



NARASARAOPETA **ENGINEERING COLLEGE**

(AUTONOMOUS)

Academic Regulations, Course Structure and Syllabus

(R20 Regulations)

B. Tech

Civil Engineering

(4 Year Program)

(Applicable for the Batches admitted from 2020-21)



NEC
NARASARAOPETA
ENGINEERING COLLEGE
(AUTONOMOUS)



NARASARAOPETA
ENGINEERING COLLEGE

(AUTONOMOUS)

Kotappakonda Road, Yellamanda (Post),

District, AP

Narasaraopet – 522601, Guntur

Approved by AICTE, New Delhi and Permanently affiliated to JNTUK, Kakinada, Code: 47,
Accredited by NBA and NAAC, RTA Approved Pollution test Centre, ISO 9001: 2008 Certified Institution

Phone: 08647-239905

Website: www.nrtec.in

DEPARTMENT OF CIVIL ENGINEERING

INSTITUTE –VISION AND MISSION

VISION:

To emerge as a **Centre of excellence** in technical education with a blend of effective **student centric teaching learning** practices as well as **research** for the transformation of **lives and community**.

MISSION:

M1: Provide the best class infrastructure to explore the field of engineering and research.

M2: Build a passionate and a determined team of faculty with student centric teaching, imbuing experiential, innovative skills

M3: Imbibe lifelong learning skills, entrepreneurial skills and ethical values in students for addressing societal problems

DEPARTMENT OF CIVIL ENGINEERING

VISION:

To be a centre of excellence with state of art infrastructure and imbibe knowledge on advanced technologies in the field of Civil engineering with a focus on research and sustainable development for the benefit of society.

MISSION:

M1: Train the students as technologically motivated Civil engineers who can serve the society competently, collaboratively and ethically as Planners, designers, constructors and operators.

M2: To provide quality-based consultancy services to the communities for the development of civil engineering industry and other allied fields.

M3: To ignite innovative thinking, entrepreneur skills and research among students.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

Graduates will be able to

- I. Analyze and design infrastructural projects of civil engineering.
- II. Lead their teams to complete the projects ethically and sustainably.
- III. Apply innovative technologies and update skills through lifelong learning.

PROGRAM SPECIFIC OUTCOMES (PSOs):

- I. The students will be able to apply fundamental concepts of structural, geotechnical, water resources and environmental engineering to make best projects in civil engineering.
- II. The students will develop skills to design sustainable solutions for real time problems of civil engineering by adopting modern technologies and designing tools.

**CURRICULAR FRAMEWORK FOR REGULAR, MINORS AND HONORS
B.TECH PROGRAMMES OF ALL BRANCHES**

1. PREAMBLE

The rapid transformation in every sphere of life is augmenting the need to prepare the present fast-paced generation to adapt to the changing knowledge & skill requirement on a life-long basis, in the fields of science, engineering, technology and humanities to influence society positively. The future looks up to multi-disciplinary, competent leaders who are Information and Communication Technology ready and driven by strong ethical values.

NEC envisions to nurture knowledge, skills, and attitude and values of the aspiring youth to enable them to become global citizens and towards that process, the institution has evolved a flexible integrated academic curriculum.

NEC introduced Outcome Based Education (OBE) and Choice Based Credit System (CBCS), which emphasized on honing the skills and knowledge of the graduates.

The Engineering curriculum is revised with an objective to fill the gaps in the existing curriculum with reference to skill development. The revised curriculum underwent a reorganization making the engineering education enshrined with skill development ecosystem to suit the industry's needs and to ensure the graduates employability.

The curriculum mandates students to take up five skill courses, 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. The students are also given the option of choosing between skill courses offered by the college and a certificate course offered by industry, a professional body, APSSDC or any other accredited body.

Another major change brought in the curriculum is the introduction of B.Tech with Honors or a B.Tech. with a Minor. This is to give an opportunity for the fast learners to earn additional credits either in the same domain or in a related domain, making them more proficient in their chosen field of discipline or be a graduate with multidisciplinary knowledge and job ready skills.

2. PROGRAMS OFFERED BY THE COLLEGE

Narasaraopeta Engineering College (NEC) offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice Based Credit System (CBCS) for the following branches of Engineering.

S. No.	Name of the Program	Program Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Information Technology	12
7.	CSE (Artificial Intelligence)	43

3. ELIGIBILITY FOR ADMISSION

The total seats available as per the approved intake are grouped into two categories viz. category A and Category B with a ratio of 70:30 as per the state government guidelines vide G.O No.52.

The admissions for category A and B seats shall be as per the guidelines of Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservation policy.

- a. Under Category A: 70% of the seats are filled through EAMCET counselling.
- b. Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE

Eligibility for Admission - Under Lateral Entry Scheme (LES)

Students with diploma qualification have an option of direct admission into 2nd year B. Tech. (Lateral Entry Scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three-year B.Tech. Lateral entry Programme will be through ECET.

4. AWARD OF THE DEGREE:

For Regular and LES (Lateral Entry Scheme) students

A student will be declared eligible for the award of B. Tech. degree if he/she fulfils the following:

- (a) Pursues a course of study in not less than four and not more than eight academic years for regular students. For LES students, pursue a course of study for not less than three academic years and not more than six academic years counted from the academic year of admission.
- (b) He/she shall forfeit their seat in B. Tech course and their admission stands cancelled after eight academic years for regular students and six academic years for LES students starting from the academic year of admission.
- (c) Registers for 160 credits and must secure all the 160 credits for Regular students. Registers for 121 credits and must secure all the 121 credits for LES students
- (d) A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160/121 credits and meet other specified requirements in the appropriate section of this document.
- (e) A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

Academic Calendar

For all the eight/six semesters a common academic calendar shall be followed in each semester by having sixteen weeks of instruction, one week for the conduct of practical exams and with two weeks for theory examinations. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in the planner.

4. Assigning of Credits:

- 1 Hr. Lecture (L) per week - 1 credit
- 1 Hr. Tutorial (T) per week - 1 credit
- 1 Hr. Practical (P) per week - 0.5 credits
- 2 Hours Practical (Lab)/week - 1 credit

5. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

A three-week induction program for first year B.Tech students is to be held in zero semester. Regular classes will start after the induction program.

The objectives of the program are as follows:

1. Assimilation in the ethos and culture of the institution
2. Exposure to a larger vision of life
3. Bonding among students and teachers
4. Learning a creative skill in arts
5. Regular lifestyle and professional discipline
6. Special assistance for needy students for improving proficiency in English and Mathematics

The above objectives will be achieved through the following activities:

1. Physical activity: Yoga, Mild Exercise, Games and sports etc.
2. Creative arts: Painting, Photography, music, dance etc.
3. Literary activity: General reading, writing summaries, debating, enacting a play etc.
4. Human Values: Discussion/Lectures in small groups of students with a faculty member
5. Lectures by eminent people: From industry, entrepreneurs, public life, social activists, alumni.
6. Exposure to department/branch, Innovation, Exploring Engineering.

6. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject – wise with a maximum of 100 marks for Theory and 50 marks for Mini Project/Practical Training/Internship/ Research Project/ Community Service Project. The Project Work shall be evaluated for 200 marks.

THEORY

For all theory subjects consisting of 5 units in each subject, the assessment shall be for 30 marks through internal evaluation and 70 marks through external end semester examination of 3 hours duration.

INTERNAL EVALUATION

Internal evaluation is based on two **Cycle** examinations. Each **Cycle** consists of three components.

1) **Assignment Test – 1 (A1):**

A1 will be conducted after the completion of 1st unit of syllabus. 5 or 6 questions will be given to students before 1 week of the commencement of the test. On the day of test each student will be given two questions at random. A1 will be evaluated for 05 marks.

2) **Quiz - 1(Q1):**

After the first two and half Units of syllabus is over along with the descriptive test, online quiz test will be conducted for 20 marks and scaled down to 10 marks.

3) **Descriptive Test – 1(D1):**

Along with the Q1, a descriptive test will be conducted for 25 marks and scaled down to 15 marks. One 10 marks question from unit 1, one 10 marks question from unit 2, and one 5 marks question from first half of 3rd unit will be given.

Cycle–I final marks = A1 (05 marks) + Q1 (10 marks) + D1 (15 marks) = 30 marks

In the similar manner, Cycle–II Examination will be conducted as follows:

A2 test will be conducted after 3.5 units of syllabus (covering syllabus from 2.5 to 3.5 units)

Q2 and D2 will be conducted after 5th unit is over. For D2, one 5 marks question will be given from second half of third unit, two 10 marks questions will be given each from units 4 and 5.

Cycle–II final marks = A2 + Q2 + D2 = 30 Marks.

Final internal marks will be computed as **80 % of best cycle marks + 20% of least cycle marks.**

EXTERNAL EVALUATION

The semester end examinations will be conducted for 70 marks consist of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

PRACTICALS

INTERNAL EVALUATION

For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows:

Day to day work - 5 marks,

Record-5 marks and

Internal laboratory test -5 marks.

EXTERNAL EVALUATION

For practical subjects there shall be an external examination at the end of the semester for 35 marks in the presence of external examiner. The examination duration is 3 hours.

DRAWING SUBJECTS

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing etc.,) and estimation, the distribution shall be 30 marks for Internal Evaluation and 70 marks for End Examination. There shall be two internal tests in a semester.

The 30 internal marks will be evaluated as follows:

Cycle-I:

Internal Test : 15 marks. (1½ hour duration)

Day – to – day work: 15 marks (evaluation of charts)

In the Similar manner, **Cycle-II examination will be conducted for 30 marks**

The sum of 80% of the best and 20% of the least of two internal tests shall be considered.

The syllabus for the subject “**Machine drawing using Auto CAD**” consists of two major portions:

1. Unit I to III –Conventional drawing pattern.
2. Unit IV to VI-Computer lab pattern using any drafting packages

The distribution of internal and external marks is 30 and 70 marks respectively.

Internal Evaluation: Max Marks: 30

The total internal evaluation marks are distributed in the following two components:

1. Day-to-day work : 15 Marks (Evaluation of Charts)
2. Descriptive Test : 15 Marks

Cycle-I Examination – Conventional drawing pattern

In Cycle-I examination the 30 marks will be awarded as follows:

- | | |
|-----------------------|------------|
| Day-to-day evaluation | - 15 Marks |
| Descriptive Test | - 15 Marks |

In the Descriptive Test of duration 2 hours, 3 questions will be given to the student and he has to answer all the three questions (3x05M = 15M).

Cycle-II Examination – Computer lab pattern using any drafting packages

for duration of 2 hours.

In Cycle-II examination the 30 marks will be awarded as follows:

Record	- 10 Marks
Execution	- 10 Marks
Paper Work	- 10 Marks

Of two cycle examinations conducted during the semester, sum of 80% of the best and 20% of the least of two cycle examinations shall be considered for the award of internal marks.

End semester Examination (Total Duration: 4 hours, Max, marks: 70)

Conventional drawing pattern (Duration: 2 Hours, Marks: 35)

Computer lab pattern using any drafting packages (Duration: 2 Hours, Max:35)

(Note: Both Conventional drawing pattern and Computer lab pattern using any drafting packages are compulsory and are to be conducted in separate sessions)

Mandatory Course (M.C): Environmental Sciences/NSS/NCC, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only SATISFACTORY(S)/NOT-SATISFACTORY (F) will be specified.

- There shall be 05 Professional Elective courses and 04 Open Elective courses. All the Professional & Open Elective courses shall be offered for 03 credits, wherever lab component is involved it shall be (2-0-2) and without lab component it shall be (3-0-0) or (2-1-0) and for all minors /honors, it shall be (4-0-0). 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.

DEPARTMENT OF CIVIL ENGINEERING

- All Open Electives are offered to students of all branches in general. However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.
- The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.
- Students shall undergo mandatory summer internships for a minimum of six weeks duration at the end of second and third year of the Programme.
- There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course.
- Undergraduate Degree with Honors/Minor shall be issued by the Institute to the students who fulfil all the academic eligibility requirements for the B.Tech program and Honors/Minor program. The objective is to provide additional learning opportunities to academically motivated students.
- **Assessment:** The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory, 50 marks for practical subject. The distribution shall be 30% marks for Internal Evaluation and 70% marks for the End Semester Examinations. A student has to secure not less than 35% of marks in the end semester examination and minimum 40% of marks in the sum total of internal and end semester examination marks to earn the credits allotted to each course.

Mini Project/Practical Training/ Internship/ Research Project/ Community Service Project (1.5 Credits):

It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydal and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme.

Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 6 weeks. The student shall register for the course as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted from the institute to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. After successful

DEPARTMENT OF CIVIL ENGINEERING

completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department.

A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. A student shall secure a minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted.

Mini Project/Practical Training/ Internship/ Research Project/ Community Service Project will be evaluated at the end of the semester for 50 marks (Record/Report: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner. There are no internal marks for the Mini Project/Practical Training/ Internship/ Research Project/ Community Service Project.

Major Project (12 credits):

Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks.

MOOCS (1.5 Credits):

Meeting with the global requirements, to inculcate the habit of self-learning and in compliance with AICTE/ UGC guidelines, MOOC (Massive Open Online Course) have been introduced, Student has to complete an on-line course to fulfil the academic requirement of B.Tech course. Students can start registering for the course from II Year I semester. The student must register for the MOOCs course as per the academic credit requirements mentioned in the Course structure offered by NPTEL with the approval of the Head of the Department. The student will be awarded the credits given in the curriculum only after the submission of the certificate. Students must submit the NPTEL Pass certificate with required credits before the end of 3rd Year 2nd Semester.

In case the student is unable to submit an NPTEL certificate with required credits by the end of 3rd Year 2nd Semester, the student is required to submit 2 MOOCs Certificates from the reputed organizations approved by the concerned HOD before the commencement of 4th Year 1st Semester examinations.

DEPARTMENT OF CIVIL ENGINEERING

Skill Oriented Courses (2 Credits)

1. 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.
2. 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.
3. 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.
4. 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 departmental committee.
5. 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.
6. 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 departmental committee.

Evaluation: The job oriented skill courses may be registered at the college or at any accredited external agency as approved by departmental committee. A student shall submit a record/report on the on the skills learned. If the student completes job oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner. There are no internal marks for the job oriented skill courses.

Curricular Framework for Honors Programme

1. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.
2. 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 upto the end of 2nd semester without any

DEPARTMENT OF CIVIL ENGINEERING

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. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Honors Programme registration active.

3. 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.

4. 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).

5. 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 8/12weeks as recommended by the Departmental committee.

6. 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.

7. The concerned departmental committee 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 departmental committee. 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 departmental committee. 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 per the guidelines approved by the departmental committee. .

8. 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.

9. 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 be mentioned 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.

10. In case a student fails to meet the SGPA 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.

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

Curricular Framework for Minor Programme:

1. 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.

2. 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.

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

4. There shall be no limit on the number of programs offered under Minor. The 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.

5. 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.

6. 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

DEPARTMENT OF CIVIL ENGINEERING

acquired 8 SGPA (Semester Grade point average) upto 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 upto 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.

7. 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).

8. 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.

9. 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.

10. Student can opt for the Industry relevant minor specialization as approved by the concerned Departmental committee. 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 Departmental committee 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.

11. 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 Departmental committee. 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.

12. 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

DEPARTMENT OF CIVIL ENGINEERING

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.

13. In case a student fails to meet the SGPA 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.

14. 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.

PASS MARK CRITERIA

A student shall be deemed to have satisfied the pass mark, if he secures not less than 35% of marks in the end examinations and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together as detailed below.

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

S.No	Category of Subject	Max. Marks	Internal Marks	External Marks	External pass %	External pass mark	Over all pass %	Over all pass mark
1	Theory/ Drawing	100	30	70	35	25	40	40
2	Practical	50	15	35	35	12	40	20
3	Miniproject/Internship/Industrial Training /Skill development courses/ Research project/ Community service project	50	-	50	40%	20	40	20
4	Project Work	200	60	140	35	50	40	80
5	MOOCs(Credit Course)	Certificate must be submitted before the end semester examinations of that semester in which MOOCs course is offered.						

11. Attendance Requirements:

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

b) Condonation of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) may be granted by the College Academic Committee. However, this condonation concession is applicable only to any two semesters during the entire programme.

c) Shortage of Attendance below 65% in aggregate shall not be condoned.

d) A student who is short of attendance in a semester may seek re-admission into that semester when offered within 4 weeks from the date of commencement of class work.

e) Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.

DEPARTMENT OF CIVIL ENGINEERING

- f) A stipulated fee shall be payable towards condonation of shortage of attendance to the college. Students availing condonation on medical ground shall produce a medical certificate issued by the competitive authority.
- g) A student will be promoted to the next semester if he satisfies the (i) attendance requirement of the present semester and (ii) minimum required credits.
- h) If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- i) For induction programme attendance shall be maintained as per AICTE norms.
- j) For non-credit mandatory courses the students shall maintain the attendance similar to credit courses

18. Promotion Rules:

- a) A student shall be promoted from first year to second year if he fulfils the minimum attendance requirements.
- b) A student will be promoted from II year to III year if he fulfils the academic requirement of 40% of credits up to II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
- c) A student shall be promoted from III year to IV year if he fulfils the academic requirements of 40% of the credits up to III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.
- d) For LES, point C is only applicable

19. 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 fall.

Marks Range	Level	Letter Grade	Grade Point
≥ 90	Outstanding	A+	10
80-89	Excellent	A	9
70-79	Very Good	B	8
60-69	Good	C	7
50-59	Fair	D	6
40-49	Satisfactory	E	5
< 40	Fail	F	0
-	Absent	AB	-
-	Malpractice	MP	-

Calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

Where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

- ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

Where 'S_i' is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester

- iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- iv. SGPA & CGPA will be calculated for those candidates who have passed all the subjects in that or up to that semester respectively.
- v. *Grade Point*: It is a numerical weight allotted to each letter grade on a 10-point scale.
- vi. *Letter Grade*: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.
- vii. As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

$$\text{Equivalent Percentage} = (\text{CGPA} - 0.75) \times 10$$

Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree, he/she shall be placed in one of the following

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.75 (With No subject failures)
First Class	≥ 6.75 (With subject failures)
Second Class	≥ 5.75 & < 6.75
Pass Class	≥ 4.75 & < 5.75

20. Gap - Year:

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at institute level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

REVALUATION

1. Student can submit the application for revaluation, along with the prescribed fee for revaluation evaluation of his answer script(s) of theory subject(s) as per the notification issued by the Controller of Examinations.
2. The Controller of Examinations shall arrange for revaluation of such answer script(s).
3. An evaluator, other than the first evaluator shall reevaluate the answer script(s).

MINIMUM INSTRUCTION DAYS

The minimum instruction days for each semester shall be 90 working days.

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

WITHHOLDING OF RESULTS

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

TRANSITORY REGULATIONS

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

A student who is following JNTUK curriculum and detained due to shortage of attendance at the end of the first semester of first year shall join the autonomous batch of first year first semester. Such students shall study all the subjects prescribed for the batch in which the student joins and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of first year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree will be sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

Transfer candidates (from non-autonomous college affiliated to JNTUK)

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

Transfer candidates (from an autonomous college affiliated to JNTUK)

A student who has secured the required credits up to previous semester as per the regulations of other autonomous institutions shall also be permitted to be transferred to this college.

A student who is transferred from the other autonomous colleges to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree.

However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of studies.

The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he has transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

Scope

1. The academic regulations should be read as a whole, for the purpose of any interpretation.
2. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
3. The college may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the College Authorities.

DEPARTMENT OF CIVIL ENGINEERING

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

- The Principal shall refer the cases of Malpractices in Internal Assessment Test and Semester end examinations to a malpractice prevention committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the students based on the recommendations of the committee.
- Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder:

	Nature of Malpractices/ Improper conduct	Punishment
	<i>If the candidate:</i>	
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.
1(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 only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the college.

DEPARTMENT OF CIVIL ENGINEERING

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and to 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 college 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 additional sheet, 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 college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in 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-	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.

DEPARTMENT OF CIVIL ENGINEERING

	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 means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
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 college 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 a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college 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

DEPARTMENT OF CIVIL ENGINEERING

		against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/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 college for further action to award suitable punishment.	

OTHER MATTERS:

1. Physically challenged candidates who have availed additional examination time and a scribe during their intermediate / EAMCET examinations will be given similar concessions on production of relevant proof / documents.
2. The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the departments shall be reported to the Academic Council for ratification.

GENERAL:

1. The academic council may, from time to time, revise, amend or change the regulations, schemes of examinations and / or syllabi.
2. Where ever the words "he" "him" "his", occur in the regulations, they include "she", "her", "hers".
3. The academic regulation should be read as a whole for the purpose of any interpretation.
4. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

ANNEXURE-I
COMMUNITY SERVICE PROJECT

.....Experiential learning through community engagement

As per the decision of the decision of the concerned department BoS

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.

DEPARTMENT OF CIVIL ENGINEERING

- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty incharge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
 - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
 - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
 - Agriculture
 - Health
 - Marketing and Cooperation
 - Animal Husbandry
 - Horticulture
 - Fisheries
 - Sericulture
 - Revenue and Survey
 - Natural Disaster Management

- Irrigation
- Law & Order
- Excise and Prohibition
- Mines and Geology
- Energy
- Internet
- Free Electricity
- Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities

DEPARTMENT OF CIVIL ENGINEERING

- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.

**SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY
SERVICE PROJECT**

The following is the recommended list of projects for engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA-533003, Andhra Pradesh (India)






For Constituent Colleges and Affiliated Colleges of JNTUK

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- ⇒ Ragging within or outside any educational institution is prohibited.
- ⇒ Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto		Fine Upto
Teasing, Embarrassing & Humiliation	 6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	 1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	 2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	 5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	 10 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE No. : 1800 - 425 - 1288

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

R20 COURSE STRUCTURE

B.Tech I Year – I Semester

S.No.	CODE:	SUBJECT NAME	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1103	Engineering Chemistry	30	70	100	3	0	0	3
2	R20CC1102	Linear Algebra and Calculus	30	70	100	2	1	0	3
3	R20CC1101	Technical and Communicative English-I	30	70	100	3	0	0	3
4	R20CC1107	Engineering Mechanics	30	70	100	2	1	0	3
5	R20CC1105	Problem Solving Using C	30	70	100	3	0	0	3
6	R20CC11L1	Soft skills and Communication SkillsLab-I	15	35	50	0	0	3	1.5
7	R20CC11L5	Engineering Chemistry Lab	15	35	50	0	0	3	1.5
8	R20CC11L2	Problem Solving Using C Lab	15	35	50	0	0	3	1.5
		Total							19.5

DEPARTMENT OF CIVIL ENGINEERING

B. Tech I Year II Semester

S.No	CODE	SUBJECT NAME	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1201	Differential Equations and Vector Calculus	30	70	100	2	1	0	3
2	R20CC1203	Engineering Physics	30	70	100	3	0	0	3
3	R20CC1207	Engineering Drawing	30	70	100	1	0	4	3
4	R20CE1212	Elements of Mechanical and Electrical Engineering	30	70	100	3	0	0	3
5	R20CE1216	Elements of Building Science	30	70	100	3	0	0	3
6	R20CE12L6	Elements of Mechanical and Electrical Engineering Lab	15	35	50	0	0	3	1.5
7	R20CC12L5	Engineering Physics Lab	15	35	50	0	0	3	1.5
8	R20CC12L4	Engineering Workshop	15	35	50	0	0	3	1.5
9	R20CC12MC2	Constitution of India (zero credit course)				2	0	0	0
		Total							19.5

DEPARTMENT OF CIVIL ENGINEERING

II B. Tech II Year I Semester

S.No	CODE	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2101	Numerical Methods and Transformation	BS	30	70	100	2	1	0	3
2	R20CE2102	Fluid Mechanics	PC	30	70	100	3	0	0	3
3	R20CE2103	Strength of Materials-I	PC	30	70	100	3	0	0	3
4	R20CE2104	Surveying and Geomatics	PC	30	70	100	3	0	0	3
5	R20CE2105	Concrete Technology	PC	30	70	100	3	0	0	3
6	R20CE21L1	Strength Of Materials Lab	PC	15	35	50	0	0	3	1.5
7	R20CE21L2	Computer Aided Building Drawing Lab	PC	15	35	50	0	0	3	1.5
8	R20CE21L3	Surveying Field Work Lab	PC	15	35	50	0	0	3	1.5
9	R20CE21SC1	Building Materials and Construction Technology Lab	SC	-	50	50	0	0	4	2
10	R20CC21MC1	Environmental Studies (Non-Credit Course)	MC	-	-	-	2	0	0	0
Total Credits										21.5

DEPARTMENT OF CIVIL ENGINEERING

B.TECH II YEAR - II SEMESTER

S.No	CODE	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2201	Technical and Communicative English-II	HS	30	70	100	3	0	0	3
2	R20CE2202	Engineering Geology	ES	30	70	100	3	0	0	3
3	R20CE2203	Structural Analysis	PC	30	70	100	3	0	0	3
4	R20CE2204	Strength of Materials-II	PC	30	70	100	3	0	0	3
5	R20CE2205	Hydraulics And Hydraulic Machinery	PC	30	70	100	3	0	0	3
6	R20CE22L1	Engineering Geology Lab	EC	15	35	50	0	0	3	1.5
7	R20CE22L2	Fluid Mechanics And Hydraulic Machinery Lab	PC	15	35	50	0	0	3	1.5
8	R20CE22L3	Concrete Technology Lab	PC	15	35	50	0	0	3	1.5
9	R20CE22SC1	Advanced Surveying	SC		50	50	0	0	4	2
Total Credits										21.5
HONORS/MINOR COURSE										
10		Honors/Minor								4

Note: Summer Internship/Community Service Project (Mandatory) to be evaluated in III-I

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I SEMESTER

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CE3101	Design and Drawing of Concrete Structures	PC	30	70	100	3	0	0	3
2	R20CE3102	Soil Mechanics	PC	30	70	100	3	0	0	3
3	R20CE3103	Highway Engineering	PC	30	70	100	3	0	0	3
Open Elective Course/Job Oriented Elective – I										
4	R20CC1OE01	Disaster Management	OE/JO E	30	70	100	3	0	0	3
	R20CC1OE02	Green Technology								
Professional Elective Course-1										
5	R20CE3104	Advanced Structural Analysis	PE	30	70	100	3	0	0	3
	R20CE3106	Environmental Impact Assessment								
	R20CE3107	Solid Waste and Hazardous Management								
6	R20CE31L1	Soil Mechanics Lab	PC LAB	15	35	50		0	3	1.5
7	R20CE31L2	Highway Engineering Lab	PC LAB	15	35	50		0	3	1.5
8	R20CE31SC3	STAAD.Pro	SAC/S SC		50	50	1	0	2	2
9	R20CC31MC01	Professional Ethics & Human Values	MC				2	0	0	0
10	R20CC31IN	Summer INTERNSHIP/ Community Service Project	PROJ	15	35	50	0	0	0	1.5
Total Credits										21.5
HONORS/MINOR COURSE										
11		Honors/Minor	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II SEMESTER

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CE3201	Design and Drawing Of Steel Structures	PC	30	70	100	3	0	0	3
2	R20CE3202	Environmental Engineering	PC	30	70	100	3	0	0	3
3	R20CE3203	Hydrology & Irrigation Engineering	PC	30	70	100	3	0	0	3
Open Elective Course/Job Oriented Elective – II										
4	R20CC2OE01	Remote Sensing And GIS	OE/JOE	30	70	100	2	0	2	3
	R20CC2OE02	Traffic Safety								
Professional Elective Course-II										
5	R20CE3204	Foundation Engineering	PE	30	70	100	3	0	0	3
	R20CE3205	Bridge Engineering								
	R20CE3206	Urban Transportation Planning								
6	R20CE32L1	Environmental Engineering Lab	PC LAB	15	35	50		0	3	1.5
7	R20CE32L2	GIS Lab	PC LAB	15	35	50		0	3	1.5
8	R20CE32L3	Civil Engineering Drawing	PC LAB	15	35	50		0	3	1.5
9	R20CC32SC1	English for Employability Skills	SAC/SS C		50	50	1	0	2	2
10	R20CC32MC1	Essence of Indian Traditional Knowledge	MC				2	0	0	0
Total Credits										21.5
HONORS/MINOR COURSE										
11		Honors/Minor								4

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I SEMESTER

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
Professional Elective Course-III										
1	R20CE4101	Advanced Foundation Engineering	PE	30	70	100	3	0	0	3
	R20CE4102	Watershed Management								
	R20CE4103	Irrigation Structures								
Professional Elective Courses – IV										
2	R20CE4104	Prestressed Concrete	PE	30	70	100	3	0	0	3
	R20CE4105	Repair & Rehabilitation Of Structures								
	R20CE4106	Ground Water Development and Management								
Professional Elective Courses – V										
3	R20CE4107	Estimation Costing and Valuation	PE	30	70	100	3	0	0	3
	R20CE4108	Ground Improvement Techniques								
	R20CE4109	Pavement Materials								
Open Elective Course/Job Oriented Elective - III										
4	R20CC3OE01	Railway, Airport & Harbour Engineering	OE/JOE	30	70	100	2	0	2	3
	R20CC3OE02	Low Cost Housing								
Open Elective Course/Job Oriented Elective – IV										
5	R20CC4OE01	Environmental Pollution & Control	OE/JOE	30	70	100	2	0	2	3
	R20CC4OE02	Construction Technology and Management								
6	R20CC4101	Business Management Concepts for Engineering	H&SSE	30	70	100	3	0	0	3
	R20CC4117	Entrepreneurship & Innovations								
7	R20CE41SC1	Quantity Estimation & Project Management lab	SAC/SSC		50	50	1	0	2	2
8	R20CC41IN	INTERNSHIP/ Community Service Project	PROJ	15	35	50				1.5
9	R20CC41MC	MOOCS								1.5
Total Credits										23
HONORS/MINOR COURSE										
10		Honors/Minor	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH II SEMESTER

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CC42PW	Major project& Internship	PROJ	60	140	200	0	0	0	12
INTERNSHIP (6 MONTHS)										
TOTAL CREDITS										
12										
HONORS/MINOR COURSE										
2		HONORS/MINOR	PC	30	70	100	4	0	0	4

**LIST OF HONORS
POOL 1 (structures stream)**

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CEHN02	Finite element methods	PC	30	70	100	4	0	0	4
2	R20CEHN03	Advanced Structural Engineering	PC	30	70	100	4	0	0	4
3	R20CEHN04	Theory of Elasticity And Plasticity	PC	30	70	100	4	0	0	4
4	R20CEHN05	Matrix Methods of Structural Analysis	PC	30	70	100	4	0	0	4

POOL 2(Environmental stream)

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CEHN01	Air pollution and control	PC	30	70	100	4	0	0	4
2	R20CEHN06	Advanced Environmental Engineering	PC	30	70	100	4	0	0	4
3	R20CEHN07	Solid waste management	PC	30	70	100	4	0	0	4
4	R20CEHN08	Rural water supply and sanitation	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

POOL 3 (SOIL MECHANICS)

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CEHN09	Rock Mechanics	PC	30	70	100	4	0	0	4
2	R20CEHN10	Geotechnical Exploration and Instrumentation	PC	30	70	100	4	0	0	4
3	R20CEHN11	Soil Dynamics And Machine Foundations	PC	30	70	100	4	0	0	4
4	R20CEHN12	Earth And Rockfill Dams	PC	30	70	100	4	0	0	4

POOL 4 (TRANSPORTATION ENGINEERING)

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CEHN13	Highway Traffic Analysis and Design	PC	30	70	100	4	0	0	4
2	R20CEHN14	Pavement Analysis and Design	PC	30	70	100	4	0	0	4
3	R20CEHN15	Transportation Systems	PC	30	70	100	4	0	0	4
4	R20CEHN16	Road Transport Management and Economics	PC	30	70	100	4	0	0	4

LIST OF MINORS

S.No	CODE	Subject	Cat Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CCMN01	Introduction to Civil Engineering-Concepts And Materials	PC	30	70	100	4	0	0	4
2	R20CCMN02	Geomatics	PC	30	70	100	4	0	0	4
3	R20CCMN05	Fundamentals of Structural Engineering	PC	30	70	100	4	0	0	4
4	R20CCMN06	Environmental Engineering	PC	30	70	100	4	0	0	4

I B.Tech I Semester

DEPARTMENT OF CIVIL ENGINEERING

R20 – REGULATIONS
B.Tech I Year – I Semester

S.No.	CODE	SUBJECT NAME	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1103	Engineering Chemistry	30	70	100	3	0	0	3
2	R20CC1102	Linear Algebra and Calculus	30	70	100	2	1	0	3
3	R20CC1101	Technical and Communicative English-I	30	70	100	3	0	0	3
4	R20CC1107	Engineering Mechanics	30	70	100	2	1	0	3
5	R20CC1105	Problem Solving Using C	30	70	100	3	0	0	3
6	R20CC11L1	Soft skills and Communication SkillsLab-I	15	35	50	0	0	3	1.5
7	R20CC11L5	Engineering Chemistry Lab	15	35	50	0	0	3	1.5
8	R20CC11L2	Problem Solving Using C Lab	15	35	50	0	0	3	1.5
		Total							19.5

I B.TECH I and II SEMESTERS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
CODE: R20CC1103	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)						

COURSE OBJECTIVES:

- To analyze water for its various parameters and its significance in industrial and domestic allocations.
- To acquire the knowledge on types of polymers, fuels and their applications.
- To provide information on exciting advanced materials available in engineering.
- To apply the electrochemical principles, understand the fundamentals of corrosion and development of different techniques in corrosion control.
- To learn the importance of engineering materials used in daily life and industry.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Analyze the suitable method of water treatment depending on the quality treatment.

-Analyzing

CO 2: Compare different types of polymers, fuels and their importance-**Analyzing**

CO 3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life-**Applying**

CO 4: Distinguish electrical energy sources and importance of corrosion science-**Analyzing**

CO 5: Identify different types of engineering materials and applications in engineering.

-Applying

UNIT-I: WATER CHEMISTRY

Characteristics of water: Sources, Impurities–Hardness and its units–Industrial water characteristics–Softening of water by external treatment methods (Lime soda process, Zeolite and Ion exchange process)–Numerical problems on lime soda process–Desalination of brackish water (Reverse osmosis and Electrodialysis).

Water analysis techniques: Alkalinity–hardness (Complexometric)–Break point chlorination–Free chlorine–DO–BOD and COD.

UNIT-II: POLYMERS AND FUEL CHEMISTRY

Polymers: Introduction to polymers–Chain growth (free radical, ionic)–Step growth polymerization–Coordination polymerization–Copolymerization with specific examples–Thermoplastics and thermosets–Plastic moulding methods (Compression and Injection moulding)–Rubbers–Natural rubber–Processing–Vulcanization.

Fuels-Types of fuels–Calorific value–Numerical problems based on calorific value–Analysis of coal–Liquid fuels–Refining of petroleum–Cracking of heavy oil–Knocking and anti-knocking agents–Octane and cetane values.

UNIT-III: CHEMISTRY OF ADVANCED MATERIALS

Nano materials: Introduction–Sol-gel method and Chemical reduction method of preparation – Characterization by BET method and TEM methods–Carbon nano tubes and fullerenes: Types–Preparation–Properties and Applications.

Liquid crystals: Introduction–Types–Applications.

Composite materials: Introduction–Definition–Types–Applications–Cermets.

UNIT-IV: ELECTROCHEMISTRY AND CORROSION

Electrochemistry: Galvanic cells–Single electrode potential–Reference electrodes–Electrochemical series–Batteries (primary, secondary and fuel cells)–Applications of secondary batteries in E- vehicles.

Corrosion: Causes and effects of corrosion–Theories of corrosion (chemical and electrochemical corrosion)–Factors effecting corrosion–Corrosion control methods–Cathode protection–Sacrificial anodic, Impressed current methods–Surface coatings–Methods of application on metals (Hot dipping, Galvanizing, Tinning, Cladding, Electroplating, Electroless plating)–Organic surface coatings– Paints–Constituents and their functions–Pigment Volume Concentration.

UNIT-V: CHEMISTRY OF ENGINEERING MATERIALS

Lubricants: Introduction–Mechanism of lubrication–Classification of lubricants–Properties and testing of lubricating oils.

Cement and Refractories: Manufacture–Setting and hardening of cement–Failures of cement–Slag cement–Refractory: Introduction–Classification and properties of refractories.

TEXT BOOKS:

1. Dr.J.Srinivasa Rao, Dr.K.Lakshman kumar, Dr.Pramila , “**Engineering Chemistry**”, ISBN 978-81-948782-6-1, Spectrum education,2021.
2. Shikha Agarwal, “**Engineering Chemistry**”, ISBN 1107476410, 2nd Edition, Cambridge University

Press, New Delhi, (2019).

3. O.G. Palana, “**Engineering Chemistry**”, ISBN 0070146101, Tata McGraw Hill Education Private Limited, New Delhi, (2009).

4. B. Rama Devi, Ch. Venkata Ramana Reddy, Prashantharath, “**Text Book of Engineering Chemistry**”, ISBN 9789353500511, Cenage Learning India Pvt. Ltd, (2016).

REFERENCE BOOKS:

1. P.C. Jain and M. Jain “**Engineering Chemistry**”, ISBN 8187433175, 15/e, Dhanpat Rai and Sons, Delhi, (2015).

2. B.S Murthy and P. Shankar, “**A Text Book of NanoScience and NanoTechnology**”, University Press (2013).

3. K. Sessa Maheshwaramma and Mridula Chugh, “**Engineering Chemistry**”, Pearson India Edn services, (2016).

4. S.S. Dara, “**A Textbook of Engineering Chemistry**”, ISBN 8121932645, S.Chand Publisher, (2010)

Web References:

1. URL: <https://www.youtube.com/watch?v=CWOJW4357Bg>

2. URL: <https://www.youtube.com/watch?v=H1Y1oxQ5eUA&dt=627s>

3. URL: <https://www.youtube.com/watch?v=1xWBPZnEJk8>

4. URL: <https://www.youtube.com/watch?v=p9yPXdT0k48&dt=225s>

5. URL: https://www.youtube.com/watch?v=xb_xndPe4n0&dt=390s

E-Books:

1. “**Engineering Chemistry**” (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S.Krishnan.

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH-I- SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
CODE: R20CC1102	LINEAR ALGEBRA and CALCULUS (Common to All Branches)						

COURSE OBJECTIVES:

1. Understanding basic concepts of linear algebra (systems of linear equations, matrix calculus).
2. To become proficiency in solving computational problems of linear algebra.
3. To acquire knowledge on mean value theorems in calculus.
4. Familiarization about the techniques in calculus and multivariate analysis.

COURSE OUTCOMES:

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

1. Solve the system of linear equations. [**Apply - K3**]
2. Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors. [**Analyzing-K4**]
3. Relate the results of mean value theorems in calculus to Engineering problems. [**Understanding-K2**]
4. Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. [**Apply - K3**]
5. Identify the area and volume by interlinking them to appropriate double and triple integrals. [**Apply - K3**]

UNIT-I: LINEAR SYSTEMS OF EQUATIONS:

(10 hours)

Rank of a matrix - Echelon form, Normal form, Solution of linear systems, Direct Methods, Gauss elimination, Gauss Jordan and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition.

Application: Finding the current in a electrical circuit, Traffic flow.

UNIT – II: EIGENVALUES AND EIGENVECTORS (12 hours)

Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem (without proof), Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive definite, negative definite, semi definite, index, signature.

Application: Finding powers and inverse of a square matrix using Cayley Hamilton's Theorem.

UNIT – III: MEAN VALUE THEOREMS (8 hours)

Review on limits and continuity, Mean Value theorems (without proofs): Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's (Generalized mean value) theorem, increasing and decreasing functions, Maxima and minima of function of single variable.

UNIT- IV: PARTIAL DIFFERENTIATION :(8 hours)

Function of two or more variables, Partial derivatives, Total derivatives, change of variables, Jacobian - functional dependence, Taylor's theorem for Two variables. Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT-V: MULTIPLE INTEGRALS: (10 hours)

Double and triple integrals, Change of Variables, Change of order of Integration, volume. Application: Momenta of Inertia.

TEXT BOOKS:

1. Dr. B.S. Grewal, "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2012.
2. B.V. Ramana, "*Higher Engineering Mathematics*", 32nd Edition, McGraw Hill Education, 2018.

REFERENCES:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
3. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
4. Peter V. O'Neil, "*Advanced Engineering Mathematics*", 7th Edition, Cengage Learning, 2011.
5. Bhavanari Satyanarayana, Pradeep Kumar T.V. and Srinivasulu D, "*Linear Algebra and Vector Calculus*", Studera Press, New Delhi, 2017.

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
CODE: R20CC1102	TECHNICAL AND COMMUNICATIVE ENGLISH - I (Common to All Branches)						

COURSE OBJECTIVES:

- To enable the engineering students develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To integrate English Language learning with employability skills and training.
- To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course.

COURSE OUTCOMES:

Learners are able to

CO1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it (**Apply-3**).

CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (**Creating-5**).

CO3: Build grammatically correct sentences using a variety of sentence structures (**Apply3**).

CO4: Enhance word power and usage of lexicons (**Apply3**).

Teaching Methodology:

The methodology of teaching will be chalk and talk, PPT, audio-visual, flipped class and activity based teaching.

UNIT-I

Hours of Instruction per unit: 8

1. A Drawer full of Happiness

- Listening** : Dialogues, Task based listening activities.
- Speaking** : Asking and answering general questions.
- Reading** : Skimming, Scanning.
- Writing** : Punctuations, Paragraphs.
- Grammar and Vocabulary** : Nouns, Adjuncts,

GRE Vocabulary, Technical Vocabulary.

UNIT-II

Hours of Instruction per unit: 8

2. Nehru's Letter to daughter Indira on her Birthday

- a. **Listening** : Individual and pair based listening to the audio track.
- b. **Speaking** : Discussion in pairs / small groups on specific topics.
- c. **Reading** : Identifying sequence of ideas; recognizing verbal techniques.
- d. **Writing** : Summarizing, Paraphrasing.
- e. **Grammar and Vocabulary**: Articles, Adjectives, Prepositions
Verbal Competence, Synonyms and Antonyms, Analogy,
GRE Vocabulary, Technical Vocabulary.

UNIT-III

Hours of Instruction per unit: 8

3. Stephen Hawking- Positivity „Benchmark“

- a. **Listening** : Listening for global comprehension and summarizing.
- b. **Speaking** : Discussing specific topics in pairs (or) small groups and reporting the discussion, Complaining, Apologizing.
- c. **Reading** : Reading between the lines, Critical reading for evaluation.
- d. **Writing** : Official Letter writing, E-Mail etiquette, General Netiquette, Covering Letter and Resume writing.
- e. **Grammar and Vocabulary** : Phrasal verbs, Verbs, Tenses (Present, Past and Future), Concord: Subject-Verb Agreement, Verbal reason, using equivalents, Words associations, GRE vocabulary, Technical vocabulary

UNIT-IV

Hours of Instruction per unit: 8

4. Like a Tree, Unbowed: Wangari Maathai- Biography

- a. **Listening** : Making predictions while listening to conversations (or) transactional dialogues.
- b. **Speaking** : Role plays for practice of conversational English in academic contexts (formal and informal) .
- c. **Reading** : Information transfer (Tables, Bar Diagrams, Line Graphs, Pie Diagrams)
- d. **Writing** : Interpreting visual information, Statement of Purpose (SOP)

e. Grammar and Vocabulary: Gender inclusive language (Gendered Noun, Gender-neutral Noun), Quantifying expressions, Adjectives, Adverbs, Degrees of comparison, GRE Vocabulary, Technical Vocabulary.

UNIT-V

Hours of Instruction per unit: 8

5. “Stay Hungry, Stay Foolish”- Rushmi Bansal

- a. Listening** : Identifying key terms, understanding concepts, interpreting the concepts.
- b. Speaking** : Formal oral presentations on topics from academic contexts
- c. Reading** : Reading comprehension, The RAP strategy for in-depth reading, Intensive reading and extensive reading.
- d. Writing** : Academic proposals, Poster presentation.
- e. Grammar and Vocabulary:** Reported Speech, Reporting verbs for academic Purposes, Corrections of sentences, GRE Vocabulary, Technical Vocabulary

TEXTBOOKS:

1. INFOTECH ENGLISH, Maruthi Publications, Guntur- 522001.

REFERENCES:

1. Raymond Murphy, *Murphy’s English Grammar*, Cambridge University Press 2004
2. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: English Skills for Engineers*, Oxford University Press, 2009
3. Michael Swan, *Practical English Usage*, Oxford University Press, 1996

Online Sources:

1. www.enchantedlearning.com
2. <https://www.englisch-hilfen.de/en/>
3. <https://www.bbc.co.uk/learningenglish/>
4. <https://in.usembassy.gov/education-culture/american-spaces/american-space-new-delhi/collection/>
5. https://www.talkenglish.com/speaking/basics/speaking_basics_ii.aspx
6. <https://www.englishclub.com/speaking/>
7. <https://agendaweb.org/listening-exercises.html>
8. <https://www.esolcourses.com/content/topicsmenu/listening.html>
9. <https://www.esl-lab.com/>

10. https://www.eagetutor.com/eage-fluent-english-speaking-search-p.htm?gclid=EA1aIQobChMIpr-F5OzH7QIVChsrCh1kBAkzEAMYASAAEgINpfD_BwE
11. https://www.myenglishpages.com/site_php_files/reading.php
12. <https://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/>

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
CODE: R20CC1107	ENGINEERING MECHANICS (COMMON TO ME, CE BRANCHES)						

COURSE OBJECTIVES:

- Learn and understanding the basic principles of mechanics of rigid bodies, various types of force systems and to analyze problems in a simple and logical manner.
- Study and calculate the concepts of wedge friction, and to analyze simple trusses using method of joints and method of sections.
- Study and determine centroids and center of gravity of various standard geometrical shapes as well as composite areas and bodies.
- Learn the concept of moment of inertia and the mathematical calculations involved in finding moments of inertia of two dimensional areas.
- The students are to be exposed to concepts of work, energy and particle motion.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply the principles of mechanics to determine the resultant of several concurrent forces acting on a particle.

CO 2: Analyze the trusses using method of joints and method of sections; apply the basic concepts of dry friction and wedges.

CO 3: Illustrate the centroid and center of gravity bodies and composite sections.

CO 4: Determine the Area Moment of Inertia and Mass Moment of Inertia of areas bodies and Composite sections.

CO 5: Apply the work-energy principle to particles and connected systems for engineering Applications

PREREQUISITES: Vectors, Differential equations and integrations.

UNIT-I

INTRODUCTION TO ENGINEERING MECHANICS: Basic Concepts, Characteristics of a Force, Force system, classification, Resultant of Force Systems, parallelogram law of forces, Triangle law of forces.

SYSTEMS OF FORCES: Resolution of forces, Coplanar Concurrent forces, Moment of Force and its

Application–Couples, Varignon’s theorem.

EQUILIBRIUM OF SYSTEMS OF FORCES: Equations of Equilibrium of Coplanar concurrent forces, Lami’s Theorem, support reactions, free body diagrams.

UNIT-II

ANALYSIS OF PLANE TRUSSES: Definition, Assumptions made in the analysis of plane trusses- methods of joints and method of sections.

FRICTION: Introduction, Classification of friction, Laws of Friction, Coefficient of Friction, Angle of Friction, Angle of Repose, Motion of a body on an Inclined Plane, Ladder friction, Wedge friction.

UNIT-III

CENTROID: Centroids of simple figures (from basic principles)-Centroids of composite figures.

CENTRE OF GRAVITY: Centre of Gravity of simple body (from basic principles), Centre of gravity of composite bodies, pappu’s theorem.

UNIT-IV

AREA MOMENTS OF INERTIA: Definition, Radius of gyration, Parallel axis theorem, perpendicular axis theorem, Moments of Inertia of composite figures, polar moment of Inertia.

MASS MOMENT OF INERTIA: Moment of Inertia of Rigid body-Moment of Inertia from basic principles-Slender bar, Rectangular Plate, Circular Plate, Moment of Inertia of 3D Bodies-Cone, Solid Cylinder.

UNIT-V

KINETICS: Analysis as a particle, Newton’s laws of motion, D’Alembert’s principle –simple applications-analysis as a rigid body in translation-fixed axis rotation-Simple applications.

WORK-ENERGY METHOD: Equations for Translation, work-Energy applications to particle motion, connected system-Impulse momentum method-simple applications

TEXT BOOKS:

1. Engineering Mechanics by Dr.M.Sreenivasa Kumar, Dr.D.Suneel,Mr.Ch.Sekhar,Sri Krishna Techno Books,ISBN :978-81-953919-2-9,2001.
2. Engineering Mechanics by S.Timoshenko and D.H.Young., 4th Edn - ,Mc Graw Hill publications.
3. Engineering Mechanics by S.S. Bhavikatti-New age publications
4. Engineering Mechanics Statics and Dynamics A.K.TAYAL Umesh publications.

REFERENCE BOOKS:

1. Engineering Mechanics by Ferdinand . L. Singer , Harper –Collins.
2. Mechanics of Materials (In SI Units) by Beer and Johnson, Tata McGraw-Hill.
3. Strength of Materials (Mechanics of Materials) by James M.Gere and Barry J.Goodno, PWS-KENT Publishing Company, 1990
3. Strength of Materials (Mechanics of Solids) by R.K. Rajput , S.Chand Publications.

Web References:

<https://nptel.ac.in/courses/112103109/142>.

<https://nptel.ac.in/courses/112103109/113>.<https://nptel.ac.in/courses/122104014/4>

E-Books:

<https://easyengineering.net/engineeringmechanicsbooks/>

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	30	70	100	3
CODE: R20CC1105	PROBLEM SOLVING USING C (Common to All Branches)						

COURSE OBJECTIVE:

- To know the basic problem solving process using Flow Charts and algorithms.
- To understand the basic concepts of control structures in C.
- To learn concepts of arrays, functions, pointers and Dynamic memory allocation in C.
- To use the concepts of structures, unions, files and command line arguments in C.

COURSE OUTCOMES:

After completion of this course, the students would be able to:

CO1: Develop algorithms and flow charts for simple problems. [K3]

CO2: Utilize suitable control structures for developing code in C. [K3]

CO3: Make use of functions and arrays in developing modular programs. [K3]

CO4: Make use of structures and pointers to write well-structured programs. [K3]

CO5: Make use of file Operations in C programming for a given application. [K3]

SYLLABUS

UNIT I

Introduction to Algorithms and Programming Languages: Algorithm – Key features of Algorithms – Some more Algorithms – Flow Charts – Pseudo code – Programming Languages – Generation of Programming Languages – Structured Programming Language.

Introduction to C: Structure of C Program – Writing the first C Program -Compiling and Executing C Programs - Using Comments – Keywords – Identifiers – Basic Data Types in C – Variables – Constants – I/O Statements in C - Operators in C -Programming Examples – Type Conversion and Type Casting.

UNIT II

Decision Control and Looping Statements: Introduction to Decision Control Statements – Conditional Branching Statements – Iterative Statements – Nested Loops – Break and Continue Statement – Goto Statement.

Functions: Introduction – using functions – Function declaration/ prototype – Function Definition – function call – return statement – Passing parameters – Scope of variables –Storage Classes – Recursive

functions – Recursion vs Iteration.

UNIT III

Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array – Calculating the length of the Array – Operations on Array — Two Dimensional Arrays – Operations on Two Dimensional Arrays.

Strings: Introduction – Reading Strings – Writing Strings – String Manipulation functions -Array of Strings.

UNIT IV

Pointers: Introduction to Pointers – declaring Pointer Variables – Pointer Expressions and Pointer Arithmetic – Null Pointers – Passing Arguments to Functions using Pointer, Dynamic Memory Allocation.

Structure, Union, and Enumerated Data Types: Introduction – Nested Structures –Arrays of Structures – Structures and Functions – Self-referential Structures – Union –Enumerated Data Types.

UNIT V

Files: Introduction to Files – Using Files in C – Reading Data from Files – Writing Data To Files – Detecting the End-of-file – Error Handling during File Operations – Accepting Command Line Arguments – Functions for Selecting a Record Randomly - Remove –Renaming a File – Creating a Temporary File

TEXT BOOKS:

1. Dr.S.N.Tirumala Rao, Dr.S.V.N.Sreenivasu, Dr.S.Siva Nageswara Rao,Dr.M.Venkata Reddy, “Programming in C”,M/S.Surneni International Book Publishers,ISBN:978-81-953920-3-2,2021
2. Reema Thareja, “Programming in C”, First edition, Oxford University Press 2018.

REFERENCE BOOKS

1. Reema Thareja, “Introduction to C programming” Oxford University Press.
2. Rachhpal Singh, “Programming in C”, kalyani publishers.
3. E Balagurusamy, “computing fundamentals and c programming”, isbn 978-0-07- 066909-3, Tata McGraw-Hill, Second Reprint, 2008.
4. Ashok N Kamthane, “Programming with ANSI and Turbo C”, Pearson Edition Publications, 2002.
5. Dennis Richie and Brian Kernighan, “The C programming Language”, 2nd edition.

WEB REFERENCES:

1. <http://cprogramminglanguage.net/>
2. <http://lectures-c.blogspot.com/>
3. http://www.coronadoenterprises.com/tutorials/c/c_intro.htm

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
CODE: R20CC11L1	SOFT SKILLS and COMMUNICATION SKILLS LAB-I (Common to All Branches)						

COURSE OBJECTIVES:

- To build confidence in the students to communicate effectively in English.
- To strengthen the oral communication skills to enable them to interact with the people in various social situations.
- To enable the learners improve pronunciation with the knowledge of phonetics.
- To provide exposure to students to soft skills like Goal Setting, Time Management, Interpersonal Skills, and Intra Personal Skills.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Communicate effectively with good pronunciation overcoming mother tongue Influence in academic and professional environment.

CO 2: Listen and comprehend several accents of English Language

CO 3: Take part in various conversations/discourses using formal and informal expressions.

CO 4: Adapt soft skills successfully in personal and professional life.

UNIT– I

- Introduction to Phonetics.
- Listening - TEDx Talks (https://www.ted.com/talks/ashweetha_shetty_how-education-helped-me-rewrite-my-life?language-en#t-623369)
- Self-Introduction

UNIT–II

- Pronunciation Rules and Common Errors in Pronunciation.
- Listening -TEDx Talks(https://www.youtube.com/watch?v=Dk20-E0yx_s)
- Role Play

UNIT–III

- Situational Dialogues (Inviting, Accepting and Declining Invitations)
- Listening - TEDx Talks (<https://www.youtube.com/watch?v=IgAnj6r1O48>)
- IAM

UNIT-IV

- a. Situational Dialogues (Commands, Instructions and Requests)
- b. Listening -TEDx Talks(<https://youtu.be/SKvMxZ284AA>)
- c. Telephonic Etiquette.

UNIT-V

- a. Time Management.
- b. Goal Setting.
- c. Interpersonal Skills and Intra personal skills.

TEXT BOOKS:

1. “Strengthen Your Communication Skills”, Maruthi Publications, 2013.

REFERENCE BOOKS:

1. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2015
2. J.D.O Conner, *Better English Pronunciation*, Cambridge University Press 1980.
3. T.Balasubramanian, “*A Text Book of English Phonetics for Indian Students*”, Macmillan, 1981
4. Penny ur *Grammar Practice Activities*, Cambridge University Press, 2010.
5. Mark Hancock, *Pronunciation in Use*, Oxford University Press 2007.
6. K. R Lakshmi Narayanan, T. Murugavan, *Managing Soft Skills*, Scitech Publications, 2010.
7. K V S G Murali Krishna, K V K K Prasad, *Placement and Personality Development*, Second Edition, Reem Publications Pvt. Limited, 2012
8. Shiv Khera, *You can Win*, Bloomsbury Publication, 2014
9. Stephen R. Covey, *The 7 Havits of Highly Effective People*, Free Press, 1989

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
CODE: R20CC11L2	PROBLEM SOLVING USING C LAB (Common to All Branches)						

COURSE OBJECTIVE:

- The purpose of this course is to introduce to students to the field of language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

COURSE OUTCOMES:

After completion of this C Programming Lab, students would be able to:

CO1: Study, analyze and understand logical structure of computer programming and different constructs to develop programs in C Language. [K4]

CO2: Compare and contrast various data types and operator precedence. [K2]

CO3: Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4]

CO4: Analyze simple data structures, use of pointers and dynamic memory allocation techniques. [K4]

CO5: Make use of functions and file I/O operations in developing C Programs. [K3]

EXERCISE 1

Construct Flowcharts for the following through Raptor:

- Develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
- Calculate simple and compound interest for various parameters specified by the user.
- Calculate the average of n numbers.

EXERCISE 2

- Write a C Program to calculate the area of triangle using the formula $Area = \sqrt{s * (s - a) * (s - b) * (s - c)}$ where $s = (a+b+c)/2$.
- Write a C Program to find the largest of three numbers using ternary operator.
- Write a C Program to swap two numbers without using a temporary variable.

EXERCISE 3

- Write a C program to find the roots of a quadratic equation.

EXERCISE 8

Draw a flow chart using Raptor and write C programs that use both recursive and non-recursive Functions for the following

- i) To find the factorial of a given integer.
- ii) To find the GCD greatest common divisor of two given integers.

EXERCISE 9

- a) Write a C Program to find Fibonacci sequence.
- b) Write C programs illustrating call by value and call by reference concepts.

EXERCISE 10

Write C Programs for the following string operations without using the built in functions - to concatenate two strings.

- a) To append a string to another string
- b) To compare two strings

EXERCISE 11

Write C Programs for the following string operations without using the built in functions

- a) To find whether a given string is palindrome or not
- b) Write a C Program to count number of occurrences of each character in a given string.

Example: if input „APPLE“ then output is „A count 1, P count 2, L count 1, E count 1“

EXERCISE 12

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

- i. To insert a sub-string in to given main string from a given position.
- ii. To delete n Characters from a given position in a given string.
- iii. To replace a character of string either from beginning or ending or at a specified location

EXERCISE 13

- a) Write a C Program to Implement Taylor series method
- b) Write a C Program to Implement Euler's method
- c) Write a C Program to Implement Runge Kutta method

EXERCISE 14

- a) Write C Program to reverse a string using pointers
- b) Write a C Program to compare two arrays using pointers
- c) Write a C program to swap two numbers using pointers

EXERCISE 15

- a) Write the following C Programs using Dynamic memory management functions.
 - i. Accept size of array from user then read n elements into two arrays and store sum of those two arrays in third array, display three arrays using pointers.
 - ii. User will specify data type and data to store, use generic pointer to store that data and display given input.

EXERCISE 16

Examples which explores the use of structures, union and other user defined variables

EXERCISE 17

- a) Write a C program which copies one file to another.
- b) Write a C program to count the number of characters and number of lines in a file.
- c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

EXERCISE 18

Virtual Lab: <http://cse02-iiith.vlabs.ac.in/>

Any three programs must be submitted with result from the above link.

At the end of the semester the student has to submit a Mini-Project on Computer Programming. The list of Mini-Projects is available in the department.

TEXT BOOKS:

1. Dr.S.N.Tirumala Rao, Dr.S.V.N.Sreenivasu, Dr.S.Siva Nageswara Rao, Dr.M.Venkata Reddy,
2. “Programming in C”, M/S.Surneni International Book Publishers, ISBN:978-81-953920-3-2, 2021
3. Reema Thareja, “Programming in C”, OXFORD.
4. The C programming Language by Dennis Richie and Brian Kernighan 2nd Ed.

REFERENCE BOOKS:

1. Dr.E.Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill Education.
2. Hanly, “Problem Solving and Program Design in C”, Koffman, 7th ed, PEARSON.
3. Forouzan, Gilberg, Prasad, ”C Programming, A Problem Solving Approach”, CENGAGE.
4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH I and II SEMESTERS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
CODE: R20CC11L5	ENGINEERING CHEMISTRY LAB (COMMON TO ALL BRANCHES)						

COURSE OBJECTIVES:

- To provide the students with a solid foundation in chemistry laboratory required to solve the engineering problems.
- To expose the students in practical aspects of the theoretical concepts.
- To train the students on how to handle the instruments.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Develop and perform analytical chemistry techniques to address the water related problems

(hardness, alkalinity, Chlorine, DO)-**Creating**

CO 2: Explain the functioning of different analytical instruments-**Applying**

CO 3: Compare viscosity and surface tension of different oils-**Analyzing**

CO 4: Measure molecular/system properties such as strength of solutions, conductance of solutions and acid number of lubricating oils, etc-**Evaluating**

List of Experiments

Introduction to chemistry laboratory–Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

1. Estimation of NaOH using standard HCl solution
2. Determination of hardness of water sample by EDTA method
3. Determination of alkalinity of water sample
4. Determination of Dissolved Oxygen content of water sample by Winkler's method
5. Determination of Dissolved Chlorine by Mohr's method
6. Estimation of Fe^{+2} by using KMnO_4
7. Preparation of phenol formaldehyde resin/Urea formaldehyde
8. Conductometric titration between strong acid and strong base
9. Determination of viscosity of a liquid by Ostwald's viscometer
10. Determination of surface tension of a liquid by Stalagmeter

11. Determination of moisture content present in given coal sample

12. Determination of acid value of an oil

VIRTUAL LABS:

1. Soil Analysis- Determination of pH of soil

2. Water analysis - Determination of Physical parameters

TEXT BOOKS:

1. N.K Bhasin and Sudha Rani “**Laboratory Manual on Engineering Chemistry**” 3/e, Dhanpat Rai Publishing Company (2007).

2. Mendham J, Denney RC, Barnes JD, Thomas M and Sivasankar B “**Vogel’s Quantitative Chemical Analysis**” 6/e, Pearson publishers (2000).

3. Sudharani, “**Lab manual on Engineering Chemistry**” Dhanpat Rai Publications, Co., New Delhi. (2009).

Web References:

1. URL: <https://vlab.amrita.edu>

I B.Tech II Semester

DEPARTMENT OF CIVIL ENGINEERING

B. Tech I Year II Semester

S.No	CODE	SUBJECT NAME	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1201	Differential Equations and Vector Calculus	30	70	100	2	1	0	3
2	R20CC1203	Engineering Physics	30	70	100	3	0	0	3
3	R20CC1207	Engineering Drawing	30	70	100	1	0	4	3
4	R20CE1212	Elements of Mechanical and Electrical Engineering	30	70	100	3	0	0	3
5	R20CE1216	Elements of Building Science	30	70	100	3	0	0	3
6	R20CE12L6	Elements of Mechanical and Electrical Engineering Lab	15	35	50	0	0	3	1.5
7	R20CC12L5	Engineering Physics Lab	15	35	50	0	0	3	1.5
8	R20CC12L4	Engineering Workshop	15	35	50	0	0	3	1.5
9	R20CC12MC2	Constitution of India (Zero Credit Course)				2	0	0	0
		Total							19.5

I B.TECH-ISEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
CODE: R20CC1201	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to Civil, EEE, ME and ECE)						

COURSE OBJECTIVES:

To formulate and solve first order ordinary differential equations.

1. To solve second order differential equations of various kinds.
2. To find the solution of first order linear and non-linear partial differential equations.
3. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

COURSE OUTCOMES:

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

1. Apply first order ordinary differential equations to real life situations. [**Apply - K3**]
2. Identify and apply suitable methods in solving the higher order differential equations. [**Apply - K3**]
3. Solve the partial differentiation equations. [**Apply - K3**]
4. Interpret the physical meaning of different operators as gradient, curl and divergence.

[Understanding - K3]

5. Estimate the work done against a field, circulation and flux using vector calculus.

[Evaluating – K5]

UNIT I: DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE: (10 hours)

Linear-Bernoulli's-Exact equations and equations reducible to exact form. **Applications:** Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories, Electrical circuits.

UNIT-II: LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER: (10 hours)

Finding the complementary functions, Inverse operator, Rules for finding the particular integrals, Method of variation of parameters. Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients. Application: L-C-R Circuit problems.

UNIT – III: FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS: (10 hours)

Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange's) equations.

UNIT- IV: VECTOR DIFFERENTIATION: (8 hours)

Scalar and vector point functions, vector operator del, del applies to scalar point functions- Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT- V: VECTOR INTEGRATION: (10 hours)

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (Without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (Without proof).

TEXT BOOKS:

1. Dr.R.Mohana Ramana,Dr.G.Dharmaiah," Differential Equations And Vector Calculus",Spectrum Education, ISBN: 978-81-948785-2-0, 2021.
2. Dr. B.S. Grewal, "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2012.
3. B.V.Ramana, "*Higher Engineering Mathematics*", 32nd Edition, McGraw Hill Education, 2018.
4. Bhavanari Satyanarayana, Pradeep Kumar T.V. and Srinivasulu D, "*Linear Algebra and Vector Calculus*", Studera Press, New Delhi, 2017.

REFERENCES:

1. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
2. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education,Singapore, Indian Print, 2003.
3. Peter V. O'Neil, "*Advanced Engineering Mathematics*", 7th Edition, Cengage Learning, 2011.
4. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
CODE: R20CC1203	Engineering Physics (Common to CE and ME)						

COURSE OBJECTIVES:

- To impart knowledge in basic concepts of wave optics, fiber optics, properties of solid crystal materials and magnetic materials, acoustics, superconductors.
- To familiarize the applications of materials relevant to engineering field.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Recognize the experimental evidence of wave nature of light and interference in thinfilms, Diffraction grating and Polarization in various fields. **(Remember) K1**

CO 2: Analyze and understand various types of lasers and optical fibers. **(Analyze) K4**

CO 3: Identifies the crystal structures and XRD techniques. **(Remember) K1.**

CO 4: Knowing the applications of magnetic and superconducting materials in engineering field. **(Remember) K1**

CO 5: Identifies the use of Acoustics and Ultrasonic in engineering field. **(Analyze) K4**

UNIT– I

Interference and Diffraction: Introduction -Interference in thin films by reflection – Newton’s rings, introduction to diffraction – difference between Fresnel’s and Fraunhofer diffraction - Fraunhofer diffraction at single slit (qualitative) - Diffraction grating.

Polarization: Introduction – Types of Polarization – Double refraction – Nicol’s prism-Quarter wave plate and Half Wave plate - Applications

UNIT–II

Lasers: Introduction – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Population inversion – Ruby laser – Helium Neon laser-Applications.

Fiber Optics: Introduction- Basic Structure and Principle of optical fiber - Acceptance angle – Acceptance cone - Numerical Aperture-Applications.

UNIT–III

Crystallography: Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais

lattices – Crystal systems – Structures and packing fractions of SC, BCC and FCC.

X-Ray Diffraction: Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg's law.

UNIT-IV

Magnetic materials: Magnetic dipole moment- Magnetization- Magnetic Susceptibility- Magnetic permeability –Classification of Magnetic materials – Dia, Para, and Ferro – Hysteresis Loop- Soft and Hard magnetic materials – Applications of Magnetic materials

Superconductivity: Introduction- Properties, Meissner effect - Type-I and Type-II super conductors-BCS theory (Qualitative) – AC and DC Josephson effects - Applications of Superconductors

UNIT-V

Acoustics: Introduction – requirements of acoustically good hall– Reverberation – Reverberation time – Sabine's formula - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

Ultrasonics: Introduction - Properties - Production by Magnetostriction and Piezoelectric methods – Non Destructive Testing (Qualitative) – Applications.

TEXT BOOKS:

1. Dr.T.Anjaneyulu,Dr.K.Neeraja,Dr.N.Giridhar," Engineering Physics",Spectrum Education,ISBN :978-93-83959-91-4,2021.
2. A.J. Dekker, "Solid state Physics", ISBN 10: 0333918339 / ISBN 13: 9780333918333, Mc Millan India Ltd, First edition, 2000.
3. M.N. Avadhanulu and P.G. Kshirasagar, text book of Engineering Physics", ISBN 81-219-0817-5, S. Chand publications, First Edition, 2011.
4. P. K. Palanisamy, "Engineering Physics", ISBN: 9788183714464, Scitech Publishers, 4th Edition, 2014
- 5.M.R. Srinivasan, "Engineering Physics", ISBN978-81-224-3636-5, New Age international publishers, 2nd Edition,2014

REFERENCE BOOKS:

1. Charles Kittel, "Introduction to solid state physics" ISBN: 9788126578436, Willey India Pvt.Ltd, 5TH edition, 2012.
2. M.Arumugam, "Applied Physics", ISBN: 81-89638-01-7, Anuradha Agencies, 4th edition, 2013.

3. D.K.Bhattacharya, "Engineering Physics", ISBN: 0198065426, 9780198065425, Oxford University press, 2nd edition, 2010.
3. Sanjay D Jain and Girish G Sahasrabudhe "Engineering Physics", University Press ISBN: 8173716781, 1st edition, 2010.
4. B.K.Pandey and S. Chaturvedi "Engineering Physics" ISBN: 8131517616, Cengage Learning, 1st edition, 2012.

Web References:

1. <http://link.springer.com/physics>
2. <http://www.thphys.physics.ox.ac.uk>
3. <http://www.sciencedirect.com/science>
4. <http://www.e-booksdirectory.com>

E-Books:

1. <http://www.peaceone.net/basic/Feynman>
2. <http://physicsdatabase.com/free-physics-books>
3. <http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf>
4. <http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html>

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	4	30	70	100	3
CODE: R20CC1207	ENGINEERING DRAWING (Common to CE and ME)						

COURSE OBJECTIVES:

- The students to use drawing instruments and to draw polygons, engineering Curves and engineering scales.
- The students use to make orthographic projections, projections of points, simple lines and projections of the lines inclined to both the lines.
- The students use to draw the projections of the planes inclined to both the plane.
- The students use to draw the projections of solids and development of surfaces.
- The students use to draw conversion of isometric views to orthographic views vice versa and to learn basic drawing commands in auto cad.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Construct the geometrical shapes of regular polygons, Engineering Curves, and scales.

CO2: Illustrate the orthographic projections, projections of points, and lines inclined to both the planes.

CO3: Construct the projection of planes inclined to both the planes.

CO4: Analyse the projection of solids and the development of surfaces for regular solids.

CO5: Analyse the conversion of isometric views to orthographic views vice versa.

UNIT– I

The basic concepts in engineering drawing: Introduction to engineering drawing instruments, lettering and dimensioning practice. Geometrical constructions- Constructing regular polygons by general methods.

Curves used in engineering practice: Introduction to conic sections, construction of ellipse parabola, hyperbola by eccentricity method. Construction of ellipse by - Arcs of circles Method, Concentric Circles Method and Oblong Method, and parallelogram methods.

Engineering Scales: Introduction, scales on drawings Representation fraction: Construction of plain, diagonal and vernier scale.

UNIT–II

Orthographic projections- **introduction to type of projections, first angle and third angle projections.**

Projection of points: Principles of orthographic projection – Convention.

Projections of straight lines:

Projections of straight lines parallel to both the planes, parallel to one plane and inclined to the other plane. Lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

UNIT–III

Projections of planes: regular planes perpendicular / parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-IV

Projections of Solids: introduction to projections of solids, types of solids: prisms, pyramids, cones and cylinders –simple positions and the axis inclined to one of the planes.

Development of surfaces- Development of surfaces of right regular solids- Prisms, Cylinder, Pyramids, Cone and their sectional parts

UNIT-V

Introduction of isometric views: Isometric projections and orthographic projections. Conversion of isometric views to orthographic views and orthographic views to isometric views.

Introduction to auto cad- Practice on Draw, Edit and Modify commands using auto CAD.

TEXT BOOKS:

1. Engineering Drawing by Mr.P.Srinivasa Rao, Mrs.P.Sravani, Mr.M.Venkanna Babu & Mr.M.Venkaiah, Spectrum Publishing house, ISBN:978-81-948784-5-2, 2001.
2. Engineering Drawing by N.D. Butt, Chariot Publications.
3. Engineering Drawing by K.L.Narayana and P. Kanniah, Scitech Publishers.

REFERENCE BOOKS:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers.
2. Engineering Drawing by Basant Agarwal and CM. Agarwal, Tata McGraw Hill Publishers.

Web References:

1. URL: <https://www.youtube.com/watch?v=ohhdNRtDpCY>,

E-Books:

<https://www3.nd.edu/~cpoellab/teaching/cse40814/Lecture1-Handouts.pdf>

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
CODE: R20CC1212	ELEMENTS OF MECHANICAL AND ELECTRICAL ENGINEERING (For Civil)						

(Mechanical Part)

COURSE OBJECTIVES:

- To provide required knowledge on joining, forming, welding and power transmissions.
- To provide required knowledge on power plants and gas turbines.
- To familiarize with the basic DC network.
- To explain the concepts of electrical machines and their characteristics

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

- Illustrate the types of power plants and applications
- Demonstrate various methods of joining and material processing
- Analyze the behavior of an electrical circuit.
- Measure the performance quantities such as losses, efficiency of DC machines

UNIT-I:

Heat Power Generation: Introduction, Steam power generation- Basic cycle, applications. Internal combustion Engines-Classification, applications, Gas turbine-Basic cycle, components of a gas turbine, Types of fuels, Refrigeration cycles-Basics, VCR system.

UNIT-II:

Power Transmission: Different types of power transmission-belt drives, rope drives, chain drives. Gears:- Classification of gears, applications.

UNIT-III:

Joining and Forming Processes: Types of joining-Arc welding, Resistance welding, Gas welding, Brazing and Soldering, Metal forming-Forging, Rolling, Extrusion operations.

Basic laws and Circuits

Active and passive elements-voltage-current-power-power factor-energy-Ohms law-Kirchhoff's Laws-series and parallel circuits-source transformations-delta-wye conversion.

Unit IV: DC Machines

Principle Operation-Constructional features-induced EMF-Types of DC generators-Working of DC motor-Torque expression-3point starter-Speed controls-Losses and Efficiency by direct loading.

Unit V: Transformers

Constructional details-working principle-EMF equation-voltage regulation-losses and efficiency-open/short circuit tests.

Induction Motors: 3-Phase Induction motor Construction-working principle-Types-slip-Performance characteristics-1-phase Induction motor working principle-applications.

TEXT BOOKS:

1. Elements of Mechanical Engineering and Electrical Engineering ,Mr.Sk.Karimulla,Spectrum Publications,ISBN:978-81-953687-0-9,2021.
2. Mechanical Engineering Science, K R Gopala Krishna, Subhas publications.
3. Elements of Mechanical Engineering, M.L. Mathur, F.S.Metha and R.P.Tiwari; Jain Brothers Publications, 2009.
4. D.P.Kothari, I.J.Nagrath, Basic Electrical and Electronics Engineering, 1st edition,McGraw Hill Education (India) Private Limited, 2017.
5. B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, 1st edition, S.Chand Publishing, New Delhi, 2006.

REFERENCES:

1. Production Technology by P.N.Rao by I and II McGraw-Hill publications.
2. Gas turbines, V Ganeshan., S.K.Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education,2011.
3. R.K.Rajput, Basic Electrical and Electronics Engineering, University Science Press,New Delhi, 2012.

WEB REFERENCES:

1. <https://www.wileyindia.com/power-plant-engineering-as-per-aicte-theory-and-practice.html>
2. <https://www.classcentral.com/course/swayam-power-plant-engineering-17735>
3. <https://www3.nd.edu/~cpoellab/teaching/eee40814/Lecture1-Handouts.pdf>

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH II SEMESTERS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
CODE: R20CC1216	ELEMENTS OF BUILDING SCIENCES						

COURSE OBJECTIVES:

- Develop knowledge of material science and behavior of various building materials used in construction.
- Identify the construction materials required for the assigned work.
- Provide basic knowledge of all the components of the structure.
- To understand the principle and science in the construction of any structure.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Classify and understand the applications of basic building materials.

CO2: Understand the applications of advanced building materials.

CO3: Explain the principles and methods of construction of building components.

CO4: Understand the building services and principles of planning.

CO5: Understand the bye-laws in planning of residential buildings.

UNIT – I

Building materials- I

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.

Lime: Technical terms – Constituents of lime stone – Classification of lime – Manufacturing of lime

UNIT – II

Building Materials- II

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

Tiles: Characteristics of good tile – Types of tiles – Testing of tiles.

Other Materials: Properties and uses of iron, glass, ceramics, plastics, steel, aluminum, gypsum and

fibre-reinforced plastics.

UNIT – III

Building Construction

Foundations: Shallow foundations – Spread, combined, strap and mat footings. Masonry: Bonds in Stone and brick masonry - Partition walls.

Floors: Materials used – Different types of floors – concrete, tiled floors. Roofs: Pitched, flat and curved roofs – RCC roofs.

Stairs: Terminology – Types of stairs.

Surface Finishes: Plastering – Pointing – White washing, distempering and Painting – Dampproofing.

UNIT – IV

Building Services and Principles of Building Planning

Ventilation: Necessity – Functional requirements – Natural and mechanical ventilation lighting: Day and artificial lighting – Types of lighting in working places.

Fire Protection: Causes – General fire safety requirements – Fire resistant construction.

Principles of Building Planning: Introduction – Selection of site – Principles of building planning

UNIT – V

Building Regulations and Planning

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

Planning of Residential Buildings: Introduction – Minimum standards for various parts of the buildings – Requirements of different parts and their grouping.

Green Building: Concept of green building – Rating IGBC.

TEXT BOOKS:

1. Dr.P.Naga Sowjanya, Er.K.V.Prataap, "Elements of Building Sciences", Sunraise Publications, ISBN:978-81-952678-2-8, 2001.
2. S.C.Rangwala, K.S. Rangwala and P.S. Rangwala [2012], *Engineering materials*, Charotar Publishers, Anand.
3. Dr. B.C. Punmia [2008], *Building construction*, Laxmi Publications (P) Ltd., New Delhi.
4. Dr. N. Kumara Swamy and A. Kameswara Rao [2012], *Building Planning and Drawing*, Charotar

Publishers, Anand.

5. Gurucharan Singh and Jagdish Singh [2009], *Building Planning Designing and scheduling*, Standard publishers Distributors.

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*, Satyaprakshan publications.
3. S.V. Deodhar [2005], *Building science and planning*, Khanna Publishers, New Delhi.
4. Bureau of Indian Standards, *National Building Code of India – 2016*, New Delhi.
5. V.K. Jain [2009], *Automation Systems in smart and Green Buildings*, Khanna Publications.
6. S.C. Rangwala [2009], *Civil Engineering Drawing*, Charotar Publishing House.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0		15	35	50	1.5
CODE: R20CE12L6	ELEMENTS OF IN MECHANICAL and ELECTRICAL ENGINEERING LAB (For CIVIL)						

COURSE OBJECTIVE

To expose the students to the operation of DC motor, Transformer and rectifiers give them experimental skill

COURSE OUTCOMES:

After completion of the lab. The students will be able to

CO1: To illustrate different heat engines and its applications

CO2: To join the metal sheets using welding method

CO3: Determine the efficiency and regulation of 1-phase transformer

CO4: Compute the performance characteristics of transformers and DC machines through suitable tests.

List of Experiments:

Mechanical

1. To study the Construction and Working of different types of boilers.
2. To study the working and function of mountings and accessories in boilers.
3. To study Two-Stroke and Four-Stroke Diesel Engines.
4. To Study Two-Stroke and Four-Stroke Petrol Engines.
5. To study the vapour compression Refrigeration System and determination of its C.O.P.
6. To determine the viscosity of given fuel/oil sample using viscometer
7. To determine the calorific value of given fuel sample using bomb calorimeter
8. To study the solar heating system
9. To weld a lap joint and butt joint using Arc welding
10. To weld sheet metal using Resistance Welding

Electrical

1. Verification of Kirchhoff's law.
2. Swinburne's test and Predetermination of efficiencies as Generator and Motor
3. Brake test on DC shunt motor. Determination of performance curves
4. Speed control of D.C shunt motor by a) Armature voltage control b) Field flux control method.
5. OC and SC tests on single phase transformer (predetermination of efficiency and regulation).
6. Load test on three-phase induction motor.

Virtual lab:

1. Verification of Kirchhoff's law.
2. Brake test on DC shunt motor. Determination of performance curves

I B.TECH I/II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
CODE: R20CC12L5	Engineering Physics Lab (Common to CE and ME)						

COURSE OBJECTIVES:

To impart physical measurement skills and make the students understand coherence between theoretical and practical knowledge.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Understand the principle of physics and interpret them in engineering field and compare the results with theoretical calculations.

CO2: Ability to use modern engineering physics techniques and tools in real time applications in engineering studies.

CO3: The student will be enabled to know about the characteristics and the behaviour of materials in a practical manner and gain knowledge and its usage.

LIST OF EXPERIMENTS:

1. Rigidity modulus of material by wire-dynamic method (torsional pendulum)
2. Determination of wavelength of a source-Diffraction Grating-Normal incidence
3. Newton's rings –Radius of Curvature of Plano Convex Lens.
4. Determination of thickness of thin wire- Air wedge method
5. Determination of wavelength of Laser Source-single slit diffraction.
6. Determine the Numerical aperture of an optical fiber.
7. Melde's experiment – Transverse and Longitudinal modes
8. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
9. Verification of laws of stretched string by using Sonometer.
10. Calculate the energy loss in a given ferromagnetic material by plotting B-H Curve.
11. Energy Band gap of a Semiconductor p - n junction.
12. Characteristics of Thermistor – temperature coefficient

TEXT BOOKS:

- 1.Engineering Physics Lab Manual by Dr.Y. Aparna and Dr.K.Venkateswarao (V.G.S.Booklinks).
- 2.Physics Practical Manual, Lorven Publications
- 3.S. Balasubramanian , M.N. Srinivasan “ A Text book of Practical Physics”- S ChandPublishers, 2017.

Web References:

1. <https://www.youtube.com/watch?v=NDsSPtL9dyQ>
2. <https://www.youtube.com/watch?v=9agoJRCnu4w>
3. <https://www.youtube.com/watch?v=bv-lLJreyCU>
4. <http://vlab.amrita.edu/index.php>

DEPARTMENT OF CIVIL ENGINEERING

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
CODE: R20CC12L4	ENGINEERING WORKSHOP (COMMON TO ME, CE BRANCHES)						

COURSE OBJECTIVES:

- To impart knowledge to students to develop their technical skill sets for creating entities from raw material.
- To give hands on training and practice to students for use of various tools, devices, machines.
- To develop ability of students to understand, plan and implement various processes and operations to be performed on the raw material to create object of desired shape and size.
- Enabling the student to understand basic hardware and software tools through practical exposure.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Make Use of the various carpentry tools, machines, devices used in engineering practice for preparing different carpentry joints.

CO 2: Make Use of the various fitting tools, machines, devices used in engineering practice for preparing different Fits.

CO 3: Develop different components using Tin Smithy and black smithy tools.

CO 4: Demonstrate the various house wiring connections for different house wiring connections

CO5: Demonstrate the need of PC hardware components, applications and softwares.

CO6: Explain the knowledge of networks, internet and World Wide Web, Search engines, Netiquette.

CO7: Install and use different software like Windows XP, Linux **CO8:** Identify and fix the defective PC and software related issues. **CO9:** Formalize with parts of windows word, Excel and Power point.

LIST OF EXPERIMENTS:

TRADES FOR EXERCISE:

CARPENTRY

1. Cross-Lap joint
2. Dove tail joint

FITTING

1. V-fit
2. Square fit

TINSMITHY

1. Square box without lid
2. Tapper tray

HOUSE WIRING

1. Two lamps series connection and parallel connection
2. Fluorescent Tube Wiring and Stair Case Wiring

BLACK SMITHY

1. S-Hook
2. Round rod to square rod

Internet and Networking Infrastructure

Task 1: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth technology, Wireless Technology, Modem, DSL, and Dialup Connection.

Orientation and Connectivity Boot Camp and Web Browsing: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.

Task 2: Search Engines and Netiquette:

Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc). Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.

Task 3: Cyber Hygiene (Demonstration) : Awareness of various threats on the internet. Importance of Security patch updates and Anti-Virus solution Ethical Hacking, Firewalls, Multi-factors authentication techniques including Smart card Biometrics and also practiced

Word

Task 4: MS Word Orientation: Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting, Drop Cap, Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving.

Task 5 : Creating Project : Abstract Features to be covered:-Formatting Styles, Inserting Table, Bullets and Numbering, Changing Text Direction, Cell alignment, footnote, Hyperlink, Symbols, Spell Check, Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Excel

Task 6: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations.

Creating Scheduler - Features to be covered:-Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task 7: Performance Analysis: Features to be covered:-Split cells, freeze panes, group and outline, Sorting, Boolean and Logical operators, Conditional Formatting.

Power Point

Task 8: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes:- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint.

Task 9: Focusing on the power and potential of Microsoft power point Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes:- Master Layouts (slide, template and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background , textures, Design Templates, Hidden slides, OLE in PPT.

TEXT BOOKS:

Faculty to consolidate the workshop manuals using the following references.

1. Anita Goel , Computer Fundamentals, Pearson.
2. Scott. Mueller QUE , Scott Mueller’s Upgrading and Repairing PCs, 18/e, Pearson, 2008

REFERENCE BOOKS:

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Venkateswarlu.
2. G Praveen Babu, M V Narayana, “Information Technology Workshop”, BS Publications, 3e
3. Vikas Gupta, “Comdex Information Technology”, Dreamtech

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	-	-	-	-
R20CC12MC12	CONSTITUTION OF INDIA (ZERO CREDIT COURSE)						

COURSE OBJECTIVES

1. To train students in understanding the basic structure of Indian Constitution
2. To aware the students about the role of constitution in a democratic society
3. To prepare students to live better and happily with other fellow beings through the application of Fundamental Rights in their lives.
4. To know about the powers of Union Government and State Government

COURSE OUTCOMES:

After the completion of this course the student should be able to

CO 1: Examine salient features of Indian Constitution and live accordingly in society and interpret the meaning of Fundamental Rights of State Policy

CO 2: Discover various aspects of Union Government legislation and live up to the Expectations of the rules.

CO 3: Critically examine State Government legislation and improve your living standards by following the rules strictly

CO 4: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living

CO 5: Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.

UNIT-I: INTRODUCTION TO INDIAN CONSTITUTION and FUNDAMENTAL RIGHTS

Meaning of the term Indian Constitution –Preamble- Constituent Assembly- Salient Features of Indian Constitution. Fundamental Rights - Fundamental Duties -The Directive Principles of State Policy.

UNIT-II: UNION GOVERNMENT

Union Government -Union Legislature (Parliament) -Lok Sabha and Rajya Sabha (with Powers and

Functions) -Union Executive -President of India (with Powers and Functions) -Prime Minister of India (with Powers and Functions) -Union Judiciary (Supreme Court) -Jurisdiction of the Supreme Court

UNIT-III: STATE GOVERNMENT

State Government -State Legislature (Legislative Assembly / Vidhan Sabha, Legislative Council / Vidhan Parishad) -Powers and Functions of the State Legislature -State Executive-Governor of the State (with Powers and Functions) -The Chief Minister of the State (with Powers and Functions) - State Judiciary (High Courts)

UNIT-IV: LOCAL SELF GOVERNANCE

Powers and functions of Municipalities, Panchyats, ZP's and Co – Operative Societies.

UNIT-V: SOVEREIGN BODIES

Election Commission of India (with Powers and Functions) -The Union Public Service Commission (with Powers and Functions)

TEXT BOOKS

1. I.Sridhar, Sd.Salma and T.L.Sravani Kumari, "Constitution of India", M/S Spectrum Publications, ISBN:978-81-952677-6-7, 2021.
2. Introduction to constitution of India, Durga Das Basu, Lexis Nexis Publications
3. Constitution of India by PROFESSIONAL BOOK PUBLISHERS
4. The Constitution of India by Arun K Tiru vengadam, Blooms bury publishers.
5. The constitution of India by PM Bakshi, Universal law publishing co
6. The Constitution of India by S.R. Bhansali, Universal law publishing co

II YEAR - I SEMESTER

DEPARTMENT OF CIVIL ENGINEERING

II B. Tech II Year I Semester

S.No	CODE	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2101	Numerical Methods and Transformation	BS	30	70	100	2	1	0	3
2	R20CE2102	Fluid Mechanics	PC	30	70	100	3	0	0	3
3	R20CE2103	Strength of Materials-I	PC	30	70	100	3	0	0	3
4	R20CE2104	Surveying and Geomatics	PC	30	70	100	3	0	0	3
5	R20CE2105	Concrete Technology	PC	30	70	100	3	0	0	3
6	R20CE21L1	Strength Of Materials Lab	PC	15	35	50	0	0	3	1.5
7	R20CE21L2	Computer Aided Building Drawing Lab	PC	15	35	50	0	0	3	1.5
8	R20CE21L3	Surveying Field Work Lab	PC	15	35	50	0	0	3	1.5
9	R20CE21SC1	Building Materials and Construction Technology Lab	SC	-	50	50	0	0	4	2
10	R20CC21MC1	Environmental Studies (Non-Credit Course)	MC	-	-	-	2	0	0	0
Total Credits										21.5

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
CODE: R20CC2101	NUMERICAL METHODS AND TRANSFORMATIONS (CIVIL, EEE, ME and ECE)						

COURSE OBJECTIVES:

1. To elucidate the different numerical methods to solve nonlinear algebraic equations.
2. To propagate the use of different numerical techniques for carrying out numerical integration.
3. Explore the use of Laplace transform method to solve with initial value problems of ODE.
4. To acquire fundamental Knowledge of Fourier series and Fourier Transform and able to give Fourier expansions of a given function.

COURSE OUTCOMES:

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

1. Evaluate approximating roots of polynomials and transcendental equations by different algorithms.
[Evaluating – K5]
2. Apply Newton’s forward backward and Lagrange’s interpolation for equal and unequal intervals.
[Apply – K3]
3. Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.
[Apply – K3]
4. Select appropriate technique of Laplace transforms in solving differential equations.
[Apply – K3]
5. Relate Fourier series, integral, transforms techniques in their core. [understanding – K2]

UNIT –I: SOLUTIONS TO ALGEBRAIC EQUATIONS AND INTERPOLATION: (10 hours)

Solution of polynomial and transcendental equations: bisection method, Regula-Falsi method and Newton-Raphson method. Finite differences, relation between operators, interpolation using Newton’s, Gauss’s forward and backward difference formulae. Interpolation with unequal intervals: Lagrange’s formulae.

UNIT –II: NUMERICAL SOLUTIONS OF ODE AND INTEGRATION: (8 hours)

Numerical Differentiation, Ordinary differential equations-Taylor’s series, Euler and modified Euler’s methods. Runge-Kutta method of fourth order for solving first and second order equations. Numerical integration- trapezoidal rule and Simpson’s 1/3rd and 3/8th rules.

UNIT-III: LAPLACE TRANSFORMATIONS:

(12 hours)

Laplace transform and its properties, Transform of derivatives and integrals, Multiplication by t^n , division by t , Unit step function and unit impulse function. Transform of periodic functions, Evolutions of integrals by Laplace Transforms. Finding inverse transforms by the method of partial fractions, other methods of finding inverse Laplace Transforms, Convolution theorem (without proof), Solutions of Initial and Boundary Value Problems.

UNIT – IV: FOURIER SERIES:

(10 hours)

Introduction, Euler's formulae, Periodic functions, Dirichlet's conditions, conditions for a Fourier expansion, functions of any period, functions having points of discontinuity, odd and even functions - half range series.

UNIT – V: FOURIER TRANSFORMS:

(8 hours)

Fourier integral theorem (without proof), Fourier cosine and sine integrals, Fourier transform, Fourier sine and cosine transforms, properties of Fourier Transforms, convolution theorem (without proof).

TEXT BOOK:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publisher.
2. B.V.Ramana, "Higher Engineering Mathematics", 32nd Edition, McGraw Hill Education, 2018.

REFERENCES:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "Engineering Mathematics", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley-India.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage Learning, 2011.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE2102	3	0	0	30	70	100	3
FLUID MECHANICS							

COURSE LEARNING OBJECTIVES:

- To understand the properties of fluids and fluid statics
- To derive the equation of conservation of mass and its application
- To solve kinematic problems such as finding particle paths and stream lines
- To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems
- To analyze laminar and turbulent flows
- To understand the various flow measuring devices

COURSE OUTCOMES:

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

CO1: Understand the various properties of fluids and their influence on fluid motion and calculate the forces that act on submerged planes and curves.

CO2: Identify and analyse various types of fluid flows and variety of problems in fluid statics.

CO3: Analyse a variety of problems in fluid dynamics and measure the quantities of fluid flowing in pipes

CO4: Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces.

CO5: Measure the quantities of fluid flowing in tanks and channels.

SYLLABUS:

UNIT I

Properties of Fluid: Physical properties of fluids - specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion, capillarity.

Fluid Statics: Pressure at a point, Pascal's law, Hydrostatic law -atmospheric, gauge and vacuum pressures- measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers.

Hydrostatics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces

– Centre of pressure.

UNIT II

Fluid Kinematics: Methods of describing fluid motion; Classification of flows; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; Irrotational and rotational flows; Streamline; Path line; Streak line; Equation for acceleration; Convective acceleration; Local acceleration; Continuity equation; Velocity potential and stream function; Flow net.

UNIT III

Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line - Momentum equation and its application – forces on pipe bend.

Flow Measurement in Pipes: Discharge through venturimeter; Discharge through orifice meter; Measurement of velocity by Pitot tube.

UNIT IV

Flow Through Orifices and Mouthpieces: Flow through orifices; Determination of coefficients for an orifice; Flow through large rectangular orifice; Flow through submerged orifice; Classification of mouthpieces; Flow through external and internal cylindrical mouthpiece.

Flow over Notches & Weirs Flow through rectangular, triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Broad crested weir.

UNIT V

Analysis of Closed Conduit Flow: Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart, Pipe network problems, Hazen-Williams formula.

Laminar Flow and Turbulent Flows: Reynold's experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction, Hagen-Poiseuille Formula, Flow between parallel plates, Flow through long tubes, hydrodynamically smooth and rough flows.

TEXT BOOKS:

1. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi
2. A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi.

REFERENCE BOOKS:

1. Fluid Mechanics by A. K Jain, Khanna Publishers.
 2. Fluid Mechanics, Hydraulics & Hydraulic Machines by K R Arora, Standard Publisher
-

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE2103	3	0	0	30	70	100	3
STRENGTH OF MATERIALS – I							

COURSE OBJECTIVES:

- To impart preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress conditions and to develop diagrams of variation of various stresses across the length.
- To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections
- The concepts above will be utilized in measuring deflections in beams under various loading and support conditions
- To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

COURSE OUTCOMES:

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

CO1: Understand the basic materials behavior under the influence of different external loading conditions and the support conditions

CO2: Draw the diagrams indicating the variation of the key performance features like bending moment and shear forces

CO3: Bending concepts and calculation of section modulus and for determination of stresses developed in the beams and

CO4: Have knowledge of deflections due to various loading conditions.

CO5: Assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure using Lamé's equation.

SYLLABUS:

UNIT – I

Simple Stresses and Strains: 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 – Elastic moduli and the relationship between them – Bars of varying section

– stresses in composite bars – Temperature stresses.

Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

UNIT – II

Shear Force and Bending Moment Diagrams: Definition of beam – Types of beams – Concept of shear force and bending moment – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads.

UNIT – III

Flexural and shear Stresses in beams

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

Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections.

UNIT – IV

Deflection of Beams

Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic curve of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Mohr's theorems – Moment area method – application to simple cases of cantilever.

UNIT – V

Thin and Thick Cylinders

Thin Cylindrical shells: Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders.

Thick Cylinders: Introduction: Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders-distribution of stresses.

TEXT BOOKS:

1. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, New Delhi
2. Strength of materials by R. K. Bansal, Lakshmi Publications.

REFERENCE BOOKS:

1. Mechanics of Materials- by R. C.Hibbler, Pearson publishers
2. Mechanics of Solids – E P Popov, Prentice Hall.
3. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press
4. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE2104	3	0	0	30	70	100	3
SURVEYING AND GEOMATICS							

COURSE OBJECTIVES:

The object of the course student should have the capability to:

- Know the principle and methods of surveying.
- Measure horizontal and vertical- distances and angles
- Recording of observation accurately
- Perform calculations based on the observation
- Identification of source of errors and rectification methods
- Apply surveying principles to determine areas and volumes and setting out curves
- Use modern surveying equipment's for accurate results.

COURSE OUTCOMES:

Course will enable the student to:

CO1: Apply the knowledge to calculate angles, distances and levels.

CO2: Identify data collection methods and prepare field notes.

CO3: Understand the working principles of survey instruments, measurement errors and corrective measures.

CO4: Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies.

CO5: understand about Photogrammetry surveying.

UNIT-I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, surveying accessories. Introduction to Compass, levelling and Plane table surveying.

Measurement of Distances and Directions: Linear distances-Direct Methods- Chains- Tapes, ranging, Tape corrections.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip – W.C.B systems and Q.B. system of locating bearings.

UNIT - II

Levelling- Types of levels, temporary and permanent adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

UNIT - III

Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angles.

Traversing: Methods of traversing, traverse computations and adjustments.

Plane table surveying: Radiation, Intersection and Traversing.

UNIT – IV

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves. **Tachometric**

Surveying: Principles of Tachometry, stadia and tangential methods of Tachometry, Modern Surveying

Methods: Principle and types of E.D.M. Instruments, Total station- advantages and Applications.

Introduction to Global Positioning System.

UNIT – V

Photogrammetry Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial Photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation.

TEXT BOOKS:

1. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
2. Chandra A M, “Plane Surveying and higher surveying”, New Age International Pvt. Ltd., Publishers, New Delhi.
3. Duggal S K, “Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

REFERENCE BOOKS:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3. Arora K R “Surveying Vol 1, 2 & 3), Standard Book House, Delhi

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE:R20CE2105	3	0	0	30	70	100	3
CONCRETE TECHNOLOGY							

COURSE OBJECTIVES:

- To know about the composition, manufacturing process, types and testing of cement and properties of materials used for making concrete.
- To study the properties and behavior of concrete during fresh state and hardened state by various theories, concepts and tests.
- To understand the composition and effects of admixtures and construction chemicals used to improve the properties of concrete.
- To know about special concretes and studying the design mix procedure as per IS10262 code

COURSE OUTCOMES:

After successful completion of the course, the students are able to

CO1: Know about the composition, manufacturing process, types and testing of cement and properties of materials used for making concrete.

CO2: Understand the properties and behavior of concrete during fresh state and hardened state by various theories, concepts and tests.

CO3: Understand the composition and effects of admixtures and construction chemicals used to improve the properties of concrete.

CO4: Understand about Hardened concrete

CO5: Knowledge about special concretes and able to design concrete mix as per IS10262 code.

UNIT I

Cement: General, Manufacture of Portland cement by dry process, Approximate oxide composition limits of OPC, Bogue's compounds, heat liberation from a setting cement, structure of hydrated cement, water requirements for hydration, Types Of Cements: Ordinary Portland cement, Portland pozzolana cement, Rapid hardening cement, Sulphate resisting cement, Slag cement, Quick setting cement, Super sulphated cement, Air entraining cement, Coloured cement, Expansive cement, High alumina cement.—
Testing Of Cement: Fineness of cement using sieve test and air-permeability method, Normal consistency

and setting times using Vicat apparatus, Soundness test using Le-chatlier apparatus, Compressive strength of cement.

UNIT II

Aggregates: Classification, source, size and shape texture and influence of texture on strength, specific gravity of aggregates, moisture in aggregates, bulking of fine aggregate, grading of aggregates, sieve analysis of fine and coarse aggregates.--**Water:** Permissible limit for solids as per IS456-2000, use of sea water for mixing concrete.

Fresh concrete: Workability, factors affecting workability, slump test, Kelly ball test, V-B test, compaction factor test, segregation, bleeding, volume batching and weigh batching, hand mixing, machine mixing, mixing time,

UNIT III

Compaction: Compaction of concrete, hand compaction, compaction by vibration, internal vibrator, form work vibrator, table vibrator, platform vibrator, surface vibrator.

Admixtures and Construction Chemicals: Chemical Admixtures: Plasticizers and super plasticizers, Retarders, Accelerators, Air-entraining admixtures. Effect of mineral admixtures on fresh and hardened concrete. Mineral admixtures: Fly ash, silica fume, Slag, Effect of mineral admixtures on strength and durability of concrete.

UNIT IV

Hardened Concrete: General; Effect of water-cement ratio on strength, Gain of strength with age, Compressive strength, Effect of height/diameter ratio on compressive strength; Flexural strength of concrete; Tensile strength of concrete; Non-destructive testing methods. Elastic properties of aggregate, Factor's affecting modulus of elasticity, Poisson's ratio.--**Durability of Concrete:** Factors contributing to cracks in concrete, Sulphate attack and methods of controlling Sulphate attack, Chloride attack, Corrosion of steel and its control.

UNIT V

Special Concretes: Fibre reinforced concrete, Ferro cement, High strength concrete, Light weight concrete, High performance concrete.--**Proportioning Of Concrete Mixes:** Concept of mix design, Variables in proportioning, Different methods of mix design, Nominal mix and design mix, Indian standard method of mix design as per IS-10262:2009.

TEXT BOOKS:

1. Concrete technology by A.R.Santha Kumar, 1st Edition, Oxford University Press, 2006.
2. Concrete technology by M.S.Shetty, S.Chand & Company Pvt. Ltd., NewDelhi,2005

REFERENCE BOOKS:

1. Properties of concrete by A.M.Neville, Pearson Education, 2007
2. Concrete technology by M.L.Gambhir, Tata McGraw-Hill, 2009.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE21L1	0	0	3	15	35	50	1.5
STRENGTH OF MATERIALS LAB							

COURSE OBJECTIVES:

- To find the strength properties of materials like steel, wood etc under direct tension, compression, shear torsion and bending by conducting relevant tests.
- To find young's modulus, modulus of rigidity of the given materials.
- To find hardness, impact resistance of the given materials by conducting relevant tests
- To determine the compressive strength and percentage of water absorption of bricks

COURSE OUTCOMES:

After the successful completion of the course, students are able to

CO1: Behavior of materials like steel, wood, concrete etc under direct tension, compression, shear, torsion and bending.

CO2: Finding properties like young's modulus, modulus of rigidity of materials.

CO3: Determining hardness, impact resistance of the given materials by conducting relevant tests.

CO4: Determining the percentage of water absorption of bricks.

EXPERIMENTS:

1. Study of stress-strain characteristics of mild steel bars by UTM
2. Study of stress-strain characteristics of HYSD bars by UTM
3. Determination of modulus of elasticity of the material of the beam by conducting bending test on simply supported beam
4. Determination of modulus of elasticity of the material of the beam by conducting bending test on cantilever beam
5. Determination of modulus of rigidity by conducting torsion test on solid circular shaft
6. Determination of hardness of the given material by Brinnel's hardness test
7. Determination of hardness of the given material by Rockwell hardness test
8. Determination of hardness of the given material by Vickers hardness test.
9. Determination of impact strength of the given material by conducting Charpy/Izod test

10. Determination of ultimate shear strength of steel by conducting double shear test
11. Determination of modulus of rigidity of the material of closely coiled helical spring.
12. Determination of compressive strength of wood with grain parallel / perpendicular to loading.
13. Determination of compressive strength of CLAY/ FAL-G brick
14. Determination of water absorption of bricks

Note:**A minimum of 10 experiments shall be done and recorded

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE21L2	0	0	3	15	35	50	1.5
COMPUTER AIDED BUILDING DRAWING LAB							

COURSE OBJECTIVES:

- To learn Basic commands of Auto CAD software
- To draw conventional signs, symbols of materials and building services
- To draw plan, section and elevations of buildings and various building components.
- To create 3D building model and rendering the model.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

CO1: Basic Auto CAD commands

CO2: Various conventional signs, symbols of materials and building services

CO3: Drawing plan, section and elevations of buildings and various building components

CO4: Basics of creating 3D building model and rendering the model.

EXPERIMENTS:

1. Learning basic commands of CAD software & drawing various geometrical Shapes using
 - Draw commands
 - Editing commands
 - Creating text
 - Dimensioning
2. Draw Conventional signs for building materials and symbols for sanitary installations and fittings.
3. Draw symbols for Doors & Windows.
4. Draw Elevation and Sections of Door & Window.
5. Draw Cross section of load bearing wall over spread footing.
6. Draw plan & sectional elevation of Dog-Legged staircase.
7. Draw Pitched roof (King post truss).
8. Draw plan of a single storied residential building showing furniture & cub-boards using layers and blocks in CAD software.
9. Draw plan of a single storied residential building showing Electrical and Sanitary features using layers and blocks in CAD software.
10. Draw Plan, Section & Elevation of single storied residential building.

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE21L3	0	0	3	15	35	50	1.5
SURVEYING FIELD WORK LAB							

COURSE OBJECTIVES:

This course will enable students to:

- Apply the basic principles of engineering surveying and measurements
- Follow effectively field procedures required for a professional surveyor
- Use techniques, skills and conventional surveying instruments necessary for engineering practice.

COURSE OUTCOMES:

After a successful completion of the course, the student will be able to:

CO1: Apply the basic principles of engineering surveying and for linear and angular measurements.

CO2: Comprehend effectively field procedures required for a professional surveyor.

CO3: Use techniques, skills and conventional surveying instruments necessary for engineering practice.

LIST OF EXPERIMENTS:

1. To measure distance between two points by using chain surveying.
2. Setting out of rectangle, hexagon using tape/chain and other accessories.
3. Closed traverse by using compass surveying.
4. Open traverse by using compass surveying.
5. To determine difference in elevation by using Height of Instrument method and Rise and fall method.
6. Use of optical theodolite / Electronic theodolite for measurement of horizontal and vertical angles.
7. Methods of plane tabling: - Radiation. Intersection and Traversing.
8. Determination of area using total station.
9. Traversing using total station.
10. Setting out a simple foundation plan in the field.

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE:R20CE21SC1	0	0	4		50	50	2
BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY LAB							

COURSE OBJECTIVES:

This course will enable students to:

Experiments/Exercises on Civil Engineering Materials, Bricks, Construction Equipment, Masonry, Painting.

COURSE OUTCOMES:

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

CO1: Evaluate civil engineering materials using various tools and techniques to solve complex civil engineering material problems by following relevant IS codes and latest developments ensuring cost effectiveness, safety, environment and sustainability.

CO2: Analyze construction techniques to solve complex construction technology problems by following current developments ensuring cost effectiveness, resource management, safety, environment and sustainability.

CO3: Perform individually or in a team besides communicating effectively in written, Verbal and graphical forms on civil engineering materials and construction technology.

LIST OF EXPERIMENTS/EXERCISES:

Part – I: CIVIL ENGINEERING MATERIALS

A. PROPERTIES AND IDENTIFICATION OF CIVIL ENGINEERING MATERIALS

1. Properties and identification of building materials
2. Market survey for building materials

B. TESTS ON BRICK

1. Visual inspection test for color, shape and size
 2. Determination of soundness of brick
 3. Water absorption test of brick
 4. Efflorescence test of brick
 5. Determination of compressive strength of brick
-

PART- II: CONSTRUCTION TECHNOLOGY

A.MASONRY

1. Construction of masonry brick wall using English bond
2. Construction of masonry brick wall using Flemish bond
3. Plastering and pointing

B.PAINTING

4. External wall painting
5. Internal wall painting

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE:R20CC21MC1	2	0	0	-	-	-	0
ENVIRONMENTAL STUDIES (NON-CREDIT COURSE)							

COURSE OBJECTIVES:

1. To make the students aware about the environment and it's inter-disciplinary, to familiarize the concept of ecosystem and their importance, basic understanding of the ecosystem and its diversity.
2. Overall understanding of the natural resources.
3. To bring the awareness among students about the importance of biodiversity and the need for its conservation.
4. To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
5. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities. Awareness on the social issues, environmental legislation and global treaties understanding the environmental policies and regulations.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO-1 Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.

CO-2 Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.

CO-3 Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.

CO-4 Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices.

CO-5 Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.

SYLLABUS:

UNIT – I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for

Public Awareness. Institutions and people in Environment.

Ecosystems:

Definitions and concepts – Characteristics of ecosystem – Structural and functional features – Producers, consumers and decomposers and food webs – Types of ecosystems – Forests, grassland, desert, crop land, pond, lake, river and marine ecosystems – Energy flow in the ecosystem – Ecological pyramids – Ecological successions.

UNIT – II

Natural Resources: Water resources–Use and over utilization of surface and natural resourced ground water–Floods, drought, conflicts over water, dams–benefits and problems on tribal population & Environment.

Forest resources: Use and over–exploitation, deforestation.

Mineral resources: Use and exploitation, tribal & environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer–pesticide problems, water logging, salinity–concept of sustainable agricultural methods.

Energy Resources: Renewable (wind energy, tidal energy) and nonrenewable energy resources (Fossil fuels, coal).

UNIT – III

Biodiversity: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity

Conservation of biodiversity: Threats to biodiversity: habitat loss, man wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: In-Situ conservation and Ex- situ conservation.

UNIT – IV

Environmental Pollution and Control Technologies: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, and nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Good Agricultural Practices – Drip irrigation, soil erosion and desertification. Covid-19- and environmental Health –Impact of the Coronavirus-Precautions and infection control.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management. Covid-19- and environmental Health –Impact of the Coronavirus-Precautions and infection control.

UNIT – V

Environmental Policy, Legislation and Environmental Management: Environmental ethics: Issues and possible solutions. Environmental Protection Act, Legal aspects -Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation.

Impact Assessment and its significance - various stages of EIA, preparation of EMP and EIS, Environmental audit, Ecotourism.

Visit to some local Polluted Site: Study of an industrially Polluted area.

TEXT BOOKS:

1. AnubhaKaushik& C. P. Kaushik, Environmental Studies, New Age International (P) Ltd., New Delhi. Fourth edition, 2014.
2. P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani, Environmental Studies, Pearson Education, Chennai. ISBN 978-93-325-2052-3, Second edition-2014.

REFERENCE BOOKS:

1. Deekshita Dave & P. Udaya Bhaskar, Text Book of Environmental Studies Cengage Learning.
2. Shaashi Chawla, a Textbook of Environmental Studies, TMH, New Delhi.
3. Benny Joseph Environmental Studies, Tata McGraw Hill Co, New Delhi.
4. Dr.K.V.S.G. Murali Krishna, Environmental Studies VGS Publishers, Vijayawada, First Edition 2016.
5. Bharucha, E. Text book of Environmental Studies, First edition, Universities Press (India) Pvt., Ltd., Hyderabad, 2005.

Web References:

1. URL:https://www.youtube.com/watch?v=7G3eXI_DPn8
2. URL: <https://www.eolss.net/sample-chapters/C09/E6-70-05-01.pdf>
3. URL: <https://www.youtube.com/watch?v=QuRL6NbyvEQ>
4. URL: [https://google/ Introduction to Environmental Studies 5JM1G2](https://google/Introduction%20to%20Environmental%20Studies)
5. URL:<http://www.teacherspayteachers.com/Product/Food-Chains-Trophic-Levels-and- Ecological-Pyramids-PowerPoint> Click the above

6. URL:<http://iadc-dredging.com/en/371/environment/ecosystem-services/> this webinar will focus on the concept of ecosystem services
7. URL: <http://mocomi.com/> presents: What is Air Pollution? Air pollution is the introduction of foreign products into the atmosphere.
8. URL: https://en.wikipedia.org/wiki/green_impact_assessment

E-books:

1. <https://faculty.psau.edu.sa/.../doc-5-pdf-d78456fce3bebc84d9320fa2f9cf9e2a-original>
2. https://www.researchgate.net/.../273775623_Introduction_to_Environmental_Sciences

II YEAR - II SEMESTER

DEPARTMENT OF CIVIL ENGINEERING

B.TECH II YEAR - II SEMESTER

S.N O	CODE	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2201	Technical and Communicative English-II	HS	30	70	100	3	0	0	3
2	R20CE2202	Engineering Geology	ES	30	70	100	3	0	0	3
3	R20CE2203	Structural Analysis	PC	30	70	100	3	0	0	3
4	R20CE2204	Strength of Materials-II	PC	30	70	100	3	0	0	3
5	R20CE2205	Hydraulics And Hydraulic Machinery	PC	30	70	100	3	0	0	3
6	R20CE22L1	Engineering Geology Lab	EC	15	35	50	0	0	3	1.5
7	R20CE22L2	Fluid Mechanics And Hydraulic Machinery Lab	PC	15	35	50	0	0	3	1.5
8	R20CE22L3	Concrete Technology Lab	PC	15	35	50	0	0	3	1.5
9	R20CE22SC1	Advanced Surveying	SC		50	50	0	0	4	2
Total Credits										21.5
HONORS/MINOR COURSE										
10		Honors/Minor	PC	30	70	100	4	0	0	4

Note: Summer Internship/Community Service Project (Mandatory) to be evaluated in III-I

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
CODE: R20CC2201	TECHNICAL AND COMMUNICATIVE ENGLISH - II (Common to All Branches)						

COURSE OBJECTIVES:

- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To enhance the students' proficiency in reading skills enabling them meet the academic needs of their course.
- To enable the engineering students develop their basic communication skills in English for academic and social purposes.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it **(Apply-3)**.

CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **(Creating-5)**.

CO3: Build grammatically correct sentences using a variety of sentence structures **(Apply3)**.

CO4: Enhance word power and usage of lexicons **(Apply3)**.

UNIT– I

1. A Proposal to Griddle the Earth, Nellie Bly

- a) **Placement Papers.**
- b) **Reading:** Skimming for main idea, scanning for specific piece of information.
- c) **Writing:** Note – making flowed by paragraph writing, effective opening sentences, introducing the topic, key words, main idea, summarize the main idea.
- d) **Grammar and Vocabulary:** Content words and function words, verbs, nouns, adjectives and adverbs. Basic sentence structure and simple question form, framing jargon, technical vocabulary (15 words)

UNIT-II

2. The District School As It Was by One who Went to It, Warren Burton

- a) **Placement Papers.**
- b) **Reading:** Identifying the sequence of ideas and recognizing verbal techniques to link the ideas in a paragraph.
- c) **Writing:** Paragraph writing, using key words/phrases and organizing points in a coherent manner.
- d) **Grammar and Vocabulary:** Linkers, articles and prepositions.

UNIT-III

3. The future of Work- Jacob Morgan

- a) **Placement Papers.**
- b) **Reading:** Sequencing of ideas and recognizing verbal techniques to link the ideas in a paragraph.
- c) **Writing:** Paragraph writing, using key words/phrases and organizing points in a coherent manner.
- d) **Grammar and Vocabulary:** Cohesive devices, articles and prepositions.

UNIT-IV

4. H.G.Wells and the Uncertainties of Progress, Peter J. Bowler

- a) **Placement Papers.**
- b) **Reading:** Understand and interpret graphic elements used in texts.
- c) **Writing:** Information transfer.
- d) **Grammar and Vocabulary:** Adjectives, adverbs and antonyms.

UNIT-V

5. Leaves from the Mental Portfolio of a Eurasian, Sui Sin Far

- a) **Placement Papers.**
- b) **Reading:** Reading for comprehension.
- c) **Writing:** Essay writing

Grammar and Vocabulary: Articles, prepositions, tenses, subject verb agreement and technical jargon (15 words)

TEXT BOOKS:

1. English All Round -I (Communication skills for Under Graduate Learners)– Orient Black Swan Pvt.Ltd. Publisher, 1st edition,2019

REFERENCE BOOKS:

1. Raymond Murphy, *Murphy's English Grammar*, Cambridge University Press 2004
2. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: English Skills for Engineers*, Oxford University Press, 2009
3. Michael Swan, *Practical English Usage*, Oxford University Press, 1996

Web References:

1. <https://www.grammarly.com/blog>
2. <https://www.englishclub.com/>
3. www.nonstopenglish.com/
4. <https://www.fluentu.com/blog/english/>
5. <https://beta.freerice.com/>
6. <https://prepinsta.com/cognizant/>
7. <https://www.geeksforgeeks.org/tcs-placement-paper-mcq-1/>
8. <https://www.firstnaukri.com/career-guidance/infosys-placement-papers-with-solutions-2019-firstnaukri-prep>
9. <https://in.usembassy.gov/education-culture/american-spaces/dostihouse-mumbai/library-services/>
10. <https://www.youtube.com/user/bbclearningenglish>
11. <https://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/>
12. <https://englishlive.ef.com/blog/language-lab/5-simple-ways-improve-written-english/>

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE2202	3	0	0	30	70	100	3
ENGINEERING GEOLOGY							

COURSE OBJECTIVES:

- Develops the ability to understand the importance of geology in civil engineering
- Develops the ability to identifying the various rock forming group of minerals and rocks and analyze the attitude of rock formations
- Develops the skills for site investigations for projects like dams, tunnels
- Develops the solutions for various geological problems at different projects.

COURSE OUTCOMES:

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

CO1: To know the weathering process and mass movement

CO2: Distinguish geological formations

CO3: Identify geological structures and processes for rock mass quality

CO4: Identify subsurface information and groundwater potential sites through geophysical investigations

CO5: Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels.

UNIT – I

Introduction: Importance of geology from Civil Engineering point of view. Important branches of geology; Weathering, erosion and denudations process on earth material and natural agencies, Geological work of wind, river underground water and glaciers. Types of weathering, its effect over the properties of rocks, Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs

UNIT – II

Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics ~~minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnetite, and~~

Bauxite.

Petrology: Introduction; Civil engineering importance of petrology; Rock cycle, Geological Classification of rocks **IGNEOUS ROCKS:** Forms, Structures and textures of igneous rocks. Megascopic description and civil engineering uses of Granite, Basalt, Dolerite, Pegmatite and Charnockite. **SEDIMENTARY ROCKS:** Formation; Structures and textures of sedimentary rocks. Megascopic description and civil engineering uses of Laterite, Conglomerate, Sand stone, Lime stone and Shale. **METAMORPHIC ROCKS:** Types of metamorphism; Structures and textures of metamorphic rocks. Megascopic description and civil engineering uses of Gneiss, Schist, Quartzite, Marble and slate

UNIT – III

Structural Geology: Geological maps – attitude of beds, out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints – their important types and case studies. Fundamental aspects of rock mechanics and environmental geology.

UNIT – IV

Earthquake and Landslides: Earthquake Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence.

Geophysical Investigations Importance of Geophysical Studies: Principles of geophysical study by Gravity methods. Magnetic methods, Electrical resistivity methods. Seismic methods, Radio metric methods and geothermal method.

UNIT – V

Dams, Reservoirs, and Tunnels: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Geological factors influencing water Lightness and life of reservoirs – Purposes of tunneling, Effects of Tunneling on the ground, Role of Geological Considerations (i.e. Lithological, structural and ground water) in tunneling over break and lining in tunnels. Improvement of competence of sites by grouting etc.

TEXT BOOKS:

1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
3. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014
4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications

REFERENCE BOOKS:

1. F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE2203	3	0	0	30	70	100	3
STRUCTURAL ANALYSIS							

COURSE OBJECTIVES:

- To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.
- To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions
- The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement of supports.
- The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads of varying spans rolling loads of Pratt and Warren trusses.

COURSE OUTCOMES:

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

CO1: Distinguish between the determinate and indeterminate structures.

CO2: Identify the behavior of structures due to the expected loads, including the moving loads, acting on the structure.

CO3: Estimate the bending moment and shear forces in beams for different fixity conditions.

CO4: Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy theorems.

CO5: Draw the influence line diagrams for various types of moving loads on beams/bridges.

SYLLABUS:

UNIT – I

Propped Cantilever and Fixed beams

Propped Cantilevers: Introduction -Degree of Static and Kinematic indeterminacy of Beams, frames and trusses. Analysis of propped cantilevers-shear force and bending moment diagrams- Elastic curve - Deflection of propped cantilever beams.

Fixed Beams – Introduction to statically indeterminate beams with U. D. load, central point load, eccentric

point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Elastic curve - Deflection of fixed beams including effect of sinking of support, effect of rotation of a support.

UNIT – II

Analysis of Continuous beams and Portal Frames

Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports. Analysis of Single bay single storey portal frames without sway. Shear force and Bending moment diagrams, Elastic curve.

Moment distribution method: Application to continuous beams with and without settlement of supports. Analysis of Single bay single storey portal frames without sway. Shear force and Bending moment diagrams, Elastic curve.

UNIT III

Analysis of Pin-Jointed Plane Frames: Determination of Forces in members of plane pin-jointed (determinate) perfect trusses by (i) method of joints (ii) method of sections and (iii) Method of Tension coefficients. Analysis of various types of cantilever and simply supported trusses by method of joints, method of sections and Tension coefficients.

UNIT – IV

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

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 sections, single point load, U.D. load longer than the span, U.D. load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

UNIT – V

Matrix Methods of Analysis: Introduction to Flexibility and Stiffness matrix methods of analyses using 'system approach' upto three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods - Analysis of pin-jointed determinate plane frames using flexibility and stiffness methods- Analysis of single bay single storey portal frames using only stiffness method - Shear force and bending moment diagrams - Elastic curve.

TEXT BOOKS:

1. Structural Analysis by R.C. Hibbeler, Pearson, New Delhi.
2. Basic Structural Analysis, K U Muthu et. al., IK International Publishing house pvt. Ltd.

REFERENCE BOOKS:

1. Indeterminate Structural Analysis, K U Muthu et. al., IK International Publishing house pvt. Ltd.
2. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi.
3. Mechanics of Structures Vol – II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt. Ltd.
5. Structural Analysis: A Matrix Approach, G.S.Pandit and S.P.Gupta, Mc Graw Hill Pvt. Ltd.

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE2204	3	0	0	30	70	100	3
STRENGTH OF MATERIALS – II							

COURSE OBJECTIVES:

- To give concepts of Principal stresses and strains developed in cross section of the beams on the cross section and stresses on any inclined plane. To impart concepts of failures in the material considering different theories
- To give concepts of torsion and governing torsion equation, and there by calculate the power transmitted by shafts and springs and design the cross section when subjected to loading using different theories of failures.
- To classify columns and calculation of load carrying capacity and to assess stresses due to axial and lateral loads for different edge conditions and to calculate combined effect of direct and bending stresses on different engineering structures.
- Introduce the concept of unsymmetrical bending in beams Location of neutral axis Deflection of beams under unsymmetrical bending.

COURSE OUTCOMES:

Upon successful completion of this course

CO1: The student will be able to understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes and design the sections.

CO2: The student can assess stresses in different engineering applications like shafts and springs subjected to different loading conditions.

CO3: The student can assess stresses in different engineering applications like columns and struts subjected to different loading conditions.

CO4: The student will be able to understand the direct and bending stresses.

CO5: The student will be able to understand the Unsymmetrical bending and Shear center

SYLLABUS:

UNIT- I

Principal Stresses and Strains and Theories of Failures: Introduction – Stresses on an inclined section

of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr’s circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

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

UNIT – II

Torsion of Circular Shafts and Springs: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\phi/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

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

UNIT – III

Columns and Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler’s theorem for long columns- assumptions- derivation of Euler’s critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler’s critical stress – Limitations of Euler’s theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry’s formula.

UNIT – IV

Direct and Bending Stresses: Stresses under the combined action of direct loading and B.M. Core of a section – 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 axis.

UNIT – V

Unsymmetrical Bending and Shear Centre

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

Shear Centre: Introduction Shear center for symmetrical and unsymmetrical sections (channel, I, T and L sections).

TEXT BOOKS:

1. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, New Delhi
2. Strength of materials by R. K. Bansal, Lakshmi Publications.

REFERENCE BOOKS:

1. Mechanics of Materials- by R. C.Hibbler, Pearson publishers
2. Mechanics of Solids – E P Popov, Prentice Hall.
3. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press.
4. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE2205	3	0	0	30	70	100	3
HYDRAULICS & HYDRAULIC MACHINERY							

COURSE OBJECTIVES:

- To study about uniform and non-uniform flows in open channel and also to learn about the characteristics of hydraulic jump.
- To understand the working principles of various types of hydraulic machines and Pumps.

COURSE OUTCOMES:

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

CO1: Solve uniform open channel flow problems.

CO2: Solve non uniform open channel flow problems.

CO3: Understand about Basics of Turbo machinery.

CO4: Understand the working principles of various hydraulic turbines.

CO5: Understand the working principles of various pumps.

SYLLABUS:

UNIT - I

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

Concept of specific energy; Critical flow; Critical flow in a rectangular channel, critical depth.

UNIT - II

Open Channel Flow-Non Uniform Flow

Gradually Varied Flow: Dynamic equation; Surface Profiles; Computation of surface profiles by single step & multi step methods; Back water Curves and Draw down curves, Control section.

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

UNIT - III

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-Angular momentum principle.

UNIT - IV

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

UNIT – V

Centrifugal-Pumps: Pump installation details-classification-work done- Manometric head-minimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves- NPSH- Cavitation.

Reciprocating Pumps: Introduction, classification, components, working, discharge, indicator diagram, work done and slip.

TEXT BOOKS:

1. Flow in Open Channels, K. Subramanya.
2. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi
3. A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi.

REFERENCE BOOKS:

1. Open Channel Flow by M.Hanif Chaudhary.
2. Fluid Mechanics by A. K Jain, Khanna Publishers.
3. Fluid Mechanics, Hydraulics& Hydraulic Machines by K R Arora, Standard Publishers.

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE22L1	0	0	3	15	35	50	1.5
ENGINEERING GEOLOGY LAB							

COURSE OBJECTIVES:

- Develops the ability to understand the importance of geology in civil engineering
- Develops the ability to identifying the various rock forming group of minerals and rocks and analyze the attitude of rock formations
- Develops the knowledge in interpreting the topographic geological maps

COURSE OUTCOMES:

CO1: Students are able to understand the importance of geology in civil engineering

CO2: Students are familiar with identifying the geological process of the region related to the civil engineering works

CO3: Students are able to evaluate the formation and properties of the minerals, rocks

CO4: Develops the ability to prepare the geological section and maps and interpret the site conditions

LIST OF EXPERIMENTS

1. Megascopic identification of minerals
 - a) Rock forming minerals
 - b) Ore forming minerals
2. Megascopic description and identification of rocks:
 - a) Igneous rocks
 - b) Sedimentary rocks
 - c) Metamorphic rocks
3. Interpretation and drawing of sections for geological maps showing tilted beds,
4. Simple Structural Geology problems- Strike and dip, thickness problems
5. Electrical Resistivity Method (demo)
6. Study of Structural Models

Field work – To identify Minerals, Rocks, and Geomorphology& Structural Geology.

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE22L2	0	0	3	15	35	50	1.5
FLUID MECHANICS AND HYDRAULIC MACHINERY LAB							

COURSE OBJECTIVES:

- To verify theoretical concepts with experimental results of flow measuring devices
- To study the performance of the turbines and pumps.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

CO1: Determine the discharge using various flow measuring devices.

CO2: Compute the minor and major losses in pipes.

CO3: Obtain performance curves of turbines and pumps.

EXPERIMENTS:

1. Verification of Bernoulli's theorem.
2. Venturimeter: Determination of Coefficient of discharge.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Determination of friction factor of Pipes.
6. Determination of loss of head in pipes due to sudden contraction.
7. Determination of Coefficient of discharge for rectangular notch / V – notch.
8. Study of characteristics of hydraulic jump.
9. Measurement of force due to impact of jets on vanes of different types.
10. Performance studies on pelton turbine
11. Performance studies on Francis turbine
12. Efficiency test on centrifugal pump.
13. Efficiency test on reciprocating pump.

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE22L3	0	0	3	15	35	50	1.5
CONCRETE TECHNOLOGY LAB							

COURSE OBJECTIVES:

- To conduct tests to find the quality of concrete making materials like cement fine aggregate and coarse aggregates.
- To determine the fresh and hardened concrete properties.
- To estimate the quality and strength of concrete using non-destructive testing on concrete
- To understand the flow properties of Self Compacting Concrete fibre reinforced concrete.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

CO1: Finding the properties of concrete making materials like cement, fine aggregate and coarse Aggregate for design mix of concrete

CO2: Properties and behavior of concrete in fresh and hardened states

CO3: Using non-destructive testing methods to estimate quality of concrete

CO4: Know the properties of self-compacting concrete and fibre reinforced concrete

EXPERIMENTS:

1. Determination of (a) Normal consistency of cement (b) Fineness of cement using 90 microns IS sieve.
2. Determination of Initial setting and final setting time of cement
3. Determination of (a) Specific gravity of cement (b) soundness of cement.
4. Determination of Fineness modulus of (a) Fine aggregate (b) Coarse aggregate
5. Determination of Bulk density and Specific gravity of (a) fine aggregate (b) coarse aggregates
6. Determination of workability of concrete by conducting Compaction factor / Vee-Bee consistometer test
7. Determination of (a) Cube compressive strength (b) Cylinder compressive strength
8. Determination of modulus of elasticity of concrete by conducting compression test on concrete cylinder
9. Determination of workability of concrete by conducting Slump cone test
10. Determination of Bulking of fine aggregate
11. Non-destructive test on concrete using Rebound Hammer

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE22SC1	0	0	4		50	50	2
ADVANCED SURVEYING							

COURSE OBJECTIVES:

This course will enable students to:

- Apply the basic principles of engineering surveying and measurements
- Follow effectively field procedures required for a professional surveyor
- Use techniques, skills and conventional surveying instruments necessary for engineering practice.

COURSE OUTCOMES:

After a successful completion of the course, the student will be able to:

CO1: Apply the basic principles of engineering surveying and for linear and angular measurements.

CO2: Comprehend effectively field procedures required for a professional surveyor.

CO3: Use techniques, skills and conventional surveying instruments necessary for engineering practice.

EXPERIMENTS:

1. Study of Theodolite in detail-practice for measurement of horizontal and vertical angles.
2. Measurement of horizontal angles by method of Repetition and Reiteration
3. Trigonometric leveling-heights and distance problem
4. Heights and distance using principles of Tachometric surveying
5. Curve setting-different methods
6. Setting out works for buildings & pipe lines
7. Determine of area using Total Station
8. Traversing using Total Station
9. Contouring using Total Station
10. Determination of Remote height using total station
11. Stake out using total station
12. Distance, gradient, difference in height between two inaccessible points using total station.

III BTECH I SEMESTER

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I SEMESTER

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CE3101	Design and Drawing of Concrete Structures	PC	30	70	100	3	0	0	3
2	R20CE3102	Soil Mechanics	PC	30	70	100	3	0	0	3
3	R20CE3103	Highway Engineering	PC	30	70	100	3	0	0	3
Open Elective Course/Job Oriented Elective – I										
4	R20CC1OE01	Disaster Management	OE/JO E	30	70	100	3	0	0	3
	R20CC1OE02	Green Technology								
Professional Elective Course-1										
5	R20CE3104	Advanced Structural Analysis	PE	30	70	100	3	0	0	3
	R20CE3106	Environmental Impact Assessment								
	R20CE3107	Solid Waste and Hazardous Management								
6	R20CE31L1	Soil Mechanics Lab	PC LAB	15	35	50		0	3	1.5
7	R20CE31L2	Highway Engineering Lab	PC LAB	15	35	50		0	3	1.5
8	R20CE31SC3	STAAD.Pro	SAC/S SC	-	50	50	1	0	2	2
9	R20CC31MC01	Professional Ethics & Human Values	MC				2	0	0	0
10	R20CC31IN	Summer INTERNSHIP/ Community Service Project	PROJ	15	35	50	0	0	0	1.5
Total Credits										21.5
HONORS/MINOR COURSE										
11		Honors/Minor	PC	30	70	100	4	0	0	4

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3101	3	0	0	30	70	100	3
DESIGN AND DRAWING OF CONCRETE STRUCTURES							

COURSE OBJECTIVES:

- To impart basic concepts of design of individual components of the reinforced concrete structures using limit state and working stress method.
- To impart concepts of limit state design and serviceability checks for different components of RCC structures using the Indian standard codes with different loading conditions and to sketch the reinforcement details of designed structure.
- To understand the principles of singly reinforced beams and doubly reinforced beams.
- To enable the students to design of Important RCC structures like beams, slabs, and columns and footings.
- For the given loads, impart the students to design according to IS codes.

COURSE OUTCOMES:

Students will be able to

CO1: Understand the fundamental behaviour of RCC structures and code provisions of IS 456:2000 and IS 875.

CO2: Analyse the different types of beams subjected to different loading conditions and understand the variation of moment of resistance (Understanding, Analysing)

CO3: Apply the IS code provisions for design of sections and determining the reinforcement detailing satisfying the given loading conditions (Applying, Analysing)

CO4: Design of slabs, columns and footings for given loading conditions (Designing)

CO5: Drawing the reinforcement detailing of beams, columns and footings and slabs for obtained data in design. (Analysing, drawing)

UNIT-I: INTRODUCTION TO DESIGN METHODS

Working stress method: Introduction- loading standards – Dead, live, wind and earthquake loads, Elastic theory: design constants, modular ratio, neutral axis depth and moment of resistance for balanced, under-reinforced and over-reinforced sections. – Design for bending – analysis and

design of singly reinforced and doubly reinforced beams.

Limit state method: Concepts of limit state design – Characteristic loads – Characteristic strength – Partial load and safety factors – Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

UNIT- II: DESIGN OF BEAMS

Beams: Design of singly and doubly reinforced beams-effective depth-Moment of Resistance-Minimum depth and minimum tension reinforcement- Design examples of simply supported and cantilever beams.

Flanged sections: Analysis of singly and doubly reinforced flanged sections – Design of flanged sections- effective width of flange- Minimum depth and minimum tension reinforcement.

Shear and Torsion: Limit state design of section for Shear and torsion – Concept of Anchorage and development length, Deflection- IS Code provisions.

UNIT-III: DESIGN OF SLABS

Slabs: Introduction to types of slabs- One way slab- two-way slabs- Design examples for one way and two-way slabs – Continuous slab design – Reinforcement detailing.

UNIT-IV: DESIGN OF COLUMNS

Columns: Different types of columns – Design of short and long columns – Columns subjected to axial load – Columns subjected to uni-axial and bi axial bending – IS code provisions– Reinforcement detailing.

UNIT-V: DESIGN OF FOOTINGS

Footings: Different types of footings – Design of isolated footings – Square, rectangular shape footings – Design of footings subjected to axial load and uni axial moment – Reinforcement Detailing.

Note: All designs from Unit II should be in limit state design. Following plates should be prepared by the students.

1. Reinforcement detailing of Rectangular beams, T-beams and L-beams.
2. Reinforcement detailing of columns and isolated footings.
3. Detailing of one-way and two-way slabs.
4. Reinforcement detailing of continuous slabs.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consists of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%

TEXT BOOKS:

1. Limit State Design, A. K. Jain.
2. Limit State Design of Reinforced concrete, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, 2007, Laxmi Publications.

REFERENCE BOOKS:

1. Reinforced concrete design, S.Unnikrishna Pillai & Devdas Menon, 3rd edition, Tata McGraw Hill, New Delhi.
2. N.C. Sinha and S.K Roy, “*Fundamentals of Reinforced Concrete*”, 4th Edition, S. Chand publishers, 2002
3. N. Krishna Raju and R.N. Pranesh, “*Reinforced Concrete Design*”, 8th Edition, New age International Publishers, New Delhi, 2004.
4. Fundamentals of Reinforced concrete design, M.L. Gambhir, 3rd edition, Printice Hall of India Private Ltd.
5. IS Codes: IS 456:2000, IS 875(Part I & II)

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3102	3	0	0	30	70	100	3
SOIL MECHANICS							

COURSE OBJECTIVES:

- To enable the student to determine the index properties of the soil and classify it.
- To impart the concept of seepage of water through soils and determine the discharge of water through soils.
- To impart the principles of compaction and consolidation of soils and determine the magnitude and the rate of consolidation settlement.
- To enable the student to understand the concept of shear strength of soils, determine the shear parameters of sands and clays and the areas of their application.

COURSE OUTCOMES:

Students will be able to

CO1: Classify -soil and their engineering properties (Understanding)

CO2: Explain-the importance of permeability, seepage and its effects (Understanding, Applying)

CO3: Calculate -the stresses in soils under external loads (Analysing, Evaluating)

CO4: Analysis- settlement behaviour of soils under compaction and consolidation (Analysing, Evaluating)

CO5: Explain- the failure mechanism under the influence of different loading and drainage conditions (Understanding)

UNIT-I

INTRODUCTION AND INDEX PROPERTIES OF SOILS

Soil formation– Soil structure and clay mineralogy, Adsorbed water, Mass- Volume relationships – Relative density. Grain size analysis– Sieve and Hydrometer methods – Consistency limits and indices– IS Classification of soils.

UNIT– II

PERMEABILITY

Soil water – Capillary rise – Flow of water through soils – Darcy's Law- Permeability – Factors

affecting permeability, Capillary phenomenon in soils – Laboratory determination of coefficient of permeability – Permeability of layered systems. Total, neutral and effective stresses – Quick sand condition

UNIT-III

STRESS DISTRIBUTION IN SOILS

Boussinesq's and Westergaard's theories for point loads and areas of different shapes – Newmark's influence chart.

SEEPAGE THROUGH SOILS

Seepage through soils –Flow nets: Construction, Characteristics and Uses.

UNIT-IV

CONSOLIDATION

Stress history of clay; Compressibility of soils, Terzaghi's one dimensional consolidation theory, Consolidation test, pre-consolidation pressure, $e - p$ and $e - \log p$ curves, total settlement.

UNIT-V

COMPACTION

Mechanism of compaction – Factors affecting compaction– Effects of compaction on soil properties – Field compaction Equipment –compaction control.

TEXT BOOKS:

1. Arora. K.R., –Soil Mechanics and Foundation Engineering, 5th Edition, Standard Publishers and Distributors, 2001.
2. Gopal Ranjan, Rao A.S.R., —Basic and Applied Soil Mechanics, 2nd Edition, New Age Intl. (P) Ltd., 2005.

REFERENCES BOOKS:

1. Das. B.M., —Principles of Geotechnical Engineering, 7th Edition, Cengage Learning, 2010.
2. Murthy V. N. S., —Textbook of Soil Mechanics and Foundation Engineering, 1st Edition, CBS Publishers, 2018.
3. Venkataramiah. C., —Geotechnical Engineering, 3rd Edition. New Age International Pvt. Ltd, 2008.

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3103	3	0	0	30	70	100	3
HIGHWAY ENGINEERING							

COURSE OBJECTIVES:

- To emphasize on highway development planning and various surveys to be conducted.
- To understand material properties and performances and limits of various tests
- Introduction to the design concepts, vehicle loading criteria and to demonstrate how they are combined to design and construct road pavements.
- To understand the principles of geometric design, both vertical and horizontal
- Emphasize on various traffic control operations and regulations

COURSE OUTCOMES:

CO 1: Plan road network by linking of various surveys and to evaluate and develop master plans for a better road network

CO 2: Select appropriate materials for use in different road layers for different types of pavements.

CO 3: Perform road pavement design and analysis by various IRC and other methods

CO 4: Interpret geometric design fundamentals, in relation to safety and driver comfort, focusing on horizontal and vertical alignment

CO 5: Ability to develop traffic signals and help to properly regulate the traffic and better use of road network.

UNIT I

Highway Development and Planning: Brief Introduction; necessity of highway planning surveys preparation of master plan highway planning in India.

Highway alignment: Factors controlling alignment; Engineering surveys, Drawing & report.

UNIT II

Highway Geometric Design: Highway cross section elements; Sight distance; Design of horizontal alignment; Design of vertical alignment.

Highway materials: Sub grade soils- CBR tests; Stone aggregates; Bitumen materials; Pavingmixes.

UNIT III



Traffic engineering: Introduction; Traffic characteristics- Road user, vehicular & travel pattern; Traffic operation- signal design; Types of inter-sections; Design of rotary intersection

UNIT V

Design of Highway Pavements: Design factors; Design of flexible pavements - IRC method, IRC recommendations; Design of Rigid pavements -Westergaard's stress equation for wheel loads and temperatures stress; IRC recommendations.

UNIT IV

Highway construction and maintenance: Construction of water bound macadam roads; bituminous pavements and cement concrete pavements; Construction of joints in cement concrete pavements; Maintenance of highways- Water bound macadam roads, bituminous pavements, Cement concrete pavements

UNIT V

Highway Drainage: Importance of highway drainage; Requirements; Surface drainage; Sub-surface drainage; Road construction in water logged areas and black cotton soils.

TEXT BOOKS:

1. Highway Engineering by S. K. Khanna & C. E. G. Justo; Nemchand & Brothers, Roorkee, 2011

REFERENCE BOOKS:

1. Principles of Transportation Engineering by Partha Chakroborty & Animesh Das, PHI Learning, 2009
2. Principles of Transportation Engineering and highway engineering by G. Venkatappa Rao, Tata McGraw-Hill, 1995

WEB RESOURCES:

1. <http://nptel.iitm.ac.in/syllabus/syllabus.php?subjectId=105101087>
2. www.irc.org.in (for various journals and manuals and code provisions)
3. www.springerlink.com (for various e journals)

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3104	3	0	0	30	70	100	3
ADVANCED STRUCTURAL ANALYSIS							

COURSE OBJECTIVES:

The objective of this course:

- Estimate the deflection of simple beams using Strain – Energy method (Castigliano's theorem)
- Enable students to analyze beams and frames by Moment Distribution and Kani's Method.
- Equip student with concepts of Arches
- Equip student with quick and approximate analysis of building frames for gravity and lateral
- Familiarize Cables and Suspension Bridges

COURSE OUTCOMES:

At the end of this course; the student will be able to

CO 1: Analyze structures using various methods - Energy theorems, Moment Distribution method.

CO 2: Analyze continuous beams and portal frames using Kani's Method.

CO 3: Analyze Two Hinged and Three Hinged Arches.

CO 4: Apply approximate methods and determine the structural response of building frames subjected to gravity loads and lateral loads respectively.

CO 5: Analyze Cable and Suspension Bridge structures

SYLLABUS:

UNIT – I

ENERGY THEOREMS: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem- Deflections of simple beams.

MOMENT DISTRIBUTION METHOD: Degrees of freedom, Member flexural stiffness and carry over factors, Distribution factors, Analysis of Portal frames with Sway. Shear force and bending moment diagrams - Elastic curve.

UNIT II

KANI'S METHOD: Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway. Shear force and bending moment diagrams - Elastic curve.

UNIT III

TWO HINGED ARCHES: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Tied arches – Fixed arches – (No analytical question).

THREE HINGED ARCHES: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels.

UNIT-IV

GRAVITY LOAD ANALYSIS USING APPROXIMATE METHODS: Analysis of continuous beams and portal frames using Inflection Points, Analysis of building frames using Substitute Frame Method

LATERAL LOAD ANALYSIS USING APPROXIMATE METHODS: Application to building frames. (i) Portal Method (ii) Cantilever Method.

UNIT – V

CABLE STRUCTURES AND SUSPENSION BRIDGES: Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

TEXT BOOKS

1. C.S. Reddy, Basic Structural Analysis, Tata McGraw-Hill
2. T. S. Thandavamoorthy, Structural Analysis, Oxford University Press (India)
3. S. S. Bhavikatti, Structural Analysis – Vol I & II, Vikas Publications
4. K. U. Muthu et al., Structural Analysis – Vol I & II, IK International
5. V. K. M. Selvam, Fundamentals of Limit Analysis of Structures, Dhanpat Rai Publications

REFERENCES

1. Structural Analysis-II, IIT Kharagpur – NPTEL (web course)
<https://nptel.ac.in/courses/105/105/105105109/#>
2. Devdas Menon, Structural Analysis, Narosa Publishers
3. Comprehensive Structural Analysis-Vol. I & 2, R. Vaidyanathan & P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi
4. Structural Analysis, R.C. Hibbeler, Pearson Education, India
5. G. S. Pandit and Gupta, Matrix Analysis of Structures, Tata McGraw-Hill

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3106	3	0	0	30	70	100	3
ENVIRONMENTAL IMPACT ASSESSMENT							

COURSE OBJECTIVES:

The objective of this course is:

- To impart knowledge on different concepts of Environmental Impact Assessment
- To know procedures of risk assessment
- To learn the EIA methodologies and the criterion for selection of EIA methods
- To know pre-requisites for ISO 14001 certification
- To know the procedures for environmental clearances and audit
- To appreciate the importance of stakeholder participation in EIA

COURSE OUTCOMES

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

CO 1: Prepare EMP, EIS and EIA report, estimate cost benefit ratio of a project

CO 2: Selection of an appropriate EIA methodology

CO 3: Evaluation of impacts on environment

CO 4: Evaluation of risk assessment

CO 5: Know the latest acts and guidelines of MoEF & CC

SYLLABUS:

UNIT-I: Basic concepts of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination- life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA, Environmental economics, Cost/benefit Analysis - EIS and EMP. Identification of activities-application of remote sensing and GIS for EIA.

UNIT-II: EIA Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods.

Impact of Developmental Activities and Land use: Introduction and Methodology for the

assessment of soil and ground water, Delineation of study area.

UNIT-III Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - EIA with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, generalized approach for assessment of Air pollution Impact.

UNIT-IV: Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation. Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment- Advantages of Environmental Risk Assessment

UNIT-V EIA: MoEF&CC Acts, Notifications and Guidelines: Provisions in the EIA notification, procedure for environmental clearance, and procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO14000. Environmental compliance reports. Case studies and preparation of EIA statement for various Industries.

TEXT BOOKS:

- 1.Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
- 2.Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

REFERENCE BOOKS:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. Katania& Sons Publication. New Delhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3107	3	0	0	30	70	100	3
SOLID WASTE AND HAZARDOUS MANAGEMENT							

COURSE OBJECTIVES:

- To impart knowledge on functional elements of solid waste management and their inter relationship
- To know the impact of solid waste on environment and human health
- To acquire knowledge on storage, transfer and transport of solid waste and route optimization
- To learn about various methods of processing disposal of solid waste
- To study the characteristics of hazardous waste
- To learn methods of treatment and disposal of bio-medical wastes and radioactive wastes

COURSE OUTCOMES:

After successful completion of the course, the students are able to

CO 1: Correlate various functions elements of solid waste management

CO 2: Suggest effective methods for on-site storage, processing, collection and transport of solid waste

CO 3: to plant methods for recovery, reuse and treatment of solid waste

CO 4: locate a suitable site and design sanitary land fill

CO 5: Visualize the impacts of hazardous wastes and plan proper methods for collection, treatment and disposal of bio-medical wastes and radioactive wastes

SYLLABUS

UNIT I: Introduction, sources and types Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics of solid waste, Effects of improper disposal of solid wastes-Public health and environmental effects-need for integrated solid waste management, Functional elements of solid waste management and their inter relationship, on-site storage, handling and processing of solid waste

UNIT II: Collection of solid waste Types and methods of waste collection systems, factors affecting collection, analysis of collection systems, optimization of collection routes.

Transfer and Transport Need for transfer operation, compaction of solid waste, transport means and methods, transfer stations types and design requirements, Separation and Transformation of solid

waste Unit operations used for separation and transformation:

UNIT III

Shredding – material separation and recovery, source reduction and waste minimization Processing and treatment: Processing of solid waste viz., combustion and composting, anaerobic treatment for energy and material recovery, incineration and pyrolysis. **UNIT IV**

Disposal of solid waste, Sanitary landfill methods of operation, advantages and disadvantages of sanitary land fill, site selection, reactions accruing in completed landfills, gas and leach ate movement and control

UNIT V

Fundamentals of Hazardous Waste Management Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects Biomedical waste Biomedical wastes and their impacts on health and environment, Collection and transport, treatment and disposal Radioactive wastes Radioactive wastes and their impact on health and environment, sources, classification and disposal

TEXT BOOKS:

1. Vesilind, P.A., Worrell, W., Reinhart, D. “Solid Waste Engineering”, Cenage learning, New Delhi, 2004
2. Solid and Hazardous Waste Management by M.N. Rao and Razia Sultana, BS Publications, Hyderabad

REFERENCE BOOKS:

1. George Tchobanoglous “Integrated Solid Waste Management”, McGraw Hill Publication, 1993
2. Environmental Engineering by Peavy, Rowe and Tchobanoglous, Tata McGraw Hill Publication

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE31L1		0	3	15	35	50	1.5
SOIL MECHANICS LAB							

COURSE OBJECTIVES:

- To calculate the physical and mechanical properties of soils and to identify their suitability for construction.
- To conduct various field tests on soils for getting the accurate results and avoid approximately.

COURSE OUTCOMES:

After performing the experiments listed in the syllabus- the students will have skills:

CO 1: To determine basic soil properties and classify the soil for Engineering application

CO 2: To investigate the engineering properties of the soil such as Strength- Compressibility and permeability and apply the same to the engineering problems.

LIST OF EXPERIMENTS:

1. Specific gravity of solids
2. Atterberg's Limits
3. Field density:
 - (a) Core cutter
 - (b) Sand replacement method
4. Grain size analysis
5. Permeability of soil - Constant and variable head test
6. Compaction test
7. CBR Test
8. Unconfined compression test
9. Tri-axial Compression test
10. Direct shear test.
11. Vane shear test.
12. Free swell test

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE31L2		0	3	15	35	50	1.5
HIGHWAY ENGINEERING LAB							

COURSE OBJECTIVES

The objective of this course is:

- To carry out surveys for traffic volume- speed and parking.
- To test crushing value- impact resistance- specific gravity and water absorption- percentage attrition- percentage abrasion- flakiness index and elongation index for the given road aggregates.
- To know penetration value- ductility value- softening point- flash and fire point- viscosity and stripping for the given bitumen grade.
- To test the stability for the given bitumen mix.

COURSE OUTCOMES:

CO 1: Conduct traffic studies for estimating traffic flow characteristics

CO 2: Perform quality control tests on pavement materials

CO 3: Estimate earth work from longitudinal and cross-section details

I. EARTHWORK CALCULATIONS FOR ROAD WORKS.

II. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.
2. Traffic Volume Studies (Turning Movements) at intersection.
3. Spot speed studies.
4. Parking study.

III. ROAD AGGREGATES:

1. Specific Gravity and Water Absorption
2. Aggregate Crushing value
3. Aggregate Impact Test.
5. Abrasion Test.
6. Shape tests.

IV. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.

V. BITUMINOUS MIX:

1. Marshall Stability test.

REFERENCES:

1. Mc Shane- WR and RP Roess- Traffic Engineering- Prentice Hall.
2. Pignataro LJ. Traffic Engineering: Theory and Practice; Prentice hall- Inc.
3. L.R. Kadiyali- Traffic Engineering and Transportation Planning- Khanna Publishers.
4. All laboratory tests are as per IS- ASTM- AASHTO- TRL- IRC- BS procedures / specifications and guidelines

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE31SC3	1	0	2		50	50	2
STAAD.Pro							

COURSE OBJECTIVES:

- To carry out Analysis of beams.
- To carry out Analysis of frames.
- To carryout Analysis of Trusses.

COURSE OUTCOMES:

At the end of course the student will be able to

CO 1: Analyse the beams

CO 2: Deisgn space frame.

CO 3: Deisgn of two-storied R.C.C frame building.

UNIT – I

1. Analysis of beams.
2. Analysis of Frames.
3. Analysis of Trusses.

UNIT - II

1. Design of Space frame subjected to gravity loads and lateral load (wind load)
2. Design of Isolated footing.
3. Design of one-way slab.
4. Design of two way slab
5. Design of Retaining wall.

UNIT -III

1. Analysis and design of two-storied R.C.C.Framed building.
2. Analysis and design of Industrial steel framed building.

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CC31MC01	2	0	0				
PROFESSIONAL ETHICS AND HUMAN VALUES							

COURSE OBJECTIVES:

- Learn about morals, values & work ethics. Learn to respect others and develop civic virtue. Develop commitment and learn how to live peacefully.
- Learn about the different professional roles to be played by Engineer.
- Provide depth knowledge on Principles of Harmony and How emotional competencies helps them to accomplish goals, meet challenges, and engage effectively in social groups and environments.
- Develop knowledge about Professional and Individual Rights. Create awareness on Collective Bargaining and Industrial Espionage.
- Create awareness about safety, risk & risk benefit analysis. Engineer's design practices for providing safety. Provide knowledge on intellectual property rights.

COURSE OUTCOMES: Student is able to

CO1: Interpret the fundamentals of Human values. [K2]

CO2: Analyse the ethical issues and role of engineers in industry. [K4]

CO3: Develop the principles of harmony in value education. [K3]

CO4: List out the duties and rights of engineers. [K4]

CO5: Summarise the engineer's responsibilities towards safety and risk. [K2]

Unit-I

Human Values: Ethics, Morals, Values, Integrity, Work Ethics- Service Learning – Civic Virtue- Respect for Others- Living Peacefully- Caring- Sharing- Honesty- Courage- Value Time- Cooperation- Commitment – Empathy- Self-Confidence- Spirituality- Character.

Unit-II

Engineering Ethics: Professional Roles to Be Played By Engineer- Engineers Role As Managers, Consultants And Leaders- Ethical Theories and Its Uses.

Unit- III

Principles for Harmony:

Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights –

Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias – Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

Unit-IV

Engineers’ Duties and Rights: Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality –Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights –Confidential and Proprietary Information - Conflict of Interest-Ethical egoism – Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes-Industrial Espionage- Price Fixing-Whistle Blowing.

Unit-V

Engineers’ Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/s Involuntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects – Threshold Levels of Risk - Delayed v/s Immediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis- Accidents.

TEXT BOOKS

1. “Professional Ethics and Morals by Prof. A.R.Arasri, Dharanikota Suyodhana- Maruthi Publications.
2. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
3. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill –2003.

REFERENCES:

1. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill –2003.
3. Engineering Ethics by Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
4. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
5. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd – 2009.
6. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
7. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill - 2013
8. Human Values and Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand Publications.

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CC31IN	0	0	0	15	35	50	1.5
SUMMER INTERNSHIP/COMMUNITY SERVICE PROJECT							

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II SEMESTER

S.N O	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CE3201	Design and Drawing Of Steel Structures	PC	30	70	100	3	0	0	3
2	R20CE3202	Environmental Engineering	PC	30	70	100	3	0	0	3
3	R20CE3203	Hydrology & Irrigation Engineering	PC	30	70	100	3	0	0	3
Open Elective Course/Job Oriented Elective – II										
4	R20CC2OE01	Remote Sensing And GIS	OE/JOE	30	70	100	2	0	2	3
	R20CC2OE02	Traffic Safety								
Professional Elective Course-II										
5	R20CE3204	Foundation Engineering	PE	30	70	100	3	0	0	3
	R20CE3205	Bridge Engineering								
	R20CE3206	Urban Transportation Planning								
6	R20CE32L1	Environmental Engineering Lab	PC LAB	15	35	50		0	3	1.5
7	R20CE32L2	GIS Lab	PC LAB	15	35	50		0	3	1.5
8	R20CE32L3	Civil Engineering Drawing	PC LAB	15	35	50		0	3	1.5
9	R20CC32SC1	English for Employability Skills	SAC/SS C		50	50	1	0	2	2
10	R20CC32M C1	Essence of Indian Traditional Knowledge	MC				2	0	0	0
Total Credits										21.5
HONORS/MINOR COURSE										
11		Honors/Minor	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3201	3	0	0	30	70	100	3
DESIGN AND DRAWING OF STEEL STRUCTURES							

COURSE OBJECTIVES:

The objective of this course is to:

- Familiarize Students with different types of Connections and relevant IS codes
- Equip student with concepts of design of flexural members
- Understand Design of tension and compression members
- Familiarize students with types of Columns, column bases and their Design
- Familiarize students with Design of Gantry Girder and Roof Trusses

COURSE OUTCOMES:

CO1: Analyze and design welded and bolted connections

CO2: Design Tension members, simple and Built-up compression members

CO3: Design Laterally-Supported and Laterally-Unsupported Beams

CO4: Design Beam-Columns, Column Splices and Bases

CO5: Analyze, Design and Detail Gantry girder and Roof Trusses

UNIT – I

Introduction: Types of steel structures and components; Hot rolled structural steel; Grades of structural steel and Mechanical properties of steel; Loads and Load combinations; Concepts of limit State Design – Limit State of Collapse and Limit State of Serviceability; Plate / local buckling, Concept of Plasticity; Advantages and disadvantages of steel structures

Simple Connections: Behavior of bolted connections; failures & Limit States of Strength; Design provisions for bolts as per IS 800:2007; Design of plate – plate bolted connections subjected to axial load; Introduction to welding – Types of welds & welded joints; weld defects; Design provisions for welding as per IS 800:2007; Design of welded plate – plate connections subjected to axial load; Advantages and disadvantages of bolted and welded connections.

Eccentric (Bracket) Connections: Bolted connection: Moment in-plane and perpendicular to plane of joint; Welded connection: Moment in-plane and perpendicular to plane of joint

UNIT – II

Tension Members: Net area; shear-lag; failure modes and limit states of strength - yielding, rupture

and block Shear; Design provisions as per IS 800:2007; Design of Tension Members **Compression Members:** Behavior of short, long and Intermediate members under axial compression - Effective length and Slenderness ratio; Types of Buckling; Limit states of strength and Design provisions as per IS 800:2007; Design of Struts and Simple Columns. Design of laced and battened built-up compression members.

UNIT –III

Design of Beams: Behavior of Laterally Supported Beams and Laterally Un-Supported Beams- Lateral – Torsional Buckling and Elastic Critical Moment; Classification of beams and failure modes; Shear behavior; Design provisions as per IS 800: 2007; Web-Crippling; Web Buckling; Deflection limits; Design of Laterally Supported and Un-Supported Beams; Design of Simple Beam to Column Web-Angle connection

UNIT – IV

Design of Beam-Columns: Behavior of beam-columns; P-delta effects; Equivalent moment factor; Failure modes; Limit states of strength and Design provisions as per IS 800:2007; Design of beam-column subjected to axial compression and bi-axial bending

Design of Column Splices and Bases: Design of column splices; Design of slab base and gusseted base

UNIT – V

Design of Gantry Girder: EOT cranes; Vertical, lateral and longitudinal loads; Impact factors, Design of Gantry girders.

Roof Trusses: Different types of trusses, Design loads – Dead, Live and Wind loads, Load combinations as per IS Codes, Design of simple Tubular roof trusses – purlin – rafter and joints.

NOTE: Welded connections should be used in Units III – V.

The students should prepare the following plates.

Plate 1 Detailing of Welded Lap Joint

Plate 2 Detailing of Beams

Plate 3 Detailing of Built-up Column including lacing and battens,

Plate 4 Detailing of Column bases – slab base and gusseted base

Plate 5 Detailing of steel roof trusses including joint details

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consists of two questions in

Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part-B is 60%.

TEXT BOOKS

1. K. S. Sai Ram, Design of Steel Structures, Pearson Education (India), 2020
2. N. Subramanian, Design of Steel Structures, Oxford University Press (India), 2015

REFERENCES / FURTHER READING

1. S. K. Duggal, Limit State Design of steel structures, Tata McGraw-Hill, New Delhi, 2019
2. M. L. Gambhir, Fundamentals of Structural Steel Design, Tata McGraw-Hill, 2013
3. L. J. Morris and D.R. Plum, Structural Steel Work Design to BS 5950, Prentice-Hall, 1996
4. D. Lam et al., Structural Steelwork: Design to Limit State Theory (BS 5950), CRC press, 2004
5. D. Lam et al., Structural Steelwork: Design to Limit State Theory (EC3), CRC press, 2014
6. A. S. Arya and J. L. Ajmani, Design of Steel Structures (*working stress method*), Nem chand publishers, 2001

IS Codes:

1. IS 800:2007, Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi.
2. IS – 875 Parts I- III, Code of practice for design loads (other than earth quake) for buildings and Structures (Part-1-Part 5), Bureau of Indian standards.
3. Steel Tables

These codes and steel tables are permitted for use in the examinations.

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3202	3	0	0	30	70	100	3
ENVIRONMENTAL ENGINEERING							

COURSE OBJECTIVES:

- Outline planning and the design of water supply systems for a community/ town/ city.
- To impart the knowledge of selecting sources of water with reference to quality and quantity in a locality, for domestic usage.
- Provide knowledge of characterization of water and wastewater.
- To introduce various treatment options available and their design principles for water treatment and wastewater treatment at the household and municipal level.
- To elucidate the various collection and disposal options available for water and wastewater, including the distribution networks, layout, construction and maintenance.

COURSE OUTCOMES:

The students will be able to

CO 1: Assess the quality and quantity of water requirements for a city

CO 2: Design of different treatment units and distribution systems for water supply

CO 3: Analyze the characteristics, collection, conveyance and disposal of wastewater

CO 4: Design of sewers and various units in a wastewater treatment plant

CO 5: Design of secondary and biological treatment units

UNIT-I: WATER DEMANDS- STANDARDS -SOURCES

Aspects of Environmental Engineering – Protected water supply – Need – Water borne diseases – Water demands – Fluctuations – Design period-Population forecast – Water quality – Drinking water standards- Testing and significance – Quality and Quantity and other considerations of surface and sub- surface sources – Yield calculations – Intake works –Types of Intakes – Storage reservoir capacity – Systems of water supply – Requirements – Detection of leakages – Selection of pump – Economical diameter of pumping main.

UNIT- II: TREATMENT OF WATER AND DISTRIBUTION

Water treatment, conventional treatment flow diagram –Sedimentation types – Principles – Design factors – Coagulation –Design of Clariflocculator – Filtration – Slow, Rapid gravity filters and Pressure filters – Design principles-Disinfection – Theory of Chlorination– Distribution systems–

Layouts – Design- and analysis, Hardy Cross method and Equivalent Pipe method. Valves – Other appurtenances.

UNIT-III: WASTEWATER MANAGEMENT

Introduction: Waste water treatment system – Definitions of terms – Collection and conveyance of sewage – Sewage flow rates – Storm water – Characteristics of sewage– Cycles of decay – BOD – COD – Ultimate disposal of sewage–self-purification of rivers– sewage farming.

UNIT-IV: DESIGN OF SEWERS AND PRIMARY TREATMENT

Layouts – Design of sewers – Sewers appurtenances – Sewage pumping -Conventional sewage treatment – Primary treatment: - Screens – Grit chamber – Sedimentation tanks – Design principles. Septic tanks and Imhoff tanks - rural latrines – House plumbing – Appurtenances.

UNIT-V: SECONDARY BIOLOGICAL TREATMENT 14 HOURS

Secondary treatment – Biological treatment – Trickling filters – Activated Sludge Process – Low cost waste treatment methods – Design of Oxidation ponds – Aerobic and Anaerobic lagoons. Sludge Digestion– Disposal.

TEXT BOOKS:

1. B.C. Punmia B C, A.K. Jain and A.K. Jain, —Water Supply Engineering, Laxmi Publications. 2nd Edition 1995, Reprint 2005.
2. B.C. Punmia, A.K. Jain and A.K. Jain, —Wastewater Engineering, Laxmi Publications, 2nd Edition 1998, Reprint 2014.

REFERENCE BOOKS:

1. S.K. Garg, —Water Supply Engineering, Khanna Publishers, 26th revised Edition, New Delhi. 2010.
2. S.K. Garg, —Sewage disposal and Air Pollution Engineering, Khanna Publishers New Delhi. 36th Edition, 2017.
3. H.S. Peavy, D. Rowe, and G. Tchobanoglous, —Environmental Engineering, McGraw Hill Publishers, New Delhi. 1985.
4. G.S. Birdie and J.S. Birdie, —Water Supply and Sanitary Engineering, Dhanpat Rai Publishing Company New Delhi, 6th Edition, 2002.
5. K.N. Duggal, —Elements of Environmental Engineering, S.Chand & Company Limited, New Delhi, 2007.
6. P. N. Modi, —Sewage Treatment Disposal & Wastewater Engineering, Standard Book House,

2016.

7. Manual on sewerage and sewage treatment, CPHEEO, Ministry of urban affairs and employment, Govt. of India, New Delhi, 2001
8. Water and Wastewater Engineering, NPTEL video lectures and web notes

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3203	3	0	0	30	70	100	3
HYDROLOGY & IRRIGATION ENGINEERING							

COURSE OBJECTIVES:

The course is designed to

- Understand the hydrologic cycle and its relevance to Civil engineering
- make the students understand physical processes in hydrology and, components of the hydrologic cycle
- Learn measurement and estimation of the components hydrologic cycle.
- provide an overview and understanding of Unit Hydrograph theory and its analysis
- appreciate the concepts of groundwater movement and well hydraulics
- able to understand the Irrigation concepts.

COURSE OUTCOMES

At the end of the course the students are expected to

CO1: Understanding about Hydrologic cycle and Precipitation

CO2: Understand the concepts of Abstractions of Precipitation i.e., Evaporation, Infiltration, Evapotranspiration.

CO3: To know the concepts of Runoff and to know about Hydrograph concept and to develop Hydrographs.

CO4: To understand about Groundwater flow conditions.

CO5: To understand about Irrigation Engineering.

UNIT I

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

Precipitation: Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

UNIT-II Abstractions from Precipitation: Initial abstractions.

Evaporation: factors affecting, measurement, reduction

Evapotranspiration: factors affecting, measurement, control

Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

UNIT-III Runoff: Catchment characteristics, Factors affecting runoff, components, computation-empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

Hydrograph analysis: Components of hydrograph, separation of base flow, effective rainfall hydrograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

UNIT-IV Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation-steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

UNIT-V Introduction to Irrigation: Definition; Necessity; Scope of irrigation science; Benefits of irrigation; Ill-effects of irrigation; Types of irrigation.

Methods of Irrigation: Methods of applying water to crops; Uncontrolled or wild flooding; Free flooding; Contour laterals; Border strip method; Check flooding; Basin flooding; Zigzag method; Furrow method; Contour Farming; Subsurface irrigation; Sprinkler irrigation; Drip irrigation.

Water Requirement of Crops: Functions of irrigation water; Classes and availability of soil water; Saturation capacity; Field capacity; Wilting point; Available moisture and readily available moisture; Moisture equivalent; Soil – moisture deficiency; Limiting soil moisture conditions; Depth and frequency of irrigation; Duty and Delta; Base period; Relation between Duty and Delta; Factors affecting duty; Methods of improving duty; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; Consumptive use of water ; Irrigation efficiencies – Water conveyance efficiency, Water application efficiency, Water distribution efficiency and Consumptive use efficiency; Determination of irrigation requirements of crops; crop rotation, Assessment of Irrigation water.

TEXT BOOKS:

- 1.Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), NewDelhi
- 2.Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and

Arun Kumar Jain, Lakshmi Publications (P)Ltd.

3.Sharma , S.K (2016) “ Irrigation Engineering”, S.chand publisher New Delhi.

REFERENCES BOOKS:

1.Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education PvtLtd, (2013),New Delhi.

2.Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers. 3.Chow ,
V.T.Maidment,D.K and Mays L.W(2011).

3.“Applied hydrology”,Tata McGraw Hills Education Pvt ltd, New Delhi.

4.Mays L.W, Wiley India Pvt. Ltd,(2013). “Water Resources Engineering” Wiley India Pvt.Ltd.

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3204	3	0	0	30	70	100	3
FOUNDATION ENGINEERING							

COURSE OBJECTIVES:

The objective of this course is:

- To impart to the student knowledge of types of shallow foundations and theories required for the determination of their bearing capacity.
- To enable the student to compute immediate and consolidation settlements of shallow foundations.
- To impart the principles of important field tests such as SPT and Plate bearing test.
- To enable the student to imbibe the concepts of pile foundations and determine their load carrying capacity.

COURSE OUTCOMES:

Upon the successful completion of this course:

CO 1: The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics.

CO 2: The student must be able to compute the magnitude of foundation settlement and decide on the size of the foundation accordingly.

CO 3: The student must be able to use the field test data and arrive at the bearing capacity.

CO 4: The student must be able to apply the principles of bearing capacity of piles and design them accordingly.

UNIT – I

Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Pressure meter – planning of Programme and preparation of soil investigation report.

UNIT – II

Earth And Earth-Retaining Structures: Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices – Taylor’s Stability Number-Stability of slopes of dams and embankments - different conditions.

Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils.

UNIT-III

Shallow Foundations – Bearing Capacity Criteria: Types of foundations and factors to be considered in their location - Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory - IS Methods.

UNIT-IV

Shallow Foundations – Settlement Criteria: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures.

UNIT -V

Deep Foundations:

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

Well Foundations: Types – Different shapes of well – Types of cussions – Components of well - functions – forces acting on well foundations - Design Criteria – Determination of steining thickness and plug - construction and Sinking of wells – Tilt and shift.

TEXT BOOKS:

1. 'Principles of Foundation Engineering' by Das, B.M., - (2011) –6th edition (Indian edition) Cengage learning
2. 'Basic and Applied Soil Mechanics' by Gopal Ranjan& ASR Rao, New Age International Pvt. Ltd, (2004).Soil mechanics & foundation engineering by Arora

REFERENC BOOKS:

1. 'Foundation Analysis and Design' by Bowles, J.E., (1988) – 4th Edition, McGraw-Hill Publishing Company, Newyork.
2. 'Theory and Practice of Foundation Design' by N.N.SOM & S.C.DAS PHI Learning Private limited.

COURSE OBJECTIVES:

The objective of this course is:

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3205	3	0	0	30	70	100	3
BRIDGE ENGINEERING							

- Familiarize Students with different types of Bridges and IRC standards
- Equip student with concepts and design of Slab Bridges, T Beam Bridges
- Understand concepts of design of Plate Girder Bridges
- Familiarize with different methods of inspection of bridges and maintenance

Course Outcomes:

At the end of this course the student will be able to

CO 1: Explain different types of Bridges with diagrams and Loading standards

CO 2: Carryout analysis and design of Slab bridges, T Beam bridges and suggest structural detailing

CO 3: Carryout analysis and design of Plate girder bridges

CO 4: Organize for attending inspections and maintenance of bridges and prepare reports.

SYLLABUS:

UNIT-I Introduction- Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, Prestressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading

UNIT-II Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon's – Massonet Method – Hendry- Jaegar Methods- Courbon's theory- Pigeaud's method

UNIT-III T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondary beams- Reinforcement detailing

UNIT-IV Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing

UNIT-V Sub Structure-Abutments-Stability analysis of abutments-piers-loads on piers- Analysis of piers-Wing walls-Design problems.

TEXT BOOKS

1. Essentials of Bridge Engineering, Jhonson VictorD
2. Design of Bridge Structures, T. R. Jagadeesh, M.A. Jayaram, PHI

3. Design of Bridges, N. Krishna Raju, Tata McGraw Hill

REFERENCES BOOKS:

1. Design of Concrete Bridges, Aswini, Vazirani, Ratwani
2. Design of Steel Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications
3. Design of R C Structures, B. C. Punmai, Jain & Jain, Lakshmi Publication

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE3206	3	0	0	30	70	100	3
URBAN TRANSPORTATION PLANNING							

COURSE OBJECTIVES:

The objective of this course is:

- To appreciate urban transportation problems and procedures for travel demand estimation
- To appreciate data collection techniques for OD data.
- To estimate trip generation, trip distribution, mode choice and traffic assignment.
- To develop alternative urban transport network plans.

COURSE OUTCOMES:

At the end of course, Student will be able to

CO 1: Estimate travel demand for an urban area

CO 2: Plan the transportation network for a city

CO 3: Identify the corridor and plan for providing good transportation facilities.

CO 4: Evaluate various alternative transportation proposals

SYLLABUS:

UNIT -I

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT -II

Data Collection And Inventories: Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT -III

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip

Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT -IV

Mode Choice Analysis: Mode Choice Behavior, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation.

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

UNIT -V

Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis, Environmental and Energy Analysis; Case studies.

TEXT BOOKS:

1. 'Transportation Engineering - An Introduction' by Khisty C.J., B. Kent Lall, Pearson India Education Services pvt. Ltd.
2. Transportation Engineering and Planning by C S Papacostas and P.D. Prevedours; Pearson India Education Services pvt. Ltd.

REFERENCE BOOKS:

1. 'Urban Transportation Planning: A decision oriented Approach' by Mayer M and Miller E, McGraw Hill
2. 'Traffic Engineering and Transportation Planning' by Kadiyali.L.R., Khanna Publishers, New Delhi.

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE32L1		0	3	15	35	50	1.5
ENVIRONMENTAL ENGINEERING LAB							

COURSE OBJECTIVES:

- To identify the suitability of water for drinking considering physical and chemical parameters.
- To learn the properties of sewage.
- To identify the suitability of water for aquatic life.

COURSE OUTCOMES:

Students will be able to

CO 1: Test the quality of water as per IS standards.

CO 2: Decide whether the water body is polluted or not.

CO 3: Assess the quality of sewage.

CO 4: Draw some conclusion and decide whether the water is potable or not.

SYLLABUS:

List of Experiments

1. Determination of pH and Conductivity of water & soil.
2. Determination of Alkalinity / Acidity.
3. Determination of Physical parameters- Temperature, Colour, Odour, Taste, Turbidity.
4. Determination of Chlorides in water & soil.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of Dissolved Oxygen with D.O. Meter.
7. Determination of iron.
8. Determination of Optimum Coagulant Dose by Jar Test
9. Determination of Total hardness in water.
10. Determination of B.O.D.
11. Determination of C.O.D.
12. Determination of Nitrogen.
13. Determination of Chlorine Demand.

NOTE: At least 10 of the above experiments are to be conducted.

TEXT BOOKS:



1. Standard Methods for Analysis of Water and Waste Water – APHA.
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi.

REFERENCE:

1. Relevant IS Codes-10500.
2. Chemistry for Environmental Engineering by Sawyer and Mc.Carty.

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE32L2		0	3	15	35	50	1.5
GIS LAB							

COURSE OBJECTIVES:

The course is designed to

- Understand the process Geo-referencing, Preparation of Base map from of Toposheet.
- Digitization, creation of thematic maps from toposheets.
- Developing Digital Elevation model
- Interpretation and Estimation of features of Land Use/land cover details from satellite imagery.
- Learn to apply GIS software to simple problems in water resources, transportation engineering and Agriculture

COURSE OUTCOMES:

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

CO 1: Work comfortably on GIS software

CO 2: Digitize and create thematic map and extract important features

CO 3: Develop digital elevation model

CO 4: Interpretation and Estimation of features from satellite imagery.

CO 5: Analyze and Modelling using GIS software.

SYLLABUS:

GIS:

SOFTWARES:

1. Arc GIS 10.1
2. QGIS

EXCERCISES IN GIS:

1. Geo-referencing of Toposheet.
2. Digitization of Map/Toposheet
 - a. Preparation of thematic map by using Points
 - b. Preparation of thematic map by using Polylines

- c. Preparation of thematic map by using Polygons.
3. Creation of Topology
4. Buffer Analysis
5. Overlay Analysis
6. Development Digital Elevation model
7. Interpretation of Land Use/land cover detail from satellite imagery
8. Creation of thematic maps.
9. Simple applications of Remote Sensing & GIS in Watershed Modelling

TEXT BOOKS:

1. Concept and Techniques of GIS' by C.P.L.O. Albert, K.W. Yong, Print ice Hall Publishers
2. Software Manuals.

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE32L3		0	3	15	35	50	1.5
CIVIL ENGINEERING DRAWING							

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 Draw and illustrate the plan, elevation and section of culverts drawings

CO2 Prepare the plan, elevation and section of Bridge drawings

CO3 Sketch and draw the plan, elevation and section of earthen bunds and Tank surplus weirs drawings

CO4 Develop the plan, elevation and section of Tank sluice and Canal drop drawings

COURSE CONTENTS

Culverts and Bridges Duration:

- a) Pipe culvert (Single Pipe)
- b) R.C.C slab culvert with square return walls
- c) Two-Span R.C.C T-beam Bridge with square return walls.
- d) Two-Span R.C.C Bridge with splayed wing walls and Return walls.

Irrigation engineering drawings Duration:

- a) Earthen bunds – Two types.
 - (i) Homogeneous type
 - (ii) Non Homogeneous type.
- b) Tank surplus weir with splayed wing walls.
- c) Tank sluice with tower head.
- d) Canal drop (notch type)
- e) Canal regulator

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CC32SC1	1	0	2		50	50	2
ENGLISH FOR EMPLOYABILITY SKILLS (Common to All Branches)							

COURSE OBJECTIVES:

- To train the students to use language effectively in professional situations like group discussions, public speaking, presentations and interviews.
- To make the students understand the importance of body language.
- To expose the students to SWOT Analysis.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Write effective Resume for employment..

CO 2: Make formal presentations using relevant technical style of communication and appropriate strategies for both academic and professional purpose.

CO 3: Participate in Group Discussions using analytical and problem solving skills.

CO 4: Face job interviews confidently and enhance employability.

UNIT– I

Personal Introduction & JAM

SWOT Analysis

UNIT–II

Resume and Video Portfolio

Non Verbal Communication

Professional Etiquette

UNIT–III

Presentation Skills

Emotional Intelligence (How to face ambiguity, uncertainty and cobntingencies

UNIT-IV

Group Discussion

UNIT-V Interview skills- Mock Interviews

REFERENCE BOOKS:

1. Rajendra Pal, J S KorlahaHi, Essentials of Business Communication, Sultan Chand & Sons
2. Andrea J. Rutherford, Basic Communication Skills for Technology, Pearson Education Asia
3. V. Prasad, Advanced Communication Skills, Atma Ram Publications
4. Sanjay Kumar, Pushp Lata, Communication Skills, Oxford University Press
5. Meenakshi Raman, Sangeeta Sharma, Fundamentals of Technical Communication, Oxford University Press.

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE:R20CC32MC1	2	0	0				
ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE							

COURSE OBJECTIVES:

The objectives of this course will help the students

- To get necessary knowledge on Indian culture
- To know the Indian languages and Literature in India
- To explore the Indian arts and architecture in India
- To know the education system, science and scientists in India

COURSE OUTCOMES:

After successful completion of the course students will be able to

- Understand the philosophy of Indian Culture
- Know the Indian languages, Epics Ramayana and Mahabharata
- Acquire the information about Indian arts and architecture
- Know the spread of cultural exchange in abroad
- Know the contributions of scientists in different eras

Unit-I. Indian Culture: An Introduction

Characteristics of Indian culture, Significance of Indian culture, Geography of Indian Culture. Society in India through ages- Ancient period- varna and jati, family and marriage in India, position of women in ancient India, Contemporary period; caste system and communalism

Unit-II Indian Languages and Literature

Evolution of script and languages in India: Harappan Script and Brahmi Script. Short History of the Sanskrit literature: The Vedas, The Brahmanas and Upanishads & Sutras, Epics: Ramayana and Mahabharata.

Unit-III. Indian Arts and Architecture

Indian Art & Architecture: Hindu Temple Architecture, Buddhist Architecture, Medieval Architecture. Rise of modern theatre and Indian cinema.

Unit-IV. Spread of Indian Culture Abroad

Causes, Significance and Modes of Cultural Exchange - Through Traders, Teachers, Emissaries,

Missionaries and Gypsies. Indian Culture in South East Asia. India, Central Asia and Western World through ages

Unit-V: Education System in India:

Education in ancient, medieval and modern India, aims of education, Science and scientists of ancient India, Science and Scientists of Modern India.

TEXT BOOKS:

- 1) Kapil Kapoor, “Text and Interpretation: The indian tradition” ISBN: 81246033375, 2005
- 2) “ Science in Samskrit”, Samskrita Bharti Publisher , ISBN 13 : 978- 8187276333,2007
- 3) NCERT , “Position Paper On Arts ,Music, Dance Theatre”, ISBN 81-7450 494-X,200

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I SEMESTER

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
Professional Elective Course-III										
1	R20CE4101	Advanced Foundation Engineering	PE	30	70	100	3	0	0	3
	R20CE4102	Watershed Management								
	R20CE4103	Irrigation Structures								
Professional Elective Courses – IV										
2	R20CE4104	Prestressed Concrete	PE	30	70	100	3	0	0	3
	R20CE4105	Repair & Rehabilitation Of Structures								
	R20CE4106	Ground Water Development and Management								
Professional Elective Courses – V										
3	R20CE4107	Estimation Costing and Valuation	PE	30	70	100	3	0	0	3
	R20CE4108	Ground Improvement Techniques								
	R20CE4109	Pavement Materials								
Open Elective Course/Job Oriented Elective - III										
4	R20CC3OE01	Railway, Airport & Harbour Engineering	OE/JOE	30	70	100	2	0	2	3
	R20CC3OE02	Low Cost Housing								
Open Elective Course/Job Oriented Elective – IV										
5	R20CC4OE01	Environmental Pollution & Control	OE/JOE	30	70	100	2	0	2	3
	R20CC4OE02	Construction Technology and Management								
6	R20CC4101	Business Management Concepts for Engineering	H&SSE	30	70	100	3	0	0	3
	R20CC4117	Entrepreneurship & Innovations								
7	R20CE41SC1	Quantity Estimation & Project Management lab	SAC/SSC		50	50	1	0	2	2
8	R20CC41IN	INTERNSHIP/ Community Service Project	PROJ	15	35	50				1.5
9	R20CC41MC	MOOCS								1.5
Total Credits										23
HONORS/MINOR COURSE										
10		HONORS/MINORS	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE4101	3	0	0	30	70	100	3
ADVANCE FOUNDATION ENGINEERING							

COURSE OBJECTIVES:

- To enable the student to understand the concepts of earth pressures and different theories.
- To impart the concept of retaining walls, types of failures, stability requirements.
- To impart the concept of sheet pile wall, cantilever, anchored sheet piles, location and forces in anchors.
- To enable the student to understand the concepts of soil reinforcement braced cuts and cofferdams.

COURSE OUTCOMES:

The students will be able to

CO1: Explain – the types of earth pressures and classical theories and computation of pressures in homogenous and layered soils (Understanding, analyzing)

CO2: Understanding-the types and failure of retaining wall, stability requirements (Understanding, Evaluating)

CO3: Analyse –Cantilever and anchored sheet piles and evaluating location and forces in anchors (Analyzing, Evaluating)

CO4: Understanding- the concept and mechanism of soil reinforcement and design of embankment (Understanding Applying)

CO5: Explain- the concept of braced cuts and cofferdams (Understanding)

UNIT-I

EARTH PRESSURES

Different types and their coefficients- Classical Theories of Earth pressure – Rankine's and Coulomb's Theories for Active and Passive earth pressure- Computation of Lateral Earth Pressure in Homogeneous and Layered soils- Graphical solutions for Coulomb's Theory in active and passive conditions..

UNIT- II

RETAINING WALLS

Different types - Type of Failures of Retaining Walls– Stability requirements – Drainage behind Retaining walls – Provision of Joints – Relief Shells.

UNIT-III

SHEET PILE STRUCTURES

Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and fixed earth support methods – Row's moment reduction method – Location of anchors, Forces in anchors.

UNIT-IV

SOIL REINFORCEMENT

Reinforced earth - Different components – their functions – Mechanics of reinforced earth – Failure modes-Failure theories – Design of Embakments on problematic soils.

UNIT-V

BRACED CUTS AND COFFERDAMS:

Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts. – types of cofferdam, suitability, merits and demerits – Design of single – wall cofferdams and their stability aspects– TVA method and Cummins' methods.

TEXT BOOKS:

1. Principles of Foundation Engineering by Braja M. Das.
2. Foundation analysis and design – Bowles, JE – McGraw Hill

REFERENCES:

1. Soil Mechanics in Engineering Practice – Terzaghi, K and Rolph, B. peck 2nd Edn. – John Wiley & Co.,
2. Analysis and Design of Foundations and Retaining Structures, Prakash, S – Saritha Prakashan, Mearut.

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE4102	3	0	0	30	70	100	3
WATERSHED MANAGEMENT							

COURSE OBJECTIVES:

- Introduce the concept of watershed management
- Understand the watershed characteristics
- Learn the principles of soil erosion and measures to control erosion
- Appreciate various water harvesting techniques.
- Learn land management practices for various land use/land cover.

COURSE OUTCOMES

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

CO 1: Calculate watershed parameters

CO 2: Analyse watershed characteristics to take appropriate management action.

CO 3: Quantify soil erosion and design control measures.

CO 4: Apply land grading techniques for proper land management.

CO 5: Suggest suitable harvesting techniques for better watershed management

UNIT-I:

INTRODUCTION: Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

UNIT- II:

CHARACTERISTICS OF WATERSHEDS: Physiography - Size, shape, slope, drainage; climate, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-III:

PRINCIPLES OF EROSION: Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation.

MEASURES TO CONTROL EROSION: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams, rock-fill dams, brushwood dam, Gabion.

UNIT-IV:

WATER HARVESTING: Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, subsurface flow harvesting, stop dams, farm ponds and dugout ponds, percolation tanks.

UNIT-V:

LAND MANAGEMENT: Land use and Land capability classification, management of forest, agricultural, grassland and wild land, land grading operation, Reclamation of saline and alkaline soils.

TEXT BOOKS:

1. Watershed Management ‘by Das MM and M.D Saikia, PHI Learning Pvt. Ltd, 2013.
2. Land and Water Management ‘by Murthy.VVN, Kalyani Publications, 2007.
3. Watershed Management ‘by Murthy J V S, New Age International Publishers, 2006.

REFERENCE BOOKS:

1. Water Resource Engineering ‘by Wurbs R A and James R A, Prentice Hall Publishers, 2002.
2. Watershed Hydrology‘by Black P E, Prentice Hall, 1996.

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE4103	3	0	0	30	70	100	3
IRRIGATION STRUCTURES							

COURSE OBJECTIVES:

The course is designed to

- introduce the concepts of planning and design of irrigation systems
- understand design methods of erodible and non-erodible canals
- know the principles of design of hydraulic structures on permeable foundations
- know the concepts for analysis and design principles of storage and diversion head works
- learn design principles of canal structures

COURSE OUTCOMES

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

CO 1: ability to design irrigation canals and canal network

CO 2: design irrigation canal structures

CO 3: plan and design diversion head works

CO 4: analyse stability of gravity and earth dams

CO 5: design ogee spillways and energy dissipation works

UNIT-I

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

UNIT-II

Canal Structures:

Falls: Types and location, design principles of Sarda type fall and straight glacis fall.

Regulators: Head and cross regulators, design principles

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage.

Outlets: types, proportionality, sensitivity and flexibility

Floods: Causes and effects, rational formula, Flood routing-Muskingum method.

UNIT-III

Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-IV

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.

Dams: Types of dams, selection of type of dam, selection of site for a dam.

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis, drainage galleries grouting.

UNIT-V

Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters, stability analysis-stability of downstream slope during steady seepage and upstream slope during sudden drawdown conditions.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

TEXT BOOKS:

1. Garg, S.K (2015), "Irrigation Engineering and Hydraulic Structures", Khanna Book house PvtLtd, New Delhi.
2. Sharma,S.K.(2016). "Irrigation Engineering and Hydraulic Sructures." S.Chand& company Pvt.Ltd, New Delhi. Pp1174.

REFERENCE BOOKS:

1. Asawa G L (2013) : "Irrigation and Water Resources Engineering, New Age International Publishers", New Delhi.
2. Modi, P. N (2011), "Irrigation Water Resources and Water Power Engineering", Standard Book House, New Delhi

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE4104	3	0	0	30	70	100	3
PRESTRESSED CONCRETE							

COURSE OBJECTIVES:

The objective of this course is:

- Familiarize Students with concepts of prestressing
- Equip student with different prestressing systems and devices
- Understand losses of prestress including short and long term losses
- Familiarize students with analysis and design of prestressed concrete members under flexure, shear and torsion

COURSE OUTCOMES:

CO 1: At the end of this course the student will be able to

CO 2: Understand different methods of prestressing

CO 3: Estimate effective prestress including short and long term losses

CO 4: Analyze and design prestressed concrete beams under flexure and shear

CO 5: Understand the relevant IS Code provisions for prestressed concrete

SYLLABUS:

UNIT-I Introduction & Methods and Systems of prestressing Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics. Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford-Udall System- Lee McCall system

Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons, Line of Thrust – Pressure Line, Load Balancing Concept.

UNIT-II Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members - Elastic shortening, shrinkage, and creep of concrete; Relaxation of steel, slip in anchorage, and frictional losses- Total loss and allowable loss of prestress for design

UNIT-III Design for Flexure - Types of failure – Code procedures - Design for flexure using IS Code (IS 1343 -2012) Cable profile in two span continuous members.

UNIT-IV Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- Deflection of determinate composite beam.

UNIT-V Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear reinforcement- Code Provisions- Design for Torsion, Design for Combined bending, shear and torsion, Control of deflections- Factors influencing Deflection- Prediction of short term and long term deflections.

TEXT BOOKS:

1. Prestressed Concrete by N.Krishna Raju, 6e Tata Mc Graw Hill Book co.
2. Prestressed Concrete by K.U.Muthu PHI Learning Pvt. Ltd.

REFERENCE BOOKS:

1. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
2. Prestressed Concrete by N. Rajagopalan Narosa Publishing House.
3. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi. 4. IS 1343:2012

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE4105	3	0	0	30	70	100	3
REPAIR & REHABILITATION OF STRUCTURES							

COURSE OBJECTIVE:

- Study the assessment, maintenance and repair techniques of concrete structures.
- Different case studies are analyzed to define the best strategy to maintain and repair the structure.
- Identify scope of rehabilitation work for dilapidated / obsolete buildings.
- Identify and apply appropriate structural and construction technologies to rectify maintenance problems.
- Prepare short and long term maintenance plans.
- Identify / apply appropriate standards and statutory controls for maintenance and rehabilitation work. Understand the use of Building Information Modelling (BIM) for maintenance planning.

COURSE OUTCOMES:

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

CO 1: Conduct field monitoring and non-destructive evaluation of concrete structures.

CO 2: Design and suggest repair strategies for deteriorated concrete structures including repairing with composites.

CO 3: Assessment of the serviceability and residual life span of concrete structures by Visual inspection and in situ tests

CO 4: Evaluation of causes and mechanism of damage

CO 5: Repair / Rehabilitate / Strengthening techniques by using traditional and advanced materials and techniques.

SYLLABUS

UNIT-I

Materials for repair and rehabilitation -Admixtures- types of admixtures- purposes of using admixtures- chemical composition- Natural admixtures- Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates- Nondestructive evaluation: Importance- Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo

methods- Ultrasound pulse velocity methods- Pull out tests.

UNIT- II

Strengthening and stabilization- Techniques- design considerations- Beam shear capacity strengthening- Shear Transfer strengthening- stress reduction techniques- Column strengthening- flexural strengthening- Connection stabilization and strengthening, Crack stabilization.

UNIT- III

Bonded installation techniques- Externally bonded FRP- Wet layup sheet, bolted plate, near surface mounted FRP, fundamental deboning mechanisms-intermediate crack deboning- CDC deboning- plate end deboning- strengthening of floor of structures.

UNIT- IV

Fiber reinforced concrete- Properties of constituent materials- Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete- applications of fibre reinforced concretes- Light weight concrete- properties of light weight concrete- No fines concrete- design of light weight concrete- Flyash concrete- Introduction- classification of flyash- properties and reaction mechanism of flyash- Properties of flyash concrete in fresh state and hardened state- Durability of flyash concretes.

UNIT- V

High performance concretes- Introduction- Development of high performance concretes- Materials of high performance concretes- Properties of high performance concretes- Self Consolidating concrete- properties- qualifications.

TEXT BOOKS:

1. Concrete technology- Neville & Brooks
2. Special Structural concrete- Rafat Siddique

REFERENCES:

1. Concrete repair and maintenance illustrated- Peter H Emmons
2. Concrete Technology-M S Shetty

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE4106	3	0	0	30	70	100	3
GROUND WATER DEVELOPMENT AND MANAGEMENT							

COURSE OBJECTIVES:

The course is designed to

- Appreciate groundwater as an important natural resource.
- Understand flow towards wells in confined and unconfined aquifers.
- Understand the principals involved in design and construction of wells.
- Create awareness on improving the groundwater potential using various recharge techniques.
- Know the importance of saline water intrusion in coastal aquifers and its control measures.

COURSE OUTCOMES:

The students will be able to

CO1: Estimate aquifer parameters, yield of wells and Analyse radial flow towards wells in confined and unconfined aquifers.

CO2: Design wells and understand the construction practices.

CO3: Determine the process of artificial recharge for increasing ground water potential.

CO4: Take effective measures for controlling saline water intrusion.

CO5: Apply appropriate measures for ground water management.

UNIT – I

Introduction:

Groundwater in the hydrologic cycle, ground water occurrence, aquifer parameters and their determination, general ground water flow equation.

Well Hydraulics: Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jacob and Chow's methods, Leaky aquifers.

UNIT – II

Well Design:

Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery

UNIT –III

Well Construction and Development:

Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail- down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT IV

Artificial Recharge:

Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge

Saline Water Intrusion: Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.

UNIT – V

Groundwater Modelling and Management:Basic principles of groundwater modelling- Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models.

Concepts of groundwater management, basin management by conjunctive use-case studies.

TEXT BOOKS:

1. Groundwater, Raghunath H M, New Age International Publishers, 2005.
2. Groundwater Hydrology, Todd D. K., Wiley India Pvt Ltd., 2014.
3. Groundwater Hydrology, Todd D K and L W Mays, CBS Publications, 2005.

REFERENCE BOOKS:

1. Groundwater Assessment and Management, Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. Groundwater Hydrology, Bouwer H, McGraw Hill Book Company, 1978.
3. Groundwater Systems Planning and Management, Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. Groundwater Resources Evaluation, Walton W C, McGraw Hill Book Company, 1978.

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE4107	3	0	0	30	70	100	3
ESTIMATION COSTING AND VALUATION							

COURSE OBJECTIVES:

- Quantity estimation for different civil engineering works like single storey residential building, BT road, canal etc.
- Cost estimation for different civil engineering works like single storey residential building, BT road, canal etc.
- Rate analysis for different items of work.
- Quantity estimation and preparing schedule of bars of different items of RC works using software like MS Excel.
- To prepare project management report for different civil engineering projects like residential building, BT road, canal etc using software packages like Primavera/MS Project etc.

COURSE OUTCOMES:

CO 1: Estimate the quantities of different items of works of like single storey residential building, BT road, canal etc.

CO 2: Estimate the cost of different items of works of like single storey residential building, BT road, canal etc.

CO 3: Determine the unit rate of different items of work.

CO 4: Prepare the schedule of reinforcement bars.

CO 5: Demonstrate the Preparing tender notice and various approvals needed for a project.

UNIT I

Procedure of Estimating: Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Units of measurement.

Methods of building estimates: Individual wall method; Centre line method; Arch masonry calculation; Estimate of steps.

Estimate of Buildings: Estimate of residential building; Estimate of a building from line plan.

UNIT II

Estimate of RCC works: Standard hooks and cranks; Estimate of RCC slab; RCC beam; and RCC

column with foundation.

Canal estimate: Earthwork in canals–different cases; Estimate of earthwork in irrigation channels.

UNIT III

Road Estimating: Estimate of earthwork; Estimate of pitching of slopes; Estimate of earthwork of road from longitudinal sections; Estimate of earthwork in hill roads.

Specifications: Purpose and method of writing specifications; General specifications. Detailed Specifications for Brick work; R.C.C; Plastering; Mosaic Flooring; R.R.Stone Masonary.

UNIT IV

Analysis of Rates: Task or out – turn work; Labour and materials required for different works; Rates of materials and labour; Preparing analysis of rates for the following items of work: i) Concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering v) CC flooring vi) White washing.

PWD Accounts and Procedure of Works: Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.

UNIT V

Valuation: Cost; Price & value; Methods of valuation; Out goings; Depreciation; Methods for Estimating cost depreciation; Valuation of building.

Miscellaneous Topics: Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage.

TEXT BOOK(s):

1. Estimating & Costing in Civil Engineering by B.N. Dutta; UBS Publishers & Distributors, 2010.
2. Valuation of Real properties by S. C. Rangwala, 8th Edition, Charotar Publishing House, 2011.

REFERENCE BOOK(s):

1. Practical information for Quantity Surveyors, Contract Managers, Architects Engineers & Builders by P.T. Joglekhar.
2. Estimating, Costing and specification in Civil Engineering by M.Chakraborti.

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE4108	3	0	0	30	70	100	3
GROUND IMPROVEMENT TECHNIQUES							

COURSE OBJECTIVES:

The objective of this course is:

- To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remolded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
- To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
- To enable the students to know how geotextiles and geosynthetics can be used to improve the engineering performance of soils.
- To make the student learn the concepts, purpose and effects of grouting.

COURSE OUTCOMES:

CO 1:By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.

CO 2:The student should be in a position to design a reinforced earth embankment and check its stability.

CO 3: The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice.

CO 4:The student should be able to understand the concepts and applications of grouting.

SYLLABUS:

UNIT- I

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT -II

Dewatering – sumps and interceptor ditches – single and multi-stage well points – vacuum well points- horizontal wells – criteria for choice of filler material around drains – electro osmosis

UNIT- III

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests. Introduction to Liquifaction& its effects & applications.

UNIT- IV

Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

UNIT- V

Geosynthetics – geotextiles – types – functions, properties and applications – geogrids, geomembranes and gabions - properties and applications.

TEXT BOOKS:

1. ‘Ground Improvement Techniques’ by Purushotham Raj, Laxmi Publications, New Delhi.
2. ‘Ground Improvement Techniques’ by NiharRanjanPatro ,Vikas Publishing House (p) limited New Delhi.
3. ‘An introduction to Soil Reinforcement and Geosynthetics’ by G.L.Siva Kumar Babu, Universities Press.

REFERENCE BOOKS:

1. ‘Ground Improvement’ by MP Moseley, Blackie Academic and Professional, USA.
2. ‘Designing with Geosynthetics’ by RM Koerner , Prentice Hall

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE4109	3	0	0	30	70	100	3
PAVEMENT MATERIALS							

COURSE OBJECTIVES:

- To understand the characteristics and tests of flexible and rigid pavements materials
- To study recent developments in construction practices and modern equipment's used.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

CO 1: Understand the need for tests and procedures adopted for construction.

CO 2: Equip the students with practical sense of road construction using suitable materials

UNIT I

Soil Characterization of subgrade soil, Properties and test for use as subgrade material. Soil classification systems regarding suitability as subgrade soil. Soil stabilization methods Soil-Lime Stabilization, Soil-Cement- Stabilization, Soil-Bitumen Stabilization, Mechanical stabilization. Road aggregates Properties of various Road aggregates, tests on road aggregates.

UNIT II

Bitumen Manufacturing, Grading and tests. Emulsions, Cut backs and Modified binders-Properties, types and uses.Bituminous pavement typesPenetration layer systems and Pre mixed aggregate and bituminous mixtures. Mix Design- Marshall method and Superpave procedure. Construction of bituminous pavements- Preparation and construction of Base, Sub base and surface layers.

UNIT III

Material characterization for Cement concrete pavementsProperties and tests for the materials used for CC pavements. Construction of Cement concrete pavements – Preparation of Subgrade and Base, Presetting reinforcements in joints and PCC slab construction stages. Thin white topping and ultra-thin white toppings.

UNIT IV

Specialised applications of materials and construction practices Interlocking concrete block pavements – Materials used and the construction procedures. Geo-Textiles- Types and functions as pavement material. Introduction to Microsurfacing, Porous pavements, Warm mix asphalt & Recycling of pavements.

TEXT BOOK:

1. Khanna S. K. and C. E. G. Justo, Highway Material Testing, New Chand & Bros., 1999.

REFERENCE BOOK(s):

1. Wright P. H. and K. Dixon, Highway Engineering, John Wiley & Sons, 1996.
2. Mallick R. B. and T. E. Korchi, Pavement Engineering, CRC Press, 2009.
3. Manual for Construction and Supervision of Bituminous Works, MoRTH , 2001.
4. IRC SP: 63-2004, Guidelines for Use of Interlocking Concrete Block Pavement, Indian Roads Congress.
5. G.V. Rao, P. K. Banerjee, J. T. Shahu, G. V. Ramana, Geosynthetics -New Horizons, Asian Books Private Ltd., New Delhi, 2004.

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code:R20CC4101	BUSINESS MANAGEMENT CONCEPTS FOR ENGINEERS						

COURSE OBJECTIVE:

- To provide an insight into the various economic concepts which are necessary for taking decisions related to economic aspects of the organization.
- To provide familiarity with the accounting concepts which will help in preparation of various accounting records
- To equip the student with the basic management concepts and functions and to provide knowledge relating to recruitment, selection, training, and motivation of employees in the organization

COURSE OUTCOMES: The student is able to

CO1: Summarize fundamentals of Managerial economics for decision making (K2).

CO2: Apply concepts of Financial Accounting and BEP for business decisions (K3).

CO3: Evaluate fundamental concepts and principles of management (K5).

CO4: Discuss functional areas of management like HR, marketing and finance (K6).

CO5: Apply project management techniques for project planning and evaluation (K3).

UNIT-I: INTRODUCTION TO MANAGERIAL ECONOMICS

Definitions, - Nature And Scope- Relation With Other Subjects- Demand Definition- Determinants- Law of Demand and Its Exceptions- Concept of Elasticity of Demand- Cost Concepts- CVP Analysis (With Simple Problems), Significance- Limitations.

UNIT-II: MARKET STRUCTURES AND FINANCIAL ACCOUNTING

Introduction to Markets – Features of various markets-Perfect competition, Monopoly and Oligopoly. Definition – Importance, limitations and basic books of financial accounting, Preparation of basic books of accounting: journal, ledger and trail balance.

UNIT-III: INTRODUCTION TO MANAGEMENT

Concept, Nature, Importance- Functions of Management- Henry Fayols Principles of Management- F.W.Taylor's Scientific Management- Douglas Mc Gregors Theory X and Y.

UNIT-IV: FUNCTIONAL AREAS OF MANAGEMENT

Concept of HRM, Functions of HR Manager- Marketing Management- Functions of Marketing

Manager- Production Management-Functions of Production Management – Financial Management and functions of Financial Management.

UNIT-V: PROJECT MANAGEMENT: (PERT/CPM)

Development of Network – Difference between PERT and CPM- Problems on Critical Path- Problems on PERT Analysis.

TEXT BOOKS

1. Dr. N. APPARAO Dr. P. Vijay Kumar: “Managerial economics and financial analysis” Cengage publication’s, New Delhi-2011.
2. Dr. A. R. Aryasri- Managerial Economics and Financial Analysis, TMH2011.
3. V. Maheswari: Managerial Economies, Sultan Chand.
4. Suma Damodaran: Managerial Economics, Oxford 2011.
5. Koontz & Weihrich: Essentials of Management” TMH 2011.

REFERENCES:

1. Managerial economics theory & applications, DM Mithani, Himalaya Publishing House, 2013.
- **Unit-1, 2**
2. Accounting For Managers, G. Prasad, Jaibharath Publishers, 2016. - **Unit-3**
3. Dr. P. Vijaya Kumar & Dr. N. Appa Rao,” Management Science” cengage. Delhi, 2012.
- **Unit-4, 5**
4. Project Planning & Control with PERT & CPM, BC Punmia & KK Khandelwal, Lakshmi Publications, New Delhi, 4th Edition – 2016. - **Unit-6**

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code:R20CC4117	ENTREPRENEURSHIP & INNOVATION						

COURSE OBJECTIVE:

- Creating awareness among the students about the significance of entrepreneurship and its social relevance.
- Imparting knowledge to the students on institutional support available to start a business venture
- To understand the significance of entrepreneurial training in the development of new and existing entrepreneurs

COURSE OUTCOME: The student is able to

CO1 : Outline the concepts of Entrepreneurship.[K2]

CO2 : Create the awareness on creativity and innovation.[K6]

CO3 : Adopt the Entrepreneurship Development programs[K6]

CO4 : Evaluate the project planning and feasibility studies.[K5]

CO5 : Analyze the concept of small and micro enterprises.[K4]

SYLLABUS:

UNIT –I: ENTREPRENEUR AND ENTREPRENEURSHIP

Entrepreneur – Definitions, concept of entrepreneur, characteristics of entrepreneur, types of entrepreneurs, concept of entrepreneurship, characteristics of entrepreneurship, role of entrepreneurship in economic development, ethics and social responsibilities of an entrepreneur, Financial institutional support to entrepreneurs(IDBI,SISI,DIC,NIESBUD, Commercial banks etc.,

UNIT-II: CREATIVITY AND INNOVATION IN ENTREPRENEURSHIP

Meaning and concept of creativity - Nature and characteristics of creativity -Creativity Process-Factors affecting creativity - Meaning and Importance Innovation - Process -Distinguish the Creativity and Innovation.

UNIT –III: ENTREPRENEURSHIP DEVELOPMENT PROGRAMMES

Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit -Training for Entrepreneurs, Entrepreneurship Development Programme (EDP) – Need and objectives of EDP’s - Phases and evolution on EDP’s existing and new Entrepreneurs.

UNIT –IV: PROJECT PLANNING AND FEASIBILITY STUDIES

Meaning of a project, Project identification – Sources of new Ideas, Methods of generating ideas, Project selection, - Project Feasibility Study -Project evaluation and Techniques (PBP, ARR, NPV, IRR & PI).

UNIT –V: SMALL AND MICRO ENTERPRISES

Importance, definitions, MSME's Development Act 2006 – policies and their support to MSMEs - Growth of Firm and growth strategies, Factors inducing growth – sickness in small business and remedies.

TEXT BOOKS:

1. “Entrepreneurship”, Arya Kumar: Pearson, Publishing House, New Delhi, 2012.
2. “Entrepreneurship”, VSP Rao, Kuratko: Cengage Learning, New Delhi, 2012
3. Shoimo Maital, DVR Seshadri, “Innovation Management”, Response Books 2007

REFERENCES:

1. “Entrepreneurship Development” B.Janakiram, M Rizwana: Excel Books, ND, 2011
2. “Entrepreneurship Development”, P.C.Shejwalkar Everest Publishing House, ND, 2011
3. Vinnie Jauhari & Sudhanshu Bhushan, “Innovation Management”. Oxford University Press, 2014.

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE41SC1	1	0	2		50	50	2
QUANTITY ESTIMATION & PROJECT MANAGEMENT LAB							

COURSE OBJECTIVES:

- Quantity estimation for different civil engineering works like single storey residential building, BT road, canal etc.
- Cost estimation for different civil engineering works like single storey residential building, BT road, canal etc
- Rate analysis for different items of work.
- Quantity estimation and preparing schedule of bars of different items of RC works using software like MS Excel.
- To prepare project management report for different civil engineering projects like residential building, BT road, canal etc using software packages like Primavera/MS Project etc.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

CO 1: Estimating quantities and cost estimation required for different civil engineering works like single storey residential building, R.C.C work, BT road, canal etc.

CO 2: Finding the unit rate of different items of work.

CO 3: Preparing the Plan and schedule for different civil engineering works like single storey residential building, BT road, canal etc. using software packages like Primavera/MS Project etc.

CO 4: Optimize and manage resources.

EXPERIMENTS:

1. Quantity Surveying

(At least SIX of the following using software's like MS Excel/ Qty./Road Estimate/Super Rate analysis etc.)

1. Quantity estimation of a single storey residential building (different items).
2. Cost estimation of a single storey residential building.
3. Quantity estimation of a B.T.Road(different items).

4. Cost estimation of a B.T.Road.
 5. Quantity estimation of a Canal (different items).
 6. Cost estimation of a Canal.
 7. Find out the labour requirement and preparing the Rate Analysis for different items of work.
 - a) C.C
 - b) R.C.C c) Brick work d) Flooring
2. UNIT-II
- Project Management
- (At least THREE of the following using softwares like MS Project/Primavera etc.)
8. Preparing the Project management report for a single storey residential building/Road/Canal by using the Bar Chart/Mile stone chart.
 9. Preparing the Project management report for a single storey residential building by using the network technique (PERT/CPM).
 10. Preparing the Project management report for a B.T.Road by using the network technique (PERT/CPM).
 11. Preparing the Project management report for a Canal by using the network technique (PERT/CPM).
3. UNIT-III
- (At least THREE of the following using software's like MS Excel.)
12. Quantity estimation of RCC roof slab and preparing schedule of bars
 13. Quantity estimation of RCC beam and preparing schedule of bars
 14. Quantity estimation of RCC Column with foundation footing and preparing schedule of bars
 15. Quantity estimation of RCC retaining wall and preparing schedule of bars

Note:**

A minimum of twelve (12No) shall be done and recorded

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CC41IN	0	0	0	15	35	50	1.5
INTERNSHIP/COMMUNITY SERVICE PROJECT							

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CC41MC					50	50	1.5
MOOCS							

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH II SEMESTER										
S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CC42PW	Major project & Internship	PROJ	60	140	200	0	0	0	12
INTERNSHIP (6 MONTHS)										
TOTAL CREDITS										12
HONORS/MINOR COURSE										
2		HONORS/MINOR	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

POOL 1 **STRUCTURES**

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CEHN02	Finite element methods	PC	30	70	100	4	0	0	4
2	R20CEHN03	Advanced Structural Engineering	PC	30	70	100	4	0	0	4
3	R20CEHN04	Theory of Elasticity And Plasticity	PC	30	70	100	4	0	0	4
4	R20CEHN05	Matrix Methods of Structural Analysis	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CEHN02	4	0	0	30	70	100	4
FINITE ELEMENT METHODS							

COURSE OBJECTIVES:

The objective of this course is:

- Equip students with fundamentals of Finite Element Analysis
- Enable students to formulate design problems into FEA.
- Enable students to solve Boundary value problems using FEM

COURSE OUTCOMES:

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

CO 1: Solve simple boundary value problems using Numerical technique of Finite element method

CO 2: Develop finite element formulation of one and two dimensional problems and solve.

CO 3: Assemble Stiffness matrices, apply boundary conditions and solve for displacements

CO 4: Compute Stresses and Strains and interpret the result.

SYLLABUS:

UNIT-I Introduction:

Principles of Elasticity- Equilibrium Equations- Strain Displacement relationships- Constitutive relationship for plane stress, plane strain and axi- symmetric bodies of revolution with axi- symmetric loading.

Stiffness method- Principle of Stationary potential energy- Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation.

UNIT-II:

Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix – Selection of approximate displacement functions- solution of a plane truss- transformation matrix- Galerkin's method for 1-D truss – Computation of stress in a truss element.

UNIT-III

Finite element formulation of Beam elements: Beam stiffness- beam stiffness matrix- Examples on Analysis of beams Subjected to Concentrated and Distributed loading

UNIT-IV

Finite element formulation for plane stress and plane strain problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces

UNIT-V I

So-parametric Formulation: Isoparametric bar element- plane bilinear isoparametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature for performing numerical integrations.

TEXT BOOKS

1. Introduction to Finite Elements in Engineering, Tirupati R. Chandrupatla, Ashok D. Belgundu, PHIpublications.
2. A first course in the Finite Element Method, Dary L. Logan, ThomsonPublications.

RÉFÉRENCES:

1. Concepts and applications of Finite Element Analysis, Robert D. Cook, Michael E Plesha, John Wiley & sonsPublication
2. Introduction to Finite Element Method, Desai & Abel CBSPublications

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CEHN03	4	0	0	30	70	100	4
ADVANCED STRUCTURAL ENGINEERING							

COURSE OBJECTIVES: Understand about the advanced structural Engineering concepts

COURSE OUTCOMES:

CO 1: Understand the rheological models and dimensional stability of concrete.

CO 2: Analyze the microstructure of concrete and admixtures.

CO 3: Explore different types of aggregates used in concrete.

CO 4: Evaluate the durability property of concrete.

CO 5: Evaluate the quality, performance and maintenance parameters of concrete.

UNIT – I

Rheological Models of Fresh Concrete: Introduction, Simple flow test, Rheological models, Schematic differences in flow curves of different types of concrete, Rheological test models, factors affecting rheological properties, Effect of rheological properties on different types of concrete.

Dimensional Stability of Concrete: Dimensional stability of concrete, Modulus of Elasticity of concrete, Factors affecting the modulus of elasticity of concrete, Poisson's ratio, Mechanics of setting and hardening, Shrinkage, Creep and Thermal effects on concrete.

UNIT – II

Microstructure of Concrete: Definition, Significance, Complexities, Microstructure of the Aggregate Phase, Microstructure of the Hydrated Cement Paste, Interfacial Transition Zone in Concrete.

Admixtures: Significance, Surface-Active Chemicals, Set-Controlling Chemicals, Mineral Admixtures.

UNIT – III

Aggregates: Significance, Natural Mineral Aggregates, Lightweight Aggregate, Heavyweight Aggregate, Blast-Furnace Slag Aggregate, Aggregate from Fly Ash, Aggregates from Recycled Concrete and Municipal Waste, Aggregate Production, Aggregate Characteristics and Their Significance.

UNIT – IV

Durability: Definition, Significance, General Observations, Water as an Agent of Deterioration,

Permeability, Classification of the Causes of Concrete Deterioration, Surface Wear, Crystallization of Salts in Pores, Frost Action, Effect of Fire, Deterioration of Concrete by Chemical Reactions, Reactions Involving the Formation of Expansive Products, Sulfate Attack, Alkali-Aggregate Reaction, Corrosion of Embedded Steel in Concrete, Concrete in the Marine Environment.

UNIT – V

Quality Control of Concrete Construction: Statistical Parameters and Variability, Recommendations of IS 456-2000, Errors in Concrete Construction, Tools for Quality Management, Analysis Techniques in Quality Management System, Quality Management System for Construction.

Performance and Maintenance of Concrete Structures: Factors Affecting Whole Life Performance, Measures to Improve Safe Life and Durability, Deterioration Model, Inspection, Tests and Monitoring, Critical Stages of a Structure, Maintenance Planning, Whole-Life Assessment.

TEXT BOOKS:

1. Concrete Technology (Second Edition) by A.R.Santhakumar, Oxford University Press, 2018.
2. Concrete, Microstructure, Properties and Materials (Third Edition) by P.Kumar Mehta and Paulo J.M. Monteiro, McGraw-Hill, 2005.

REFERENCE BOOKS:

1. Properties of Concrete (Fifth Edition) by A.M.Neville, Pearson, 2012.
2. Advanced Concrete Technology by Zongjin Li, John Wiley and Sons, Inc. New Jersey, 2011.
3. Handbook on Advanced Concrete Technology by N.V.Nayak and A.K.Jain, Alpha Science International Ltd, 2012.

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CEHN04	4	0	0	30	70	100	4
THEORY OF ELASTICITY AND PLASTICITY							

COURSE OBJECTIVES: Understand about Theory of elasticity and Plasticity concepts.

COURSE OUTCOMES:

CO 1: Analyse the stress and strain in three dimensions.

CO2: Solve two-dimensional problems in rectangular coordinates.

CO 3: Solve two-dimensional problems in polar coordinates.

CO 4: Analyse the stresses due to torsion of bars having different cross sections.

CO 5: Understand the basic concepts of plasticity.

UNIT-I

Analysis of stress and strain in three dimensions

Stress at a point – components of stress; Principal stresses; Stress ellipsoid and stress director surface; Determination of principal stresses; Stress invariants; Determination of maximum shear stresses; Octahedral shear stress; strain at a point – Components of strain; Differential equations of equilibrium ; Conditions of compatibility; Generalised Hooke's law

UNIT-II

Two-dimensional problems in rectangular coordinates

Plane stress ; Plane strain; Differential equations of equilibrium; Boundary conditions; Compatibility equations; Stress function; Governing differential equation; Solution by polynomials; End effects – Saint-Venant's Principle; Determination of displacements; Bending of a cantilever loaded at the end; Bending of a beam by uniform load

UNIT-III

Two-dimensional problems in polar coordinates

General equations in polar coordinates; Stress distribution symmetrical about an axis; Effect of circular holes on stress distribution in plates; Concentrated force at a point of a straight boundary; Concentrated force acting on a beam; Stresses in a circular disc

UNIT-IV

Torsion

Torsion of straight bars – Saint Venant’s theory; Elliptic cross section; Membrane analogy; Torsion of a bar of narrow rectangular cross-section; Torsion of rolled profile sections; Torsion of thin tubes

UNIT-V

Plasticity

Yield criteria – Introduction, The Tresca yield criterion, The von Mises yield criterion; Stress-Strain relations – Introduction, Plastic potential and Plastic flow, Levy-Mises equations, Prandtl-Reuss equations

TEXT BOOKS:

1. Theory of elasticity by S.P.Timoshenko & J.N.Goodier, McGraw-Hill, 1982.
2. Applied elasticity for engineers by L.Govindaraju and T.G.Sitharam, Civil Engineering, www.nptel.ac.in

REFERENCE BOOKS:

1. Advanced mechanics of solids by LS Srinath, TataMcGra-Hill, 2009.
2. Computational elasticity by M. Ameen, Narosa Publishing House, 2008.

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CEHN05	4	0	0	30	70	100	4
MATRIX METHODS OF STRUCTURAL ANALYSIS							

COURSE OBJECTIVES: Understand about Matrix Methods of Structural Analysis concepts.

COURSE OUTCOMES:

CO 1: Determine and formulate the degree of static and kinematic indeterminacy of the structures

CO 2: Analyze structures like continuous beams and single bay, single story rigid jointed and pin jointed frames for internal forces using flexibility matrix and stiffness matrix methods.

CO 3: Analyze structures like continuous beams and single bay, single story rigid jointed frames for internal forces using stiffness matrix methods

CO 4: Analyze structures like continuous beams, pin jointed plane frames for internal forces using member stiffness matrix methods

CO 5: Develop flow charts for analysis of continuous beams and pin jointed plane frames

Unit-I

Basic Concepts of Structural Analysis:

Introduction; Types of Framed Structures; Deformations in Framed Structures; Actions and Displacements; Equilibrium; Compatibility; Static and Kinematic Indeterminacy; Structural Mobilities; Principle of Superposition; Action and Displacement Equations; Flexibility and Stiffness Matrices; Equivalent Joint Loads; Energy Concepts; Virtual Work.

Unit-II

Fundamentals of the Flexibility Method:

Introduction; Flexibility Method; Temperature changes; Prestrains and Support Displacements; Joint Displacements; Member End Actions and support reactions; Flexibilities of prismatic members; Formalization of the Flexibility method.

Unit-III

Fundamentals of the Stiffness Method :

Introduction; Stiffness Method; Temperature changes; Prestrains and Support Displacements; Stiffness of Prismatic Members; Formalization of the Stiffness Method.

Unit-IV Computer Oriented Direct Stiffness method :

Introduction; Direct Stiffness Method; Complete Member Stiffness Matrices; Formation of Joint Stiffness Matrix; Formation of Load Vector; Rearrangement of Stiffness and Load Arrays; Calculation of Results; Analysis of Continuous Beams; Plane Truss Member Stiffness; Analysis of Plane Trusses; Rotation of Axes in Two Dimensions; Application to Plane Truss Members; Rotation of Axes in Three Dimensions; Plane Frame Member Stiffness; Analysis of Plane Frames.

Unit-V

Computer Programs for Framed structures:

Flow Chart for the analysis of the following structures:

Continuous Beam

Plane Truss

Plane Frame

TEXT BOOKS:

1. Matrix Analysis of Framed Structures by W. Weaver & J.M.Gere, CBS Publishers,1986.
2. Matrix methods of structural analysis by PN Godbole, RS Sonparote, SU Dhote,PHI, 2014.

REFERENCE BOOKS:

1. Matrix methods of structural analysis by AS Meghre and SK Deshmukh, Charotar Publishing House,2003.
2. Computer analysis of framed structures by Damoder Maity, IK International, 2007.
3. Matrix analysis of structures by P.K.Singh, Cengage Learning India , 2013.
4. Matrix methods of structural analysis by SS Bhavikatti, IK International Publishing House Pvt.Ltd.,2011.

DEPARTMENT OF CIVIL ENGINEERING

**POOL 2
ENVIRONMENTAL**

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CEHN01	Air pollution and control	PC	30	70	100	4	0	0	4
2	R20CEHN06	Advanced Environmental Engineering	PC	30	70	100	4	0	0	4
3	R20CEHN07	Solid waste management	PC	30	70	100	4	0	0	4
4	R20CEHN08	Rural water supply and sanitation	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CEHN01	4	0	0	30	70	100	4
AIR POLLUTION AND CONTROL							

COURSE OBJECTIVES:

The course will address the following:

- To know the analysis of air pollutants
- To know the Threshold Limit Values (TLV) of various air pollutants
- To acquire the design principles of particulate and gaseous control
- To learn plume behavior in different environmental conditions
- To learn carbon credits for various day to day activities

COURSE OUTCOMES:

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

CO 1: Decide the ambient air quality based on the analysis of air pollutants

CO 2: Design particulate and gaseous control measures for an industry

CO 3: Judge the plume behaviour in a prevailing environmental condition

CO 4: Estimate carbon credits for various day to day activities

SYLLABUS:

UNIT – I

Air Pollution: Sampling and analysis of air pollutants, conversion of ppm into $\mu\text{g}/\text{m}^3$. Definition of terms related to air pollution and control - secondary pollutants - Indoor air pollution – Ozone holes and Climate Change and its impact - Carbon Trade.

UNIT-II

Thermodynamics and Kinetics of Air-pollution: Applications in the removal of gases like SO_x , NO_x , CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

UNIT – III

Meteorology and Air Pollution: Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena on plume

behaviour and Air Quality - Wind rose diagrams and Isopleths Plume Rise Models

UNIT-IV

Ambient Air Quality Management: Monitoring of SPM - RPM SO₂; NO_x and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring – Noise Monitoring
- Weather Station. Emission Standards- Gaussian Model for Plume Dispersion

UNIT-V

Air Pollution Control: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipments – Settling Chambers, Cyclone separators –Fabric filters–Scrubbers, Electrostatic precipitators- Control of NO_x and SO_x emissions – Environmental friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

TEXT BOOKS:

1. Air Pollution and Control, K.V.S.G. Murali Krishna, Laxmi Publications, New Delhi,2015
2. Air Pollution, M. N. Rao and H. V. N. Rao, Tata McGraw Hill Company.

REFERENCES:

- 1.An Introduction to Air pollution, R. K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution by Wark and Warner - Harper & Row, New York.

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CEHN06	4	0	0	30	70	100	4
ADVANCED ENVIRONMENTAL ENGINEERING							

COURSE OBJECTIVES: Understand about Advanced Environmental Engineering concepts.

COURSE OUTCOMES:

CO1: To identify the principles of environmental management.

CO2: To analyze environmental impact prediction, evaluation and mitigation.

CO3: To identify and review audit-related documentation, prepare checklists and audit process

CO4: To apply tools such life cycle assessment, environmental audits, evaluation of environmental performance for environmental decision-making.

CO5: To evaluate the effectiveness of systematic EMS monitoring processes and to analyze Implementation of EMS Conforming to ISO 14001

SYLLABUS:

UNIT – I

Principles of Environmental Management, Ecosystem Concepts, Environmental Concerns in India, Policy and Legal Aspects of Environmental Management, Introduction to Environmental Policies, Environmental Laws and Legislations, Environmental Legislations in India.

UNIT – II

Environmental Impact Assessment (EIA), Impact Prediction, Evaluation and Mitigation, Forecasting Environmental Changes, Strategic Environmental Assessment (SEA), Environmental Clearance Procedure in India, EIA Documentation and Processes, EIA Monitoring and Auditing.

UNIT – III

Environmental Auditing, Elements of Audit Process, Waste Audits and Pollution Prevention Assessments, EA in Industrial Projects.

UNIT – IV

Life Cycle Assessment (LCA), Stages in LCA of a Product, Procedures for LCA, Different Applications of LCA. Sustainable approach towards Environment Management, Environmental

Protocols

UNIT – V

Environmental Management System Standards, Implementation of EMS Conforming to ISO 14001.
Environmental Economics: Introduction, economic tools for evaluation, Green GDP, Cleaner development mechanisms and their applications.

TEXT BOOK:

1. Vijay Kulkarni and Ramachandra T.V., 2006. Environmental Management, Commonwealth of Implementing, Canada and Indian Institute of Science, Bangalore.

REFERENCE BOOKS:

1. Lohani B.N (1984)., “Environmental Quality Management”, South Asian Publishers, New Delhi
2. Chanlett, (1973) “Environmental Protection”, McGraw Hill Publication, New York.
3. Danoy G.E., and Warner R.F., (1969), “Planning and Design of Engineering Systems”,Unwin Hyman Publications.
4. MOEF, Government of India, “Carrying Capacity Based Developmental Planning Studies for the National Capital Region”, 1995-96.

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CEHN07	4	0	0	30	70	100	4
SOLID WASTE MANAGEMENT							

COURSE OBJECTIVE

The student will have a thorough understanding of key functional elements in municipal solid waste management including waste minimization concepts. And also designing of engineered land fill sites for the disposal of wastes.

COURSE OUTCOMES (COS)

CO1: Identify improper practices of solid waste disposal and their environmental implications. Know the basic engineering principles of solid waste management

CO2: Describe the need for economics in collection and transportation of solid waste and clearly discuss various types of collection systems and analyse system dynamics

CO3: Understand the management concepts, define 4 R approach, apply PPP model and community involvement for effective management of solid waste

CO4: Develop a concise idea on various conventional and advanced treatment options for solid waste

CO5: Conceive the design aspects of engineered disposal options and apply the gained knowledge to solve numerical examples.

SYLLABUS:

UNIT-I

Introduction Sources and engineering classification, characterization, generation and quantification; Objectives, principles, functional elements of solid waste management system – Regulatory aspects of solid waste management, major problems. Environmental implications of open dumping, Construction debris – management & handling, E- Waste Management, Rag pickers and their role.

UNIT-II

Waste Generation: Rate of generation, frequency, storage and refuse collection, physical and chemical composition, quantity of waste, engineering properties of waste, prediction, modelling concepts.

UNIT-III

Collection, Segregation and Transport: Handling and segregation of wastes at source, Collection (primary & secondary) and storage of municipal solid wastes, collection equipment, transfer stations, collection route

optimization and economics, regional concepts. System dynamics

Waste Minimization: 4R: reduce, recover, recycle and reuse, case study, guidelines

UNIT-IV

Treatment Methods: Refuse processing technologies. Mechanical and thermal volume reduction. Biological and chemical techniques for energy and other resource recovery: composting, vermicomposting, termigradation, fermentation. Incineration of solid wastes.

UNIT-V

Disposal Methods: Impacts of open dumping, site investigation and selection, sanitary land filling - Types, geotechnical considerations, design criteria and design, Liners - earthen, geo membrane, geo synthetics and geo textiles.

TEXT BOOKS

1. Tchobanoglous G., Theissen H., and Eliassen R., “Solid Waste Engineering Principles and Management Issues”, McGraw Hill, New York.
2. Pavoni J.L., “Handbook of Solid Waste Disposal”.
3. Peavy, Rowe and Tchobanoglous, “Environmental Engineering”, McGraw Hill.
4. Mantell C.L., (1975), “Solid Waste Management”, John Wiley.

REFERENCES

1. CPHEEO Manual on Solid Waste Management.
2. WHO Manual on Solid Waste Management.
3. Vesiland A., “Solid Waste Engineering”, Thompson Books.
4. Flintoff F., (1976), “Management of Solid Wastes in De

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
CODE:R20CEHN08	RURAL WATER SUPPLY AND SANITATION						

COURSE OBJECTIVES:

The course is designed to

- Student should be able to make technology choice to deal with water quality issues, operate and maintain working treatment systems and do troubleshooting of the problems in these systems.
- The student will be able to apply the knowledge gained from the subject in EIA studies for water component and water pollution control strategies.

COURSE OUTCOMES:

At the end of the course the student will be

CO 1: Identify various techniques and problems in rural water supply.

CO 2: Monitor the quality and maintenance of rural water supply.

CO 3: Design low cost water treatment system for rural areas.

CO 4: Understand the rural sanitation and the management of grey and storm water.

CO 5: Recognize different types of waste water treatment systems.

CO 6: Know safe disposal of solid waste and different methods of solid waste management.

UNIT I

Introduction: Water quality parameters and their environmental and health significance. Behavior of pollutant in rivers and lakes. Waste related standards and philosophy. Status of water supply and sanitation sector in India.

UNIT II

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies.

UNIT III

Low Cost Water Treatment: Introduction – Epidemiological aspects of water quality- methods for low cost water treatment - Specific contaminant removal systems

UNIT IV

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Ecological sanitation approach – Grey water and storm water management- Compact and simple wastewater treatment systems in rural areas- catch basins constructed wetlands- roughing filters- stabilization ponds - septic tanks – anaerobic baffled reactors soak pits- low cost excreta disposal systems- Village ponds as sustainable wastewater treatment system
Wastewater disposal

UNIT V

Solid Waste Management: Disposal of Solid Wastes- Composting- land filling- incineration- Biogas plants - Other specific issues and problems encountered in rural sanitation.

Text Books:

1. Eulers, V.M., and Steel, E.W., Municipal and Rural Sanitation, 6th Ed., McGraw Hill Book Company,.
2. Wright, F.B., Rural Water Supply and Sanitation, E. Robert Krieger Publishing Company, Huntington, New York.

References:

1. Juuti, P., Tapio S. K., and Vuorinen H., Environmental History of Water: Global Views on Community Water Supply and Sanitation, IWA Publishing (Intl Water Assoc).
2. Winbald, U., and Simpson-Hebert, M., Ecological Sanitation, SEI, Stockholm, Sweden.
3. Kadlec R.H. and Wallace S.D., Treatment Wetlands, CRC Press, Boca Raton
4. Wastewater Engineering – Treatment and Reuse, Metcalf and Eddy, Tata McGraw Hill

DEPARTMENT OF CIVIL ENGINEERING

POOL 3
SOIL MECHANICS

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CEHN09	Rock Mechanics	PC	30	70	100	4	0	0	4
2	R20CEHN10	Geotechnical Exploration and Instrumentation	PC	30	70	100	4	0	0	4
3	R20CEHN11	Soil Dynamics And Machine Foundations	PC	30	70	100	4	0	0	4
4	R20CEHN12	Earth And Rockfill Dams	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
CODE: R20CEHN09	ROCK MECHANICS						

COURSE OBJECTIVES:

- To know about scope and problems of Rock Mechanics.
- To understand rock classification, rock coring, laboratory testing of rocks.
- To understand deformation characteristics of rocks, permeability characteristics.
- To know about mechanical, thermal and electrical properties of rock mass.
- To know about bearing capacity of homogeneous as well as discontinuous rocks.

COURSE OUTCOMES: At the end of the course the student will be able to:

CO 1: Students should be conversant with scope and problems of Rock Mechanics

CO 2: Students should be exposed with Rock exploration, laboratory testing etc

CO 3: Student should be conversant with Deformation characteristics of rocks.

CO 4: Student should be conversant with mechanical, thermal and electrical properties of rock mass.

CO5: Student should be conversant with Rock mechanics application, bearing capacity of homogeneous as well as discontinuous rocks, Rock bolting plastic mechanics.

SYLLABUS:

UNIT I

Engineering Classification of Rocks: Classification of intact rocks, Rock mass classifications, Rock Quality Designation (RQD), Rock Structure Rating (RSR), Rock Mass Rating (RMR), Norwegian Geotechnical Classification (Q-system), Strength and modulus from classifications, Classification based on strength and modulus and strength and fracture strain, Geoengineering classification.

UNIT II

Deformation characteristics of rocks, instrumentation and measurement of deformation of rocks. Permeability characteristics, interstitial water on rocks, unsteady flow of water through jointed rock mass.

UNIT III

Strength, Modulus and Stresses-Strain Responses of Rocks: Factors influencing rock response, Strength criteria for isotropic intact rocks, Modulus of intact rocks, effect of confining pressure,

Uniaxial Compressive strength, Strength criteria for intact rocks, Strength due to induced anisotropy in rocks,. Stress Strain Models: Constitutive relationships, Elastic, Elasto-plastic, Visco-elastic, Elasto-viscoplastic stress-strain models.

UNIT IV Introduction to Rock Slopes: Introduction to Rock slopes, Modes of failure, Rotational failure, Plane failure, Design charts, Wedge method of analysis, Buckling failure, Toppling failure, Improvement of slope stability and protection.

UNIT V Bearing capacity of homogeneous as well as discontinuous rocks. Support pressure and slip of the joint. Delineation of types of rock failure. Unsupported span of underground openings, pillars. Rock slopes.

TEXT BOOKS:

1. Central Board of Irrigation and Power - Manual on Rock Mechanics, 1988.
2. R. E. Goodman, "Introduction to Rock Mechanics" John Wiley & Sons, New York, 1989.
3. Wakter Wittke, "Rock Mechanics" Springer Verlag, New York, 1990.

REFERENCE BOOKS:

1. Kiyoo Mogi "Experimental Rock Mechanics" Taylor & Francis Group, UK, 2007.
2. T. Ramamurthy, "Engineering in Rocks for slopes, foundations and tunnels", PHI Learning Pvt. Limited, 2010.

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
CODE: R20CEHN10	GEOTECHNICAL EXPLORATION AND INSTRUMENTATION						

COURSE OBJECTIVES:

- To learn about objects and stages of site investigation; types of samples and samplers.
- To know about the different boring methods.
- To impart knowledge about standard penetration test, static and dynamic cone penetration tests, in-situ vane shear test, geophysical exploration methods.
- To know about plate load test, pressure meter test, piezometer, slope inclinometer.
- To learn about location of ground water table, offshore exploration; preparation of site investigation report.

COURSE OUTCOMES: At the end of the course the student will be able to:

CO1: Students would be able to identify the objects of site investigation; and describe the use of different types of samples and samplers.

CO2: Students would understand the process of soil exploration by different boring methods.

CO3: Students shall be able to perform standard penetration test, static and dynamic cone penetration tests, in-situ vane shear test, and geophysical exploration methods.

CO4: Students will be capable of carrying out plate load test, pressure meter test; using piezometer, slope inclinometer.

CO5: Students would be locate to able to locate ground water table, perform offshore exploration, and prepare site investigation report.

Detailed syllabus:

UNIT I

Introduction: Soil Formation, types of soils, physical and biological weathering, soil transport, deposition and stratification phenomena and Soil Classification.

UNIT II

Soil Exploration: Soil Exploration Programme for different Civil Engineering Projects Exploration Methods: Methods of Boring, Augering and Drilling. Machinery used for drilling, types of augers and their usage for various projects.

UNIT III

Soil Sampling: sampling methods, types of samples, storage of samples and their transport. Sample preparation, sample sizes, types of sampler's specifications for testing.

UNIT IV

Borehole Logging: Logging of Boreholes-logging methods- Ground water observations – water table fluctuations and effects - Preparation of soil profiles - calculations

Field testing of soils: methods and specifications – visual identification tests, vane shear test, penetration tests, analysis of test results.

UNIT V

Report writing: Soil exploration Reports- identification, calculations and preparation. Field Instrumentation: Rollers, Pressure meters, Piezometer, Pressure cells, Sensors, Inclometers, Strain gauges etc.

TEXT BOOKS:

1. J. E. Bowles, "Foundation Analysis and Design", McGraw Hill Companies, 1997.
2. M. D., Desai, "Ground Property Characterization from In-Situ Testing", Published by IGS-Surat Chapter, 2005.

REFERENCE BOOK

1. M. J., Hvorslev, "Sub-Surface Exploration and Sampling of Soils for Civil Engineering Purposes", US Waterways Experiment Station, Vicksburg, 1949.

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
CODE: R20CEHN11	SOIL DYNAMICS AND MACHINE FOUNDATIONS						

COURSE OBJECTIVES:

- Understand the fundamental concepts of Theory of vibration and the various terminology encompassed to study the behavior of soils due to the effects of dynamic loads.
- To recognize phenomenon of Vibration Isolation & assess the nature of wave propagation through soil.
- To study about the dynamic soil properties & their determination by field and laboratory tests & create an understanding about the general principles of analysis and design of machine foundation.
- To familiarize with the methods of analysis of dynamic earth pressure & dynamic bearing capacity of shallow foundations.
- To study the phenomenon of liquefaction and anti-liquefaction measures.

COURSE OUTCOMES: At the end of the course the student will be able to:

CO 1: Develop basic knowledge in machine vibrations.

CO 2: Familiarize with dynamic properties of soil.

CO 3: Demonstrate the ability to design machine foundations.

CO 4: Demonstrate the ability to design foundations for Reciprocating and impact machines.

CO 5: To study the phenomenon of liquefaction and anti-liquefaction measures.

SYLLABUS:

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, Natural frequency of foundation soil system -Barkan's and IS methods – Pressure bulb concept

UNIT-II

Wave propagation and dynamic soil properties:

Elastic waves in Rods – Waves in elastic Half space, Field and Laboratory methods of determination – Uphole, Down hole and Cross hole methods – Cyclic plate load test – Block vibration test.

UNIT-III

Machine foundations:

Design criteria, Permissible amplitudes and Bearing pressure, Degrees of freedom - Analysis under different modes of vibration of block foundation.

UNIT-IV

Design of foundations for reciprocating and impact machines:

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-V

Liquefaction of foundation soils:

Factors affecting liquefaction& anti-liquefaction measures, criterion for partial and complete liquefaction, mechanism of liquefaction, Field conditions for soil liquefaction, Standard curves & correlations for liquefaction, Evaluation of zone of liquefaction in field, Evaluation of liquefaction potential using SPT

TEXTBOOKS:

1. Bharath Bhusan Prasad, “Soil Dynamics and Earthquake Engineering”, PHI, New Delhi, 2009.
2. S. Prakash, “Soil Dynamics”, McGraw Hill Book Co., New York, 1999

REFERENCE BOOK

1. S. Prakash and V. K. Puri, “Analysis and Design of Machine Foundations”, McGraw Hill Book Co., New York, 1993
2. P. Sreenivasulu and C. V. Vidyanathan, “Hand Book of Machine Foundation”, Tata McGraw Hill, New Delhi, 1981.

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HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
CODE: R20CEHN12	EARTH AND ROCKFILL DAMS						

COURSE OBJECTIVES:

- To know about aims of stability analysis, natural slopes and its stability, man-made slopes, Geomorphology and Slopes, Types of Slope movement and Landslides.
- To analyse stability of slope by Fellinius method, Bishop’s method and Morgestern-Price methods, Variation approach, Statistical and Probabilistic analysis.
- To know about effect of ground water table i.e. Seepage force, hydrostatic force, Excess Pore water pressures, Progressive failure of Slopes, Seismic and Blast vibration effect on slope. Embankment and earth rock dams.
- To be exposed to rock slope Stability i.e. behavior of rock slope in presence of structural discontinuities, weak and fragmented rock, rock mass rating.
- To be conversant with Slope Protection measures like Drum- debris walls, Geo-textiles and Geo-membranes, Geo-grids and Gabions, Re-vegetation mats, Braced coffer dams – walls and supports, bottom heave and piping, Cellular coffer dams, Cantilever sheet pile walls, Anchored Bulkheads with Free and Fixed Earth supports, Rowe’s moment reduction method and Modified equivalent Beam method, Bulkhead anchorages, Failures in Anchored Bulkheads.

COURSE OUTCOMES: At the end of the course the student will be able to:

CO 1: Student shall be exposed to aims of stability analysis, natural slopes and its stability man Made slopes, Geomorphology and Slopes, Types of Slope movement and Land slides

CO 2: Student shall be analyze stability of slope by Fellinius method, Bishop’s method and Morgenstern-Price methods, Variation approach, Statistical and Probabilistic analysis.

CO 3: Student should know about effect of ground water table i.e. Seepage force, hydrostatic force, Excess Pore water pressures, Progressive failure of Slopes, Seismic and Blast vibration effect on slope. Embankment and earth rock dams.

CO 4: Student shall be exposed to rock slope Stability i.e. behavior of rock slope in presence of structural discontinuities, weak and fragmented rock, rock mass rating.

CO 5: Student shall be conversant with Slope Protection measures like Drum- debris walls, Geo-

textiles and Geo-membranes, Geo-grids and Gabions, Re-vegetation mats, Braced coffer dams – walls and supports, bottom heave and piping, Cellular coffer dams, Cantilever sheet pile walls, Anchored Bulkheads with Free and Fixed Earth supports, Rowe’s moment reduction method and Modified equivalent Beam method, Bulkhead anchorages, Failures in Anchored Bulkheads.

SYLLABUS:

UNIT I

Introduction: - Stability of Slopes, Aims of Slope Analysis, Natural Slopes and their stability, Man-made Slopes, Geomorphology and Slopes, Types of Slope movement and Landslides.

UNIT II

Methods of Analysis: - Fellenius method, Bishop’s method and Morgenstern-Price methods, Variational approach, Statistical and Probabilistic analysis.

UNIT III

Effect of ground water table :- Seepage force, hydrostatic force, Excess Pore water pressures, Progressive failure of Slopes, Seismic and Blast vibration effect on slope. Embankment and Earth - rock dams

UNIT IV

Rock slope Stability: - Behavior of rock slope in presence of structural discontinuities, Weak and fragmented rock, Rock Mass rating. Case studies of Slope failure. Slope Protection: - Drum- debris walls, Geo-textiles and Geo-membranes, Geo-grids and Gabions, Revegetation mats.

UNIT V

Coffer dams: - Braced coffer dams – walls and supports, bottom heave and piping. Sheet Piles: - Cantilever sheet pile walls, Anchored Bulkheads with Free and Fixed Earth supports, Rowe’s moment reduction method and Modified equivalent Beam method, Bulk head anchorages, Failures in Anchored Bulkheads.

TEXT BOOKS:

1. Sherard, et.al. “EARTH AND ROCK DAMS”, John Wiley Inc..1963.
2. H. D. Sharma, “Embankment dams”, Oxford and IBH Publishing Co...1991.

REFERENCE BOOK:

1. Bharath Singh and R. S. Varshney, “engineering for embankment dams” A. A. Balekema publications, 1995.

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POOL 4
TRANSPORTATION ENGINEERING

S.NO	CODE	SUBJECT	CAT. CODE	INTERNAL	EXTERNAL	TOTAL MARKS	L	T	P	CREDITS
1	R20CEHN13	Highway Traffic Analysis and Design	PC	30	70	100	4	0	0	4
2	R20CEHN14	Pavement Analysis and Design	PC	30	70	100	4	0	0	4
3	R20CEHN15	Transportation Systems	PC	30	70	100	4	0	0	4
4	R20CEHN16	Road Transport Management and Economics	PC	30	70	100	4	0	0	4

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
CODE: R20CEHN13	HIGHWAY TRAFFIC ANALYSIS AND DESIGN						

COURSE OBJECTIVES:

- To study about Highway traffic analysis and design concepts in Highway Engineering.

COURSE OUTCOMES: At the end of the course the student will be able to:

CO 1: Understand about various Elements of Traffic Engineering.

CO 2: Understand about various Traffic flow studies.

CO 3: Understand about elements of design.

CO 4: Understand about Traffic regulation and control studies.

CO 5: Understand about Grade separate interactions.

SYLLABUS:

UNIT-I

Elements of Traffic Engineering - road user, vehicle and road way. Vehicle characteristics - IRC standards - Design speed, volume. Highway capacity and levels of service - capacity of urban and rural roads - PCU concept and its limitations - Road user facilities - Parking facilities - Cycle tracks and cycle ways - Pedestrian facilities.

UNIT-II

Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, Parking studies, Accident studies.

UNIT-III

Elements of design - Alignment - Cross sectional elements - Stopping and passing sight distance. Horizontal curves - Vertical curves. Design problems – Hill Roads.

UNIT-IV

Traffic regulation and control - Signs and markings - Traffic System Management - Design of at-grade intersections – Principles of design – Channelization - Design of rotaries - Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination.

UNIT-V

Grade separated intersections - Geometric elements for divided and access controlled highways and expressways – Road furniture - Street lighting. Traffic Safety – Principles and Practices – Road Safety

Audit.

TEXT BOOKS:

1. ITE Hand Book, Highway Engineering Hand Book, Mc Graw – Hill
2. AASHTO A Policy on Geometric Design of Highway and Streets

REFERENCE BOOKS:

1. R. J. Salter and N. B. Hounsel, Highway Traffic Analysis and Design, Macmillan Press Ltd, 1996.

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
CODE: R20CEHN14	PAVEMENT ANALYSIS AND DESIGN						

COURSE OBJECTIVES:

- To study about pavement analysis and design concepts in Highway Engineering.

COURSE OUTCOMES: At the end of the course the student will be able to:

CO 1: Understand about various Traffic Pavements.

CO 2: Understand about Pavement Design Factors.

CO 3: Understand about Flexible Pavement Design concepts.

CO 4: Understand about Rigid Pavement Design concepts.

CO 5: understand about Pavement Management concepts.

SYLLABUS:

UNIT-I

Introduction: Types and component parts of pavements, Factors affecting design and performance of pavements. Highway and airport pavements, functions of pavement components

UNIT-II

Pavement Design Factors: Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads, aircraft loading, gear configuration and tyre pressure. Drainage – Estimation of flow, surface drainage, sub-surface drainage systems, design of sub-surface drainage structures

UNIT-III

Flexible Pavement Design: Empirical, semi-empirical and theoretical approaches, design of highway and airport pavements by IRC, AASHTO Methods, applications of pavement design software

UNIT-IV

Rigid Pavement Design: Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and airports as per IRC, AASHTO, design of joints. Design of continuously reinforced concrete pavements. Reliability; Use of software for rigid pavement design

UNIT-V

Pavement Management: Pavement failures, maintenance of highways, structural and functional condition evaluation of pavements, pavement management system.

TEXT BOOKS:

1. Yoder and Witczak, Principles of Pavement Design, John Wiley and Sons
2. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc
3. Relevant IRC Codes

REFERENCE BOOKS:

1. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group)
2. W.Ronald Hudson, Ralph Haas and Zeniswki , Modern Pavement Management, Mc Graw Hill and Co.

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
CODE: R20CEHN15	TRANSPORTATION SYSTEMS						

COURSE OBJECTIVES:

- To study about Road development systems in INDIA.
- To know about Railways, Air ways, Water ways.
- To know about urban transportation systems.

COURSE OUTCOMES: At the end of the course the student will be able to:

CO 1: understand about Road development systems in INDIA

CO 2: understand about Railway planning.

CO 3: understand about Airport planning.

CO 4: understand about Planning of Harbors and ports

CO 5: understand about urban transportation systems

SYLLABUS:

UNIT-I

Historical development of transport in India - 20 year Road Plans, National Transport Policy Recommendations, IRC, CRRI, Vision 2021, NHDP, PMGSY. Characteristics of different modes of transport and their integration and interactions - impact on environment.

UNIT-II

Planning of railway - Passenger and goods terminals - layout - passenger facilities - traffic control.

UNIT-III

Airport Planning, requirements and components. Design of runway and taxiway - Apron - parking configuration - terminal requirements - Airport marking and lighting - Air traffic control.

UNIT-IV

Planning of Harbors and ports - cargo handling - Containerization - Navigation aids - Inland waterways - Pipeline transportation.

UNIT-V

Urban transportation systems - Mass rapid transit system - Light rail transit - Personal rapid transit, guided way systems, cabin taxi, dual mode bus - Para transit systems - Demand responsive system - Intermediate public transport.

TEXT BOOKS:

1. Paquette, R.J., et al, Transportation Engineering Planning and Design, John Wiley & Sons, New York, 1982.

REFERENCE BOOKS:

1. Alan Black, Urban Mass Transportation Planning, McGraw-Hill, 1995.

DEPARTMENT OF CIVIL ENGINEERING

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
CODE: R20CEHN16	ROAD TRANSPORT MANAGEMENT AND ECONOMICS						

COURSE OBJECTIVES:

- To study about Road Transport Management and Economics

COURSE OUTCOMES: At the end of the course the student will be able to:

CO 1: understand about Motor Vehicles Act

CO 2: understand about Depots and Terminals.

CO 3: understand about Transportation cost analysis concepts.

CO 4: understand about Economic analysis of projects

CO 5: understand about Financing of road projects

SYLLABUS:

UNIT-I

Motor Vehicles Act - statutory provision for road transport and connected organizations. Route scheduling, Freight transport, Vehicle scheduling, Optimum fleet size, Headway control strategies, Crew scheduling.

UNIT-II

Depots and Terminals - Principles and types of layout, Depot location, Twin depot concept, Crew facilities. Design of parking facilities – Bus terminal, bus stops and bus bays

UNIT-III

Transportation costs - Supply and demand - elasticity of demand; Supply of transport services - Economics of traffic congestion - Pricing policy. Vehicle operating costs - Fuel costs - Maintenance and spares - Depreciation - Crew costs - Value of travel time savings - Accident costs.

UNIT-IV

Economic analysis of projects - Methods of evaluation - Cost-benefit ratio, first year rate of return, net present value, and internal-rate of return methods; Indirect costs and benefits of transport projects.

UNIT-V

Financing of road projects - methods – Private Public Partnership (PPP) - Toll collection - Economic viability of Build-Operate-Transfer Schemes – Risk Analysis - Case Studies.

TEXT BOOKS:

1. Winfrey, Economic analysis for Highways, International Textbook Company, Pennsylvania, 1969.
2. CRRI, Road User Cost Study in India, New Delhi, 1982

REFERENCE BOOKS:

1. IRC, Manual on Economic Evaluation of Highway Projects in India, SP30, 2007