) Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, 2003.
6) Inter-Agency Standing Committee (IASC) Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC, 2007
7) http://ndma.gov.in/ (Home page of National Disaster Management Authority).

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(A0135207) ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT
(Open Elective-III)

COURSE OBJECTIVES:
- ❖ Define and Classify Environmental Impacts and the terminology
- ❖ Understands the environmental Impact assessment procedure and methodology
- ❖ List and describe environmental audits

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 EIA reports and environmental management plans
- ❖ Study and rectification of case studies.

MAPPING OF COs & POs:

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

UNIT-I   BASIC CONCEPT OF EIA
The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle, 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   EIA 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. EIA review- Baseline Conditions - Construction Stage Impacts, post project impacts.

UNIT-III   QUALITY ASSESSMENT OF NATURAL SOURCES AND POLLUTION 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. Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact.

UNIT-IV   ENVIRONMENTAL MANAGEMENT PLAN:
EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT-V   ENVIRONMENTAL LEGISLATION AND LIFE CYCLE ASSESSMENT
Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules.

Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria- case studies.

UNIT-VI   CASE STUDIES

Case studies and preparation of Environmental Impact assessment statement for various Industries namely thermal power plants, pharmaceutical industries, Water Resources Project, Nuclear fuel complex, Sewage treatment plant, Air ports.

TEXT BOOKS:
1. Y. Anjaneyulu, Environmental Impact Assessment Methodologies, B.S. Publication, Hyderabad, 2019.
2. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York, 2020.

REFERENCE BOOKS:
1. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002
2. Suresh K. Dhaneja, Environmental Science and Engineering, S.K.Katania & Sons Publication, New Delhi, 2021.
3. Petts, J., Handbook of Environmental Impact Assessment Vol. I and II, Blackwell Science, London, 2020.
4. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.
5. Environmental Assessment Sourcebook Vol. I, II and III, The World Bank Group, The World Bank, Washington, 2020.

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(A0139207) WATERSHED MANAGEMENT
(Open Elective-IV)

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
- ❖ Plan watershed management activities and prepare plan of action.
- ❖ Understand the modern techniques used in Watershed management

MAPPING OF COs & POs:

	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, Objectives and Policies of Watershed Development, Effect of watershed on community.

UNIT-II   WATERSHED MODELLING
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. Watershed Delineation and Modeling

UNIT-III   SUSTAINABLE WATERSHED APPROACH AND WATERSHED MANAGEMNT PRACTICES
Sustainable watershed management, Agriculture Practices and watershed management, soil erosion and conservation, principles of erosion factors affecting soil erosion, cost of soil erosion, estimation of loss of soil from erosion, control of soil erosion, conservative measures

UNIT-IV   INTEGRATED WATERSHED MANAGEMENT
Integrated water resources management, conjunctive use of water resources, Rainwater Harvesting and Roof catchment systems

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   USE OF MODERN TECHNIQUES IN WATERSHED MANAGEMNET
GIS and its applications in watershed management, Remote sensing and its applications in watershed management

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TEXTBOOKS
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.

REFERENCES
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.

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(A0146207) CONSTRUCTION METHODS & EQUIPMENT
(Open Elective-IV)

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 OF COs & POs:

	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   INTRODUCTION - EQUIPMENT ECONOMICS
The history of construction equipment, safety, planning equipment utilization, Equipment records, Cost of Capital, Elements Operating Cost, , Rent and Lease Considerations.

UNIT-II   PLANNING FOR EARTHWORK CONSTRUCTION
Planning, Graphical Presentation of Earthwork, Earthwork Quantities, , 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   MACHINE EQUIPMENT POWER REQUIREMENTS
Required Power, Available power, Usable power,. Dozers- pushing material, land clearing, ripping rock, Scrapers- types, operation, production cycle, scraper safety, Excavators- front shovels, hoes, loaders.trucks, cranes,finishing equipment.

UNIT –V   CONCRETE AND CONCRETE EQUIPMENT
Piles and Pile-Driving Equipment, - Concrete Mixtures, Batching of Concrete, Placing of Concrete, Consolidating and Finishing,

UNIT-VI   PLANNING FOR BUILDING CONSTRUCTION
Introduction, Control of Construction Nuisances, forming systems- Classification, Formwork Design, Formwork Economics, Safety

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.

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(A0147207) URBAN TRANSPORTATION PLANNING
(Open Elective-IV)

COURSE OBJECTIVES:
- ❖ Impart the knowledge of urban transportation system.
- ❖ Developing analytical and comprehensive approach to select appropriate mode of transportation.

COURSE OUTCOMES:
At the end of the course students will be able to:
- ❖ Interpret the urban activity system and travel patterns
- ❖ Demonstrate the classical methods of urban transportation planning
- ❖ Apply four stage travel demand modelling
- ❖ Understand the trip generations and trip distribution concepts
- ❖ Understand the mode and route choice of trip makers

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PSO3
CO1	2	2	1	2	2									3	
CO2	2	2	1	2	2									3	
CO3	2	2	1	2	2									3	
CO4	2	2	1	2	2									3	
CO5	2	2	1	2	2									3	

UNIT-I
Introduction to Urban Planning: Urban morphology - Urbanization and travel demand – Urban activity systems and travel patterns – Systems approach – Trip based and Activity based approach - Urban Transportation Planning – Goals, Objectives and Constraints - Inventory, Model building, Forecasting and Evaluation - Study area delineation – Zoning - UTP survey.

UNIT-II
Trip generation models: Trip classification - productions and attractions – Trip rate analysis - Multiple regression models - Category analysis - Trip distribution models – Growth factor models, Gravity model and Opportunity modes.

UNIT-III
Modal split models: Mode choice behaviour – Trip end and trip interchange models- Probabilistic models - Utility functions - Logit models - Two stage model - Traffic assignment –Transportation networks – Minimum Path Algorithms - Assignment methods – All or Nothing assignment and Multi path assignment - Route-choice behaviour.

UNIT-IV
User Equilibrium assignment: System optimum assignment - Incremental assignment - Capacity restraint assignment - Stochastic user equilibrium assignment - Dynamic Assignment.

UNIT-V
Transportation Survey: Introduction - Types of Movement-Types of Surveys- Home-interview survey , Commercial Vehicle Survey , Innovative Commercial Vehicle Tracking Methods , Cordon-Line Survey

UNIT-VI
Land use transportation models: – Urban forms and structures - Location models - Accessibility– Land use models - Lowry derivative models – Micro level Planning-International Practice.

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TEXTBOOKS:
1) Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, NJ, 2007..
2) Papacostas C.S. and Prevedouros, P.D., Transportation Engineering & Planning, PHI, New
3) Hutchinson, B.G., Principles of Urban Transport Systems Planning, Scripta, McGraw-Hill,NewYork, 1974.

REFERENCES:
1) Black, Alan, Urban Mass Transportation Planning, McGraw- Hill, Inc., New York, 1995.
2) Vukan, R. Vuchic, Urban Transit Systems and Technology, John –Wiley & Sons, New Jersey, 2007.
3) National Urban Transport Policy

WEB REFERENCES:
1) https/www.coursera.org
2) www.nptel.ac.in/courses

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(A0148207) TRAFFIC ENGINEERING
(Open 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, Traffic Control aids

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 OF COs & POs:

	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　　　TRAFFIC SIGNSAND ROADMARKINGS
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　　　MISCELLANEOUS TRAFFIC CONROL AIDS AND STREET FURNITURE
Traffic Aids and Street Furniture-Principles of Street Furniture Design-Roadway Delineators- Hazard Delineators- Hazard Makers- Object Markers- Speed Breakers- Rumble Strips.

TEXTBOOKS
1. Highway Engineering–S.K.Khanna & C.E.G.Justo,Nemchand &Bros,10thEdition, 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

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(A0149207) 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 OF COs & POs:

	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, Applications in quality control and assurance

UNIT-II   ANALYTICAL MODELS OF RANDOM PHENOMENON
Random variables and random phenomenon – probability distributions: Normal, Guassian, log normal, Poison, exponential, gamma, binomial, beta distributions.

UNIT-III   LINEAR REGRESSION AND CORRELATION ANALYSES
Introduction – applications of regression analysis in engineering - fundamentals of linear regression analysis – correlation analysis – univariate linear regression analysis - linear regression – multivariate linear regression analysis - multiple linear regression – nonlinear regression.

UNIT-IV   BAYESIAN APPROACH
Introduction – basic concepts – continuous case – discrete case – Bayesian concept in sampling theory – Bayesian regression and correlation analysis.

UNIT-V   NUMERICAL METHODS
Introduction – Two Dimensional Integrals, stiffness integration, stress calculation, four node and eight noded Quadrilateral Integration

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UNIT-VI   DIFFERENTIAL EQUATIONS

Introduction – Taylor series simulations – Runge Kutta's method – 1D and 2D wave equations 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.

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(A0150207) GREEN BUILDINGS
(Humanities and Social Sciences)

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 OF 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, Need of green building in present scenario, Importance of green building, Merits and demerits. Sustainable Buildings

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). Scenarios for each classification of green buildings

UNIT-III DEVELOPMENT OF ENERGY EFFICIENT BUILDING
Introduction, Concept, Advantages, Design parameters, Sustainable Sites, Water Efficiency renewable energy utilization.

UNIT-IV ENERGY & ATMOSPHERE
Materials & Resources, Indoor Environmental Quality, An additional category Innovation & Design criterion, energy performance optimization.

UNIT-V ENERGY CONSERVATION BUILDING CODE
Study of existing green buildings. Types of energy building codes- ASHRAE -2019, IECC 2021, Title-24- 2019

UNIT-VI PRINCIPLES AND PLANNING CONCEPTS OF GREEN BUILDINGS
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.

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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, AyshaZeneeb Majeed Springer Transactions in Civil and Environmental Engineering, (1st ed).2020.

harmony of the Self ('I') with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

UNIT III: Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family), Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order, b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b. At the level of society: as mutually enriching institutions and organizations, Sum up.

Textbooks:
1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books:
1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).

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harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health (Practice Exercises and Case Studies will be taken up in Practice Sessions)

UNIT III: Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship (Part-I)

Understanding Harmony in the family the basic unit of human interaction, Understanding values in human-human relationship; meaning of Justice (Nyaya) (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness (Ubhay-tripti); Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence

UNIT IV: Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship (Part-II)

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals (Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals), Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha), Practice Exercises and Case Studies will be taken up in Practice Sessions

UNIT V: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence, Practice Exercises and Case Studies will be taken up in Practice Sessions

UNIT VI: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

TEXT BOOK
1) R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2) R R Gaur, R Asthana, G P Bagaria, "Teachers Manual for a Foundation course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

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REFERENCE BOOKS

1) Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2) A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3) The Story of Stuff (Book).
4) Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5) E F Schumacher, "Small is Beautiful"
6) Slow is Beautiful – Cecile Andrews
7) J C Kumarappa "Economy of Permanence"
8) Pandit Sunderlal "Bharat Mein Angreji Raj"
9) Dharampal, "Rediscovering India"
10) Mohandas K Gandhi, "Hind Swaraj or Indian Home Rule"
11) India Wins Freedom – Maulana Abdul Kalam Azad
12) Vivekananda – Romain Rolland (English)
13) Gandhi – Romain Rolland (English)

In addition, the following reference books may be found useful for supplementary reading in Connection with different parts of the course:

1) B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co.,Lucknow. Reprinted 2008.
2) PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3) Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4) Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins,USA
5) Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6) Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
7) A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8) E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
9) A.N. Tripathy, 2003, Human Values, New Age International Publishers.

RELEVANT WEBSITES, MOVIES AND DOCUMENTARIES

1) Story of Stuff, http://www.storyofstuff.com
2) Al Gore, An Inconvenient Truth, Paramount Classics, USA
3) Charlie Chaplin, Modern Times, United Artists, USA
4) IIT Delhi, Modern Technology the Untold Story
5) Gandhi A., Right Here Right Now, Cyclewala Productions

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	L	T	C
IV B.Tech, I-Sem (CE)

	L	T	C
	0	0	1

(A0094207) COMPREHENSIVE VIVA-VOCE

There shall be comprehensive Viva-Voce examination at the end of 7th semester. Comprehensive Viva 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.

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IV B.Tech, I-Sem (CE)	L	T	C
	0	0	3

(A0095207) INDUSTRIAL / RESEARCH INTERNSHIP

COURSE OBJECTIVE:
- ❖ To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:
At the end of the project work the students are able to:
- ❖ Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- ❖ Identify methods and materials to carry out experiments/develop code
- ❖ Analyse the results to come out with concrete solutions.
- ❖ Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

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

The student has to undergo research / industry internship in III year, II-Semester break for a period of two months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the research / industry internship will be evaluated during 7th semester which carries 3 credits. Certificate from the organization has to be submitted to this effect attested by HoD and Internship in charge to the academic section.

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IV B.Tech, II-Sem (CE)

L	T	C
0	0	1

(A0096208) TECHNICAL SEMINAR

COURSE OBJECTIVES:
- ❖ To understand the basic concepts of technical and practical issues of course specialization
- ❖ To import a well-organized report writing skill of technical writing

COURSE OUTCOMES:
At the end of the Seminar the students are able to:
- ❖ Identify and compare technical and practical issues related to the area of course specialization
- ❖ Outline annotated bibliography of research demonstrating scholarly skills
- ❖ Prepare a well-organized report employing elements of technical writing and critical thinking.
- ❖ Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

MAPPING OF COs & POs:

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

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IV B.Tech, II-Sem (CE)	L	T	C
	0	0	5

(A0097208) INTERNSHIP IN INDUSTRY

COURSE OBJECTIVE:
- ❖ To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:
At the end of the project work the students are able to:
- ❖ Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- ❖ Identify methods and materials to carry out experiments/develop code
- ❖ Analyse the results to come out with concrete solutions.
- ❖ Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

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

The student has to undergo 6 months internship in IV year, II-Semester for a complete period of 06 months in a reputed industry/organization. The finalization of the summer internship industry/organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the industry internship will be evaluated during 8th semester which carries 05 credits. Certificate from the organization has to be submitted to this effect attested by HoD and Internship in charge to the academic section.

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IV B.Tech, II-Sem (CE)	L	T	C
	0	0	6

(A0098208) PROJECT WORK

COURSE OBJECTIVE:
 ❖ To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:
At the end of the project work the students are able to:
 ❖ Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
 ❖ Identify methods and materials to carry out experiments/develop code
 ❖ Analyse the results to come out with concrete solutions.
 ❖ Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

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

The project topic should be approved by Internal Department Committee (IDC) / Identified by organization where the student is carrying out 6 months internship. Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 marks for the End Semester Examination. The evaluation of project work shall be conducted at the end of the IV year II semester. The external 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 one technical seminars (25 marks) and remaining 25 for main project related activities. 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.

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ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct *If the candidate:*	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject onlyof all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection withthe examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has beenimpersonated, shall be cancelled in all the subjects of the examination (including practicals and projectwork) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additionalsheet, during or After the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language inthe answer paper or in letters to the Examiners or writes to the Examiner requesting	Cancellation of the performance in that subject.

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	him to award pass marks.	
6.	Refuses to obey the orders of the Chief Superintendent/Assistant–Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair mearsor misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not The candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned inclause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examinationhall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that

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		semester/year.
11.	Copying detected on the basis of Internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal or College Academic committee for furtheraction to award suitable punishment.	