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)

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(AUTONOMOUS)

Kotappakonda Road, Yellamanda (Post), Narasaraopet – 522601, Guntur District, AP

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**

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, imbibing 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.

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, and 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.
- 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 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. He/she can start doing the course from II Year I semester and submit the MOOCs certificate before the commencement of the end examinations of IV year I SEM. The student shall register for the course (Minimum of 8 weeks) offered by SWAYAM/NPTEL/ Any other reputed organization, through online with the approval of Head of the Department. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only after submission of the certificate.

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 4^{th} semester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2^{nd} semester without any backlogs. In case of the declaration of the 3^{rd} semester results after the commencement of the 4^{th} 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 and 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 acquired 8 SGPA (Semester Grade point average) up to the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA 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 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.

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.

$$SGPA = \Sigma (C_i \times G_i) / \Sigma C_i$$

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.

$$CGPA = \Sigma (C_i \times S_i) / \Sigma C_i$$

Where 'Si' 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:

Equivalent Percentage = (CGPA – 0.75) x 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
FAIL	< 4.75

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.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT INEXAMINATIONS

➢ 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**
	If the candidate:	
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
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.
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	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.

	representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair 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 6to 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 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.

- 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.
- TheCommunity 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
- 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

R20 COURSE STRUCTURE

B.TECH I YEAR – I SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Engineering Chemistry	**BS**	30	70	100	3	0	0	3
2	Linear Algebra and Calculus	**BS**	30	70	100	2	1	0	3
3	Technical and Communicative English-I	**HS**	30	70	100	3	0	0	3
4	Engineering Mechanics	**ES**	30	70	100	2	1	0	3
5	Problem Solving Using C	**ES**	30	70	100	3	0	0	3
6	Soft skills and Communication Skills Lab-1	**HS**	15	35	50	0	0	3	1.5
7	Engineering Chemistry Lab	**BS**	15	35	50	0	0	3	1.5
8	Problem Solving Using C - Lab	**ES**	15	35	50	0	0	3	1.5
Total									19.5

B.TECH I YEAR – II SEMESTER

S.No	SUBJECT NAME	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
1	Differential Equations and Vector Calculus	BS	30	70	100	2	1	0	3
2	Engineering Physics	BS	30	70	100	3	0	0	3
3	Engineering Drawing	ES	30	70	100	1	0	4	3
4	Elements of Mechanical and Ele. and Engg.	ES	30	70	100	3	0	0	3
5	Elements of Building Science	ES	30	70	100	3	0	0	3
6	Elements of Mechanical and Ele. and Engg Lab	ES	15	35	50	0	0	3	1.5
7	Engineering Physics Lab	BS	15	35	50	0	0	3	1.5
8	Engineering Workshop	ES	15	35	50	0	0	3	1.5
9	Constitution of India(MC)	MC	15	35	50	2	0	0	0
	Total								**19.5**

B.TECH II YEAR – I SEMESTER

S.No	SUBJECT NAME	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
1	Numerical Methods and Transformations	BS	30	70	100	2	1	0	3
2	Fluid Mechanics	PC	30	70	100	2	1	0	3
3	Building Materials and Building Construction	PC	30	70	100	3	0	0	3
4	Surveying and Geomatics	PC	30	70	100	2	1	0	3
5	Mechanics of Solids	PC	30	70	100	2	1	0	3
6	Engineering Surveying Laboratory	PC	15	35	50	0	0	3	1.5
7	Computer Aided Building Drafting Laboratory	PC	15	35	50	0	0	3	1.5
8	Mechanics of Solids Laboratory	PC	15	35	50	0	0	3	1.5
9	Building Planning and Drawing	SOC	15	35	50	0	0	4	2
10	Environmental Studies	**MC**	100		100	3	0	0	0
Total						**21.5**			

B.TECH II YEAR – II SEMESTER

S.No	SUBJECT NAME	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
1	Structural Analysis –I	ES	30	70	100	2	1	0	3
2	Engineering Geology	PC	30	70	100	3	0	0	3
3	Hydraulics and Hydraulic Machinery	PC	30	70	100	2	1	0	3
4	Concrete Technology	PC	30	70	100	3	0	0	3
5	Technical and Communicative English-II	HS	30	70	100	3	0	0	3
6	Fluid Mechanics and Hydraulic Machinery Laboratory	PC	15	35	50	0	0	3	1.5
7	Engineering Geology Laboratory	PC	15	35	50	0	0	3	1.5
8	Concrete Technology Laboratory	PC	15	35	50	0	0	3	1.5
9	Computer-aided Civil Engineering Drawing	SC	15	35	50	1	0	2	2
Total						**21.5**			

B.TECH III YEAR – I SEMESTER

S.No	SUBJECT NAME	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
1	Structural Analysis –II	ES	30	70	100	3	0	0	3
2	Basics in Design of Reinforced Concrete Structures	PC	30	70	100	3	0	0	3
3	Soil Mechanics	PC	30	70	100	3	0	0	3
4	**Open Elective Course/Job Oriented Elective - I**	OE	30	70	100	3	0	0	3
5	**Professional Elective Course-1** Irrigation and Water Resources Engineering Environmental Pollution and Control Ground Improvement Techniques Photogrammetry and Remote Sensing	PE	30	70	100	3	0	0	3
6	Soil Mechanics Laboratory-1	PC	15	35	50	0	0	3	1.5
7	Field Work with Digital Technologies	PC	15	35	50	0	0	3	1.5
8	STAAD PRO Software	SC	15	35	50	0	0	3	1.5
9	PE and HV (MC)	MC				1	0	2	2
10	Internship/Practical Training/Mini Project	PR	15	35	50	2	0	0	0
11	Honors / Minor Courses	HC	30	70	100	4	0	0	4
Total						**21.5**			

B.TECH III YEAR – II SEMESTER

S.No	SUBJECT NAME	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
1	Design of Steel Structures	ES	30	70	100	3	0	0	3
2	Transportation Engineering	PC	30	70	100	3	0	0	3
3	Environmental Engineering	PC	30	70	100	3	0	0	3
4	**Open Elective Course/Job Oriented Elective - II**	OE	30	70	100	3	0	0	3
5	**Professional Elective Course-II** Advanced Design of Concrete Structures Water Resource System Planning and Development Foundation Engineering Building Information Modelling	PE	30	70	100	3	0	0	3
6	Transportation Engineering Laboratory	PC	15	35	50	0	0	3	1.5
7	Environmental Engineering Laboratory	PC	15	35	50	0	0	3	1.5
8	Soil Mechanics Laboratory-2	PC	15	35	50	0	0	3	1.5
9	Advanced Communication Skills	SC	15	35	50	1	0	2	2
10	Essence of Indian Traditional Knowledge (MC)	MC				2	0	0	0
Total						**21.5**			

B.TECH IV YEAR – I SEMESTER

S.No	SUBJECT NAME	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
1	**Professional Elective Course-III** Prestressed Concrete Smart City Planning and Development Advanced Design of Steel Structures Alternate Construction Technology	PE	30	70	100	3	0	0	3
2	**Professional Elective Courses - IV** Construction Technology and Management Bridge Engineering Repair and Rehabilitation of Structures Advanced Design of Steel Structures	PE	30	70	100	3	0	0	3
3	**Professional Elective Courses - V** Estimation Specifications and Costing Earthquake Resistant Design Road Safety Engineering Ground Water Hydrology	PE	30	70	100	3	0	0	3
4	**Open Elective Course/Job Oriented Elective - III**	OE	30	70	100	3	0	0	3
5	**Open Elective Course/Job Oriented Elective - IV**	OE	30	70	100	3	0	0	3
7	Business Management Concepts for Engineering/Entrepreneurship and Innovations	HS	15	35	50	3	0	0	3
8	E-Tabs	SC	15	35	50	1	0	2	2
9	Industrial/Research Internship	PR	15	35	50	0	0	0	3
10	Honors/Minor Courses (MOOCS)	HC				4	0	0	0
Total						**23**			

B.TECH IV YEAR – II SEMESTER

S.No	SUBJECT NAME	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
1	Major Project	PR	60	140	200	0	0	0	12
Total						12			
Credits Grand Total						160			

LIST OF HONORS

POOL 1 :(Structures Stream)

S.No	Subject	Cat Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Advanced Structural Analysis	PC	30	70	100	4	0	0	4
2	Advanced Design of Concrete Structures	PC	30	70	100	4	0	0	4
3	Earthquake Resistance Design	PC	30	70	100	4	0	0	4
4	Design of Prestressed Concrete	PC	30	70	100	4	0	0	4

POOL 2 :(Environmental Stream)

S.No	Subject	Cat Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Air Pollution and Control	PC	30	70	100	4	0	0	4
2	Advanced Environmental	PC	30	70	100	4	0	0	4
3	Solid Waste Management	PC	30	70	100	4	0	0	4
4	Rural Water Supply And Sanitation	PC	30	70	100	4	0	0	4

LIST OF MINORS

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

LIST of SOC

S.No	Subject	Year	Semester
1	Building Materials And Construction Technology Lab	**II**	**I**
2	Advanced Surveying	**II**	**II**
3	Staad Pro	**III**	**I**
4	Water Related Leakage Field Studies	**III**	**II**
5	Computer Aided Construction Management	**IV**	**I**

I B.Tech I Semester

R20 – REGULATIONS

B.Tech I Year – I Semester

S.No.	CODE:	SUBJECT NAME	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
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-1	15	35	50	0	0	3	1.5
7	R20CC11L5	Engineering ChemistryLab	15	35	50	0	0	3	1.5
8	R20CC11L2	Problem Solving Using CLab	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 watercharacteristics–Softening of water by external treatment methods (Lime soda process, Zeolite andIon exchange process)–Numerical problems on lime soda process–Desalination of brackish water (Reverse osmosis and Electrodialysis).

Water analysis techniques: Alkalinity–hardness (Complexo-metric)–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 ofcoal–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. Shikha Agarwal, "**Engineering Chemistry**", ISBN 1107476410, 2nd Edition, Cambridge University Press, New Delhi, (2019).
2. O.G. Palana, "**Engineering Chemistry**", ISBN 0070146101, Tata McGraw Hill Education Private Limited, New Delhi, (2009).
3. 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. Sesha 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=H1Y1oxQ5eUAandt=627s
3. URL: https://www.youtube.com/watch?v=1xWBPZnEJk8
4. URL: https://www.youtube.com/watch?v=p9yPXdT0k48andt=225s
5. URL: https://www.youtube.com/watch?v=xb_xndPe4n0andt=390s

E-Books:

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

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 Jordon 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 DIFFERENTION: (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.

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 questionsand summarize it **(Apply-3).**

CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer informationinto 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**

a. **Listening** : Dialogues, Task based listening activities.

b. **Speaking** : Asking and answering general questions.

c. **Reading** : Skimming, Scanning.

d. **Writing** : Punctuations, Paragraphs.

e. **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 verbaltechniques.

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,

Word 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=EAIaIQobChMIpr-F5OzH7QIVChsrCh1kBAkzEAMYASAAEgINpfD_BwE
11. https://www.myenglishpages.com/site_php_files/reading.php
12. https://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/

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: **Analyz**e 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 aForce, Force system, classification, Resultant of Force Systems, parallelogram law of forces, Trianglelaw 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 S.Timoshenko and D.H.Young., 4th Edn - ,Mc Graw Hill publications.

2. Engineering Mechanics by S.S. Bhavikatti-New age publications

3. Engineering Mechanics Statics and Dynamics A.K.TAYAL Umesh publications.

REFERENCE BOOKS:

1. Engineering Mechanics by Fedinand . L. Singer , Harper –Collins.

2. Mechanicsof Materials (In Si Units) by Beer and Johnson, Tata McGraw-Hil.

3. Strengthof Materials (Mechanics of Materials) by James M.Gere and Barry J.Goodno, PWS-KENT Publishing Company, 1990

4. Strengthof 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/

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. 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
4. http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf

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 (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

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

UNIT–II

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

UNIT–III

a. Situational Dialogues (Inviting, Accepting and Declining Invitations)
b. Listening - TEDx Talks (https://www.youtube.com/watch?v=IgAnj6r1O48)
c. JAM

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:

"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:

i) Develop a calculator to convert time, distance, area, volume and temperature from one unit to another.

ii) Calculate simple and compound interest for various parameters specified by the user.

iii) Calculate the average of n numbers.

EXERCISE 2

a) 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.

b) Write a C Program to find the largest of three numbers using ternary operator.

c) Write a C Program to swap two numbers without using a temporary variable.

EXERCISE 3

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

b) Write a C program, which takes two integer operands and one operator form the user,performs the operation and then prints the result. Consider the operators +,-,*, /, % and use Switch Statement.

EXERCISE 4

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.

b) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

EXERCISE 5

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.

b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.

c) Write a C Program to check whether the given number is Armstrong number or not.

EXERCISE 6

a) Write a C program to interchange the largest and smallest numbers in the array.

b) Write a C program to input two m x n matrices, check the compatibility and perform Addition and multiplication of them.

EXERCISE 7

a) Write a C Program to find sum of following series for a given n value.

i. 1+(1+2)+(1+2+3)+(1+2+3+4)+(1+2+3+4+5)+...+(1+2+...+n).

ii. 1+(2+2)+(3+3+3)+(4+4+4+4)+…+(n+n+n+n..+n).

b) Write a C Program to display following patterns for a given n value

i.1

2 2

3 3 3 if n =3

i. 1

2 2

3 3 3

2 2

1 if n=3.

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. Reema Thareja, "Programming in C", OXFORD.
2. 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.

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 Stalagnometer

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, Thosmas 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

B. Tech I Year II Semester

S.No	CODE	SUBJECT NAME	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
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 Ele. and Engg.	30	70	100	3	0	0	3
5	R20CE1216	Elements of Building Science	30	70	100	3	0	0	3
6	R20CC12L6	Elements of Mechanical and Ele. and Engg 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	R20CCMC2	Constitution of India(MC)	15	35	50	2	0	0	0
		Total							**19.5**

I B.TECH-II-SEMESTER	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:

1. To formulate and solve first order ordinary differential equations.
2. To solve second order differential equations of various kinds.
3. To find the solution of first order linear and non-linear partial differential equations.
4. 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:

Linear-Bernoulli‟s-Exact equations and equations reducible to exact form. (10 hours)

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. B.S. Grewal, "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2012.
2. B.V.Ramana, "Higher Engineering Mathematics", 32nd Edition, McGraw Hill Education, 2018.
3. 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.

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 thin films, Diffraction grating and Polarization in various fields. **(Remember) K1**

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

K4CO 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. A.J. Dekker, "Solid state Physics", ISBN 10: 0333918339 / ISBN 13: 9780333918333, Mc Millan India Ltd, First edition, 2000.
2. M.N. Avadhanulu and P.G. Kshirasagar, "A text book of Engineering Physics", ISBN 81-219-0817-5, S. Chand publications, First Edition, 2011.

3. P. K. Palanisamy, "Engineering Physics", ISBN: 9788183714464, Scitech Publishers, 4th Edition, 2014
4. M.R. Srinivasan, "Engineering Physics", ISBN978-81-224-3636-5, New Age international publishers, 2nd Edition,2014

REFERENCE BOOKS:

1. Charles Kittle, "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.
4. Sanjay D Jain and Girish G Sahasrabudhe "Engineering Physics", University Press ISBN: 8173716781, 1st edition, 2010.
5. 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

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)**						

COURCE 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 N.D. Butt, Chariot Publications.

2. Engineering Drawing by K.L.Narayana and P. Kannaiah, 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

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 behaviour 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-Performancecharacteristics-1-phase Induction motor working principle-applications

TEXT BOOKS:

1. Mechanical Engineering Science K R Gopala Krishna, Subhas publications.
2. Elements of Mechanical Engineering, M.L. Mathur, F.S.Metha and R.P.Tiwari; Jain Brothers Publications, 2009.
3. D.P.Kothari, I.J.Nagrath, Basic Electrical and Electronics Engineering, 1stedition, McGraw Hill Education (India) Private Limited, 2017.
4. B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, 1stedition, 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.
3. S.K.Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2011.
4. 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

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 – Damp proofing.

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. S.C.Rangwala, K.S. Rangwala and P.S. Rangwala [2012], *Engineering materials,* Charotar Publishers, Anand.

2. Dr. B.C. Punmia [2008], *Building construction*, Laxmi Publications (P) Ltd., New Delhi.

3. Dr. N. Kumara Swamy and A. KameswaraRao [2012], *Building Planning and Drawing,* Charotar Publishers, Anand.

4. 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	3	15	35	50	1.5
CODE: R20CC12L6	**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

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 controlmethod.
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 comparesthe 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.Book links).

2. Physics Practical Manual, Lorven Publications

3. S. Balasubramanian , M.N. Srinivasan " A Text book of Practical Physics"- S Chand Publishers, 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

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 weekincludes:- 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
	3	0	0	40+40+20		100	MC(0)
CODE:R20CCMC1	**ENVIRONMENTAL STUDIES (Common to all Branches)**						

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.

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 and Environment.

Forest resources: Use and over–exploitation, deforestation.

Mineral resources: Use and exploitation, tribal and 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 ofsustainable 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.

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. AnubhaKaushikand C. P. Kaushik, Environmental Studies,NewAge International (P) Ltd., New Delhi. Fourth edition, 2014.

2. P. N. Palanisamy, P. Manikandan, A. Geetha, and K. ManjulaRani,Environmental Studies,Pearson Education, Chennai.ISBN 978-93-325-2052-3,Secondedition-2014.

REFERENCE BOOKS:

1. Deekshita Dave and P. UdayaBhaskar, Text Book of Environmental Studies CengageLearning.
2. Shaashi Chawla, A Textbook on Environmental Studies, TMH, New Delhi.
3. Benny Joseph Environmental Studies, Tata McGraw Hill Co, NewDelhi.
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 Studies5JM1G2
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 willfocus on the concept of ecosystem services
7. URL: http://mocomi.com/ presents: What is Air Pollution? Air pollution is the introduction offoreign products into the atmosphere.

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 - I SEMESTER

II B. Tech II Year I Semester

S.No	CODE	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	C
1	R20CC2101	Numerical Methods and Transformation	BS	30	70	100	3	0	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	SOC	15	35	50	1	0	2	2
10	R20CC21MC1	Environmental Studies	MC	100		100	3	0	0	0
Total Credits										**21.5**

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	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, 9thEditiwiley-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 no 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-Poiseulle 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 Publishers

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 Lame'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

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, Ist 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 LABORATORY							

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 bricks
14. Determination of water absorption of bricks

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

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.

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 LABORATORY							

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.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE:R20CE21SC1	1	0	2		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 beable 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, oral 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 ENGINEERINGMATERIALS

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

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE:R20CC21MC1	3	0	0	40+40+20		100	0
ENVIRONMENTAL STUDIES							

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.

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
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

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	CC	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 Machines	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 Mechanic 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	SOC		50	50	1	0	2	2
	Total Credits									**21.5**

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/

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

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
3. Publishers, New Delhi.
4. Mechanics of Structures Vol – II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
5. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt. Ltd.
6. Structural Analysis: A Matrix Approach, G.S.Pandit and S.P.Gupta, Mc Graw Hill Pvt. Ltd.

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.

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 MACHINES							

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.

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.

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.

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

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
CODE: R20CE22SC1	1	0	2		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.