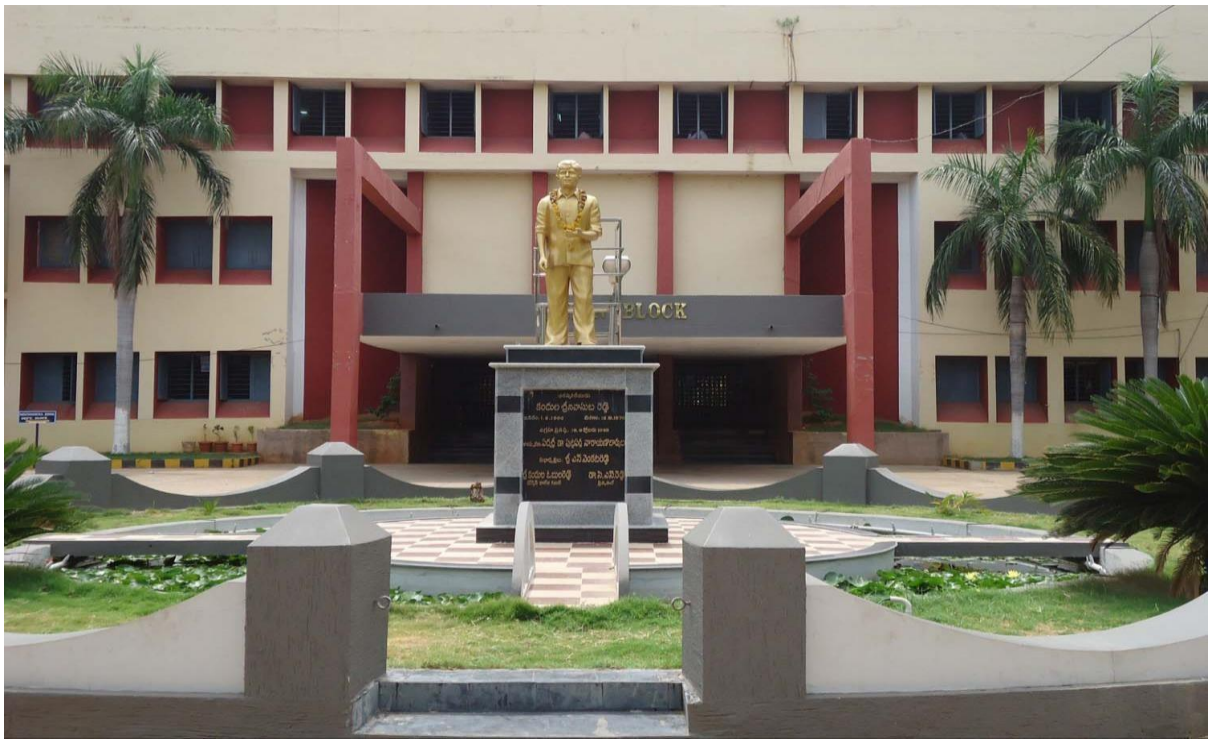
Regulations, Curriculum and Syllabus for
UG Programs in Engineering (R20UG)
(Effective from 2020-21 for Regular students and from 2021-22 for Lateral Entry students)

CIVIL ENGINEERING



Kandula Srinivasa Reddy Memorial College of Engineering (Autonomous)
Kadapa 516005, AP
(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)
(An ISO 9001-2008 Certified Institution)

ABOUT THE COLLEGE

The college owes its existence to the keen interest of Late Kandula Obul Reddy to develop technical education in Rayalaseema region of Andhra Pradesh. With a view to translating his noble ideal of imparting technical education into reality, a Technical Training Institute at Vempalli, Kadapa District was started in 1979 under the aegis of Sri Kandula Obul Reddy charities. It is in the year 1980 that K.S.R.M. College of Engineering was established to perpetuate the memory of Late Sri. Srinivasa Reddy, youngest son of Late Sri Obul Reddy. Sri Srinivasa Reddy, a brilliantstudent of III year Mechanical Engineering at Delhi College of Engineering, New Delhi, met with his untimely death in a scooter accident on 18th Oct, 1979. The college was formally inaugurated on 14 November 1980 by Sri T. Anjaiah, the Chief Minister of Andhra Pradesh and it started functioning from the academic year 1980-81.

The college had its modest beginnings in 1980 with an intake of 160 students with core branches "Civil, Electrical & Electronics, Electronics & Communications and Mechanical Engineering. Keeping in view the latest trends, priorities and relevance in Engineering and Technology, the Board of Management decided to start Computer Science and Engineering in 1990 commemorating the decennial year of the college. With the conserted efforts of the Management and the Successive Principals, the departments have been strengthened year after year and the intake has steadily been increased to 1080 by the year 2014. Furthering its sphere of activity, the college started post graduate programme in CAD/CAM (ME), Geo-technical Engineering (CE) in the year 2004, Power Systems (EEE) & Computer Science and Engineering (CSE) during 2010-11 and Digital Electronics and Communication Systems (ECE) in 2011-12 respectively. The branches have constantly been strengthened by increasing the intake from time to time. This reflects one aspect of the progress and development of the college.

The College campus is located 7 K.M. away from Kadapa town on Kadapa to Pulivendula Highway in a calm and salubrious area of 35 acres. The College is set in a serene environment with lush greenery and fresh air. Four multi-storeyed RCC structures measuring 26,700 sqm provide accommodation for the departments. The College has dedicated electric power feeder and 250 KVA substation. Other capital resources include transport vehicles and four hostels. Excellent Bus facilities exist from Kadapa to Hyderabad, Vijayawada, Nellore, Tirupati, Kurnool, Bangalore, Chittoor and Chennai.

VISION

To evolve as center of repute for providing quality academic programs amalgamated with creative learning and research excellence to produce graduates with leadership qualities, ethical and human values to serve the nation.

MISSION

M1: To provide high quality education with enriched curriculum blended with impactful teaching learning practices.

M2: To promote research, entrepreneurship and innovation through industry collaborations.

M3: To produce highly competent professional leaders for contributing to Socio-economic development of region and the nation.

ABOUT THE DEPARTMENT

Civil Engineering Department of KSRM College of Engineering is one of the five founding departments since the college was established in the year 1979. The motto of the department is EXCEED (Excellence in Civil Engineering Education). The department is offering B.Tech program with an intake of 180 students. The department is also offering M.Tech program in Geotechnical Engineering with an intake of 18 students. The department has well equipped laboratories needed for undergraduate and post graduate students. The department produced many skilled engineers, the bulk of whom made successful lives for themselves in India and abroad since inception. The department provides valuable consultancy services to various Government and Non-governmental Departments and individual firms in and around Rayalaseema region. The Civil Engineering Department is recognized as research center by JNTUA, Ananthapuramu. AICTE sponsored 13.55 Lakhs under MODROBS scheme to modernize and equip with latest digital equipment in Geotechnical Engineering Lab. The department undertakes all the infrastructure development and maintenance activities/works across the Kandula Group of Institutions-Kadapa.

VISION

To become a frontrunner in the field of Civil Engineering, and tackle national and global challenges that aligns with the needs of society.

MISSION

M1: To provide value added education and cope up with the changes through innovative and dynamic curriculum.

M2: To engage in research that creates state-of-the-art technologies and futuristic knowledge, with a strong emphasis on meeting the socio-economic requirements of society.

M3: To produce globally competent professionals with leadership skills, team work and ethical conduct.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1 - To excel in professional career in the industry or to be a successful entrepreneur to create a sustainable built environment.

PEO2 - To pursue higher education and involve in research with zeal for lifelong learning.

PEO3 - To demonstrate leadership qualities, ethical values and environmental awareness, to serve the society.

PROGRAMME OUTCOMES

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES

The graduates in Civil Engineering will be able to

PSO 1: Analyze, Design, Construct, Maintain and Operate infrastructural projects.

PSO 2: Assess the environmental impact of various projects and take required measures to curb environmental deterioration.

PSO 3: Use latest software pertaining to various streams of Civil Engineering.

KSRM College of Engineering (Autonomous), Kadapa-516005, AP

Regulations for UG Programs in Engineering (R20UG)
(Effective from 2020-21)

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KSRM College of Engineering (Autonomous), Kadapa-516005, A.P.

Regulations for UG Programs in Engineering (R20UG)
(Effective from 2020-21)

1.0 Nomenclature

1.1 *Academic Year*: Period of academic instruction of, approximately, one year duration that usually starts in June/July and ends in April/May next

1.2 *Semester*: Either of two divisions of an academic year

1.3 *Major*: A specific field of study. Example: Civil Engineering

1.4 *Minor*: An area outside of, or complementary to, a Major. Example: For Civil Engineering major, Computer Science is a minor and vice versa

1.5 *Subject*: An area of knowledge that is studied as part of a Course

1.6 *Core*: A subject that is mandatory for a Major course of study

1.7 *Elective*: A subject that is selected for study to suit one's individual needs

1.8 *Mandatory Subject*: A subject that is studied to meet certain requirements but has no credits assigned to it

1.9 *Humanities subjects*: Subjects that describe and interpret human achievements, problems and historical changes at individual and societal levels covering the disciplines of literature, history, and philosophy

1.10 *Social Sciences*: Subjects that describe the mental and behavioural activities of individuals, groups, organizations, institutions, and nations covering the disciplines of anthropology, economics, linguistics, political science, and psychology

1.11 *Exam*: A test to measure one's progress, knowledge, or ability in a subject

1.12 *Credit*: A numerical weight given to a subject, usually based on quantum of academic work

1.13 *Grade*: A numerical or alphabetic designation measuring the level of achievement in an exam

1.14 *Attendance*: Physical presence of oneself in a classroom/laboratory for purpose of a scheduled academic instruction

1.15 *Course*: A series of subjects that constitute a Major field of study

1.16 *Branch*: Same as Course

1.17 *Program*: Same as Course

1.18 *Degree*: An academic title conferred to honour distinguished achievement

1.19 *Minor Degree*: An Academic honour conferred on achieving 20 extra credits in one's minor area of study

1.20 *Honours*: An Academic honour conferred on achieving 20 extra credits in one's major area of study

2.0 Short Title and Application

2.1 These rules and regulations may be called as R20UG and come into force from Academic Year 2020-21 and exists until superseded by new regulations. These rules are applicable for students who join the institute from academic year 2020-21 onwards. Students who have joined in earlier regulations will continue in their respective regulations.

2.2 These rules and regulations are applicable to all under graduate courses inengineering and technology leading to Bachelor's Degree in Technology (B. Tech)

2.3 The Major courses offered, at present, are:

2.3.1 Civil Engineering

2.3.2 Electrical and Electronics Engineering

2.3.3 Mechanical Engineering

2.3.4 Electronics and Communication Engineering

2.3.5 Computer Science and Engineering

2.4 The Institute may offer new Majors in future to which these rules and regulationswill be applicable.

3.0 Suspension and Amendment of Rules

3.1 Academic Council has the authority to suspend a rule temporarily.

3.2 Academic Council has the authority to amend a rule.

3.3 For affirmative action on any suspension or amendment of a rule, an affirmative vote of three-fifths of the members present and voting shall be required in Academic Council.

4.0 Requirements for Admission

4.1 At present, admissions into first-year class of various Majors are governed by Government and the Affiliating University. The eligibility criteria and procedure for admissions are prescribed by Government and Affiliating University.

4.2 A student is not allowed change of Major after admission into first-year.

4.3 A student must fulfil medical standards required for admission.

4.4 The selected students are admitted into first-year class after payment of the prescribed fees.

5.0 Structure of the B. Tech course

5.1 *Duration*: The duration of B. Tech degree course is eight semesters spread over four academic years. Semesters are named sequentially from First Semester to Eighth Semester.

5.2 *Working Days*: Calendar for any semester shall be announced at least four weeks before its commencement. Minimum number of working days shall be 90 for any semester.

5.3 *Curriculum*: Each major shall have core, elective and mandatory subjects drawn from six categories of subject areas - i) Basic Sciences (BSC), ii) Humanities and Social Sciences including Management Courses (HSMC), iii) Engineering Science Courses (ESC), iv) Professional Core Course (PCC), v) Professional Elective Course (PEC), and vi) Open Elective Course (OEC). The curriculum for each branch shall be approved by its corresponding Board of Studies and Academic Council.

5.4 *Credits*: All subjects that are assessed for marks have credits assigned to them. Thecredits assigned to subjects shall be given in curriculum. The total number of credits for entire course is 160 for all branches.

5.5 *Curriculum and Syllabus*: The curriculum and syllabus for first and second semesters is given in Annexure-1 and Annexure-2 respectively.

5.6 *Medium of Instruction*: The medium of instruction, examinations and all other related activities is English.

5.7 *Responsibility and Advising*: It is the responsibility of the student to understand and know the regulations and requirements to earn the degree. Each student admitted into the degree programs is assigned to a Faculty Advisor who assists the student in designing an effective program of study. Students should consult their Faculty Advisors for selection of electives and for general advice on academic program.

5.8 *Gap-Year*: Outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II Year / III Year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. College Academic Council shall evaluate the proposal submitted by the student and decide on permitting the student for availing the gap-year. Gap- year can be availed once in the entire course.

6.0 Registration and Enrolment

6.1 Prior to start of each semester, every student shall register for all the subjects listed in curriculum and additional subjects required for achieving honours/ minor degree. Excepting first semester, the registration for a semester shall be done during a specified week after end examinations of previous semester. In first semester, the registration shall be done within six working days from date of joining. Recommendation of Faculty Advisor is needed for registration.

6.2 A student can register utmost 8 theory subjects, including mandatory subjects, in any semester.

6.3 Late registration will be permitted with a fine, decided from time to time, up to six working days from the last date specified for registration.

6.4 A student will be eligible for registration for a semester if she or he i) is promoted to that semester, ii) has cleared all fees to the Institute, library and hostel of previous semester, and iii) is not disqualified for registration by a disciplinary action of the Institute.

6.5 A student will be enrolled and allowed to attend the classes on successful registration and payment of necessary fees to Institution, library, and hostel.

6.6 Registration and enrolment will be controlled by the Office of the Controller of Examinations.

7.0 Assessment Procedure – Internal Tests and End Examinations

7.1 Performance of students in all subjects is assessed continuously through assignments, internal assessment tests and an End examination.

7.2 Allocation of internal assessment and End examination marks

7.2.1 For theory subjects, the allocation is 40 marks for internal assessment and 60 marks for End examination totalling 100 marks.

7.2.2 For laboratory/drawing/project work subjects, the allocation is 40 marks for internal assessment and 60 marks for End examination totalling 100 marks.

7.2.3 For seminar/industrial training/internship subjects, the allocation is 100 marks for internal assessment. There is no end examination for these subjects.

7.2.4 For mandatory subjects the allocation is 40 marks for internal assessment and no allocation for End examination. These marks are specified for purpose of clause 9.3, and do not account for any credits.

7.3 Internal Assessment

7.3.1 Internal assessment means performance evaluation of students by faculty

members who teach the subjects.

7.3.2 *Guidelines*:

a) *Allocation*: For theory subjects including mandatory subjects the total internal assessment marks is 40 of which 30 marks are assessed through midterm tests, 5 marks by surprise or sudden quiz and 5 marks by assignments. The faculty members of the concerned subject will assess themarks in the midterm tests and assignments.

b) *Midterm tests*: Each midterm test will be of 90 minutes duration and evaluated for 30 marks. Internal assessment marks for midterm tests will be calculated as weighted sum of the two midterm test marks, with 80% weight for the best and 20% weight for the other marks. Internal assessment marks for assignments is calculated as the average of all assignments. Total internal marks are the sum of midterm tests, surprise orsudden quiz and assignments assessment marks.

If any student abstains for any midterm test, she or he will be awarded zeromarks for that midterm test. If any student fails to submit any assignment within the specified deadline, she or he will be awarded zero marks for thatassignment.

i. *Number and duration*: There shall be two midterm tests each with a duration of 90 minutes.

ii. *Format of test and division of marks*: Internal test shall consist of only descriptive part for 30 marks.

iii. *Descriptive or Subjective part*: Subjective part shall contain three questions and all questions shall be answered. However, each question can have internal choice (either or type question). Generally, each question shall test one Course Outcome (CO).

iv. *Syllabus*: Each test shall cover 50% of the syllabus, approximately.

c) *Assignments*: The assignments shall aid and hone the daily routine of students. Assignments shall be stimulating and thought provoking to the student. While some questions may test student's understanding of the subject, there shall be questions that imply connect to real world applications. A variety of questions can posed in assignments.

i. *Number:* A minimum of four assignments shall be given in each subject with one assignment from Unit I to IV of syllabus of that subject.

ii. *Quantum of work*: An assignment shall take about four to six hours of study / work per week. Assignments shall not be overloaded nor under loaded. As a guideline, each assignment may contain five questions, each question taking an hour to answer.

iii. *Marks*: Each assignment must be evaluated for fifty marks. Final marks are obtained by averaging all the assignment marks and reducing it to five marks.

iv. *Deadlines*: Students shall be given at least one-week time to complete and submit assignments. Assignments shall be submitted within deadline. Late submissions should be awarded zero marks.

v. *General*: It is advised to administer assignments using Google Classroom.

d) *Quiz*: The concerned faculty has to conduct 8 surprise quiz exams in the regular class itself. From each unit two quiz exams shall be conducted and

each quiz is for 10 marks. Out of 8 quizzes 6 best quizzes shall be considered and average of 6 quizzes will be reduced to 5 marks. Each quiz can be fill in the blanks or single sentence answer or definitions.

7.3.3 For laboratory/practical/drawing subjects, the internal assessment will be based on regular laboratory work over full semester. The assessment will be done by the faculty concerned. The students shall be informed sufficiently early of the procedure to be followed for internal assessment.

7.3.4 For subjects like seminar, project-work, industrial training/internship, and comprehensive viva-voce, the internal assessment will be done by a Department Committee consisting of two senior faculty members and faculty guide of concerned student. The assessment procedure will be informed sufficiently early to the students.

a) *Mandatory internships*: University Guidelines shall apply.
b) *Evaluation of internships*: Shall be evaluated through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the department committee. The report and the oral presentation shall carry 40% and 60% weightages respectively.
c) *Final Semester Internship*: A student should mandatorily undergo internship (University Guidelines shall apply) and should work parallelly on a project. At the end of the semester the candidate shall submit an internship completion certificate and a project report. The project report shall be evaluated with an external examiner.

7.3.5 After the course work is over, the student is permitted to improve his/her internal marks of any 3 theory subjects in the entire course. However he/she will have to attend the course work.

7.4 End examinations

7.4.1 End examinations shall be conducted after completion of coursework in each semester. End exams assessment is for 60 marks. The question paper contains 5 questions and all questions shall be answered. Each question have internal choice (either or type question). Each question carries 12 marks.

7.4.2 The question papers for theory subjects shall be set by faculty members outside of the Institute. The external faculty members for question paper setting shall be appointed by the Principal.

7.4.3 Evaluation of answer scripts shall be done by either Internal or External examiners appointed by the Principal. A minimum of 50% of subjects will be evaluated by external examiners.

7.4.4 For laboratory subjects, end examination shall be conducted by a committee consisting of two internal examiners. One examiner shall be appointed by Head of Department of concerned Major, and the other examiner shall be appointed by the Principal.

7.4.5 For project work viva-voce, end examination shall be conducted by a committee consisting of one internal examiner, one external examiner, and the concerned guide of the student. Internal examiner shall be appointed by Head of Department of

concerned Major, and the external examiner shall be appointed by the Principal.

7.4.6 If a student abstains from End examination of any subject, for any reason, she or he shall be marked as "ABSENT" in that subject.

7.4.7 There is no end examination for mandatory subjects.

8.0 Method of Assigning Letter Grades and Grade Points

8.1 For all credit-bearing subjects, performance of a student in a subject is indicated by a letter grade that corresponds to absolute marks earned in that subject. Each letter grade is assigned a numeric Grade Point that is used to compute Grade Point Average on a scale of 0 to 10.

8.2 Performance of a student in both internal assessment and End examination will be considered for awarding grades for credit bearing subjects. Total marks earned in a subject is the sum of marks obtained in internal assessment and End examination in that subject.

8.3 Pass grade S to E is assigned to a subject based on total marks earned in that subject provided that a student earns at least i) 35% of marks in End examination, and ii) 40% of marks in internal assessment and End examination put together; otherwise fail grade F will be assigned to that subject.

8.4 Grade I will be assigned to a subject if a disciplinary action is pending and is not resolved before publication of results. Office of Controller of Examinations shall resolve the pending disciplinary action within six working days from the date of publication of results and change the grade to any of S to F.

8.5 Grade *Ab* will be assigned to a subject if a student abstains for End examination of that subject.

8.6 The absolute marks and corresponding letter grade and grade points are given in Table 1.

Table 1: Letter Grades and Grade Points

Absolute Marks	Letter Grade	Grade Points assigned	Remark
≥ 90	S (Outstanding)	10	Pass
80 - 89	A (Excellent)	9	Pass
70 - 79	B (Very Good)	8	Pass
60 - 69	C (Good)	7	Pass
50 - 59	D (Average)	6	Pass
40 - 49	E (Below Average)	5	Pass
< 40	F (Fail)	0	Fail
Absent	Ab (Absent)	0	Fail
-	I	0	Result Withheld

8.7 *SGPA*: Semester Grade Point Average indicates the performance of a student in all credit-bearing subjects of a semester. SGPA is calculated as the weighted average of Grade Points of all subjects of the semester with corresponding credits of subjects as weights. Audit and Self-study subjects are not considered for SGPA calculation

$$SGPA = \frac{\sum GP_i \times CR_i}{\sum CR_i}$$

where GP_i *= Grade Point earned in a subject*

and CR_i *= Credits allocated for that subject*

8.8 *CGPA*: Cumulative Grade Point Average indicates the performance of a student in all semesters up to and including the current semester under consideration. CGPA is calculated as the weighted average of SGPAs with total credits in each semester as the weights.

$$CGPA = \frac{\sum S_i \, X \, TC_i}{\sum TC_i}$$

where S_i *= SGPA obtained in a semester*

and TC_i *= Total Credits for that semester*

8.9 As per AICTE regulations, conversion of CGPA into equivalent percentage is as follows:

Equivalent Percentage = (CGPA – 0.50) x 100

8.10 In *SGPA / CGPA* calculations credits earned towards honours / minor degree will not be counted.

8.11 *Grade Card*: All students shall be issued Grade Cards after the publication of results of a semester. Grade Card is a statement of performance of a student in a semester. It contains information about each registered subject: type of subject, allocated credits, and letter grade earned. SGPA and CGPA will also be indicated.

9.0 Requirements for Completing Subjects

9.1 A student shall complete all credit-bearing and mandatory subjects successfully to be eligible for award of degree.

9.2 *Credit-bearing subjects*: A student is considered to have completed a credit-bearing subject successfully and earned credits if she or he obtains a pass grade from S to Ein that subject. If a student receives fail grade F or *Ab* in any subject, she or he must register for supplementary End examination for that subject as and when opportunity arises and improve grade to pass grade.

Mandatory subjects: A student is considered to have successfully completed a mandatory subject if she or he earns at least 40% of internal assessment marks in that subject.

Supplementary exam for mandatory subjects: If a student fails in mandatory subject, she or he shall register for supplementary examination in that subject as and when the opportunity arises and pass that subject. The supplementary exam will be conducted for 30 marks covering the entire syllabus and student is deemed to havepassed in the subject if she or he earns 12 marks (40% marks) in the supplementary exam, disregard of her or his performance in assignments and internal tests.

10.0 Requirements for taking End Examinations and Promotion

10.1 A student is eligible to take regular End Examinations of current semester if she orhe fulfils the attendance requirement.

10.2 A student shall be promoted from current semester to succeeding semester on satisfying the attendance and total credits-earned requirements.

10.3 Attendance Requirement

10.3.1 Attendance of students shall be recorded for credit-bearing and mandatory subjects as per the work load indicated in curriculum.

10.3.2 Total class-periods conducted shall be reckoned from beginning to end of a semester as published in academic calendar.

10.3.3 Aggregate Percentage of Attendance is calculated using total number of class-periods attended as numerator and total number of class-periods conducted for the concerned semester as the denominator.

10.3.4 A minimum aggregate attendance of 75% is required for promotion to succeeding semester and be eligible to take End examinations of current semester. In addition, student has to acquire a minimum of 40% attendance in each subject.

10.3.5 A student can appeal to the Principal for condoning deficiency in aggregate attendance if she or he gets an aggregate attendance of 65% or more but less than the required 75%, presenting a valid reason for deficiency. Such a student will be granted promotion if the Principal pardons the deficiency. Principal has the right to reject the appeal if he/she is not satisfied with the performance of the student or the reason cited for deficiency of the attendance.

10.3.6 A student earning less than 65% aggregate attendance will be denied promotion. A student who is not promoted on basis of attendance shall be removed from the rolls and shall register for the same semester when opportunity arises. The current semester record of the student is cancelled automatically.

10.4 Credits-Earned Requirement

10.4.1 This rule is applicable for promotion of a student from fourth semester to fifth semester and from sixth semester to seventh semester.

10.4.2 A student who is denied promotion for want of requisite credits shall take supplementary examinations, as and when offered, and earn credits to be eligible for promotion.

10.4.3 Subjects registered for honours/minor degree shall not be considered towards credits-earned requirement.

10.4.4 For promotion from fourth semester to fifth semester, a student must earn at least 40% credits (rounded to lower integer) from first semester to third semester subjects. A student will get the following opportunities to pass the subjects:

First semester subjects	: One regular and three supplementary exams
Second semester subjects	: One regular and two supplementary exams
Third semester subjects	: One regular and one supplementary exam

10.4.5 For promotion from sixth semester to seventh semester, a student must earn at least 40% credits (rounded to lower integer) from first semester to fifth semester subjects. A student will get the following opportunities to pass the subjects:

First semester subjects	: One regular and five supplementary exams
Second semester subjects	: One regular and four supplementary exams
Third semester subjects	: One regular and three supplementary exams
Fourth semester subjects	: One regular and two supplementary exams Fifth
semester subjects	: One regular and one supplementary exam

11.0 Revaluation of End Examination Scripts

11.1 Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee.

11.2 Procedure for Revaluation: The script will be revaluated by an examiner appointedby the Principal. The maximum of revaluation and regular end examination marks will be awarded for that subject.

11.3 A student can apply for revaluation in a subject only once.

12.0 Supplementary End Examinations

12.1 Students are eligible to take Supplementary examinations in subjects with fail gradeeither F or *Ab* only.

12.2 Supplementary examinations for even semester subjects will be conducted along with regular examinations of odd semester subjects.

12.3 Supplementary examinations for odd semester subjects will be conducted along with regular examinations of even semester subjects.

12.4 For eighth semester, special supplementary examinations will be conducted in second week following the results publication date of regular examination of eighthsemester.

13.0 Requirements for Award of B. Tech degree

13.1 Time Limit for completion of requirements for award of degree is eight academic years including gap-year from the date of admission. A student who could not complete all the requirements in this time limit shall forego admission and will be removed from the rolls of the Institute.

13.2 A student shall be eligible for award of B. Tech degree provided she or he has:

13.2.1 Registered and successfully completed all required credit-bearing andmandatory subjects with a total of 160 credits

13.2.2 Secured a CGPA of 4.5 or more

13.2.3 Cleared all dues to the Institute, library and hostel

13.2.4 No disciplinary action is pending against her or him

13.2.5 Satisfied any other stipulation of the affiliating university

13.3 *Award of Class*: Each student will be given class in degree based on CGPA as follows:

Table 2: Class of Degree

Class of Degree	Range of CGPA
Pass Class	>= 4.5 but <5.5
Second Class	>= 5.5 but <6.5
First Class	>= 6.5 but <7.5
First Class with Distinction	>= 7.5

13.4 *Degree with Honours designation*: Students with higher learning capabilities are encouraged to opt for Honours designation. Degree with Honours imply a higher

level of academic achievement. A student can earn B.Tech degree with honours designation by meeting the following requirements

13.4.1 Honours designation is optional. A student can opt for either Honours designation or Minor degree (clause 13.5) but not both.

13.4.2 *Entry eligibility*: Students shall apply for Honours designation at the beginning of the fourth semester. Eligibility criteria are (i) minimum CGPA of 8.0 and (ii) no backlogs, reckoned up to second semester. The Chairperson of the concerned Board of Studies will process the applications and publish the list of eligible students.

13.4.3 *Additional course work*: Students shall complete an additional 20-credits coursework, in addition to 160 regular credits, in her/his own major during fifth to seventh semesters. The Board of Studies (BoS) of the concerned major shall specify the list of advanced elective subjects for the purpose of honours designation.

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

If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

If a student drops or is terminated from the Honours program, the additional credits earned so far will remain extra. These additional courses will find mention in the transcript but not in the degree certificate.

13.4.4 *Registration and enrollment*: Clause 6.0 shall apply

13.4.5 *Evaluation*: The evaluation shall be as per clause 7.0

13.4.6 *Continuous performance*: Students shall earn a minimum SGPA of 8.0 in all semesters, from fourth to seventh, and without backlogs to be eligible for award of Honours designation. Regular and additional subjects shall be considered for SGPA calculation. If a student does not get a minimum SGPA of 8.0 or fails in any subject during fourth to seventh semesters, she/he will lose candidature for honours designation.

13.5 *Minor Degree designation*: Students with higher learning capabilities are encouraged to opt for Minor degree designation. Minor degree imply a higher level of academic achievement and improves employability. A student can earn minor degree designation by meeting the following requirements

13.5.1 Minor degree is optional. A student can opt for either Minor degree or Honours designation (clause 13.4) but not both.

13.5.2 *Entry eligibility*: Students shall apply for minor degree at the beginning of fourth semester. Eligibility criteria are (i) minimum CGPA of 8.0 and (ii) no backlogs, reckoned up to second semester. The Chairperson of the concerned Board of Studies (minor department) will process the applications and publish the list of eligible students.

13.5.3 *Additional coursework*: Students shall complete an additional 20-credits coursework, in addition to 160 regular credits, in selected minor program during fourth to seventh semesters. The Board of Studies (BoS) of the concerned minor program shall specify the list of core and elective subjectsfor the purpose of minor degree. Out of the 20 credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS and must pursue atleast 2 courses through MOOCs. (of 8 week duration)

13.5.4 *Registration and enrollment*: Clause 6.0 shall apply.

13.5.5 *Evaluation*: The evaluation shall be as per clause 7.0.

13.5.6 *Continuous performance*: Students shall earn a minimum SGPA of 8.0 in all semesters, from fourth to seventh, and without backlogs to be eligible for award of minor degree. Regular and additional subjects shall be considered for SGPA calculation. If a student does not get a minimum SGPA of 8.0 or fails in any subject during fourth to seventh semesters, she/he will lose candidature for minor degree.

13.6 Degree will be issued under the seal of affiliating University.

14.0 Regulations for Lateral Entry Students under R20UG

a) *Title and application*: These rules and regulations may be called R20UG-LE and come into force from academic year 2021-22 and exist in force until superseded by other regulations. These regulations are applicable to students admitted under lateral entry scheme leading to Bachelor's Degree in Technology (B.Tech).

b) *Regulations and curriculum*: The regulations and curriculum of R20UG shall be applicable in general with the following modifications:

i. *Entry and duration*: The students will be admitted directly into third semester of regular 4-year B.Tech degree course governed by R20UG regulations. The duration of the course is three academic years.

ii. *Curriculum*: Third semester to eighth semester curriculum of R20UG.

iii. *Promotion by credits-earned requirement*: This is applicable for the promotion of a student from sixth semester to seventh semester only. She/he must earn at least 40% of total credits (rounded to lower integer) from third to fifth semesters for promotion from sixth semester to seventh semester.

c) Requirements for the award of B.Tech degree:

i. Time limit for completion of requirements for award of degree is six academicyears from the date of admission.

ii. Registered and successfully completed all required credit-bearing and mandatory subjects with a total of 121 credits. (third semester to eighth semester subjects)

iii. *Honours/minors designation*: shall earn extra 20 credits in addition to 121 credits.

15.0 Transitory Regulations

15.1 A student who initially joins the Institute in a previous Regulation and has to re- join in a semester of the present Regulations, due to any reason, shall be bound bythe rules of the current Regulations. Board of Studies of the concerned Major will specify, extra or otherwise, academic coursework to be undertaken by such students who join the current Regulations.

THREE WEEK INDUCTION PROGRAM

Introduction

The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfil his responsibility as an engineer, a citizen and a human being. Besides the above, several meta- skills and underlying values are needed.

1. 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.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. 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.

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would chose one skill related to the arts whether visual arts or performing arts. Examples are painting, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept. / Branch & Innovations

They should be told about what getting into a branch or department means what role itplays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

Amendments to R20UG Regulations:-

1. Skill courses shall be conducted from III Sem to VI Sem.
2. Internships/ Socially relevant projects, which can be conducted during IV Sem& V Sem break, VI Sem & VII Sem break and the same may be evaluated during V & VII semesters.
3. The eligibility criteria for Minor/ Honor degree is minimum CGPA of 8.0 and no backlogs, reckoned up to III semester.
4. Minimum CGPA of 7.5 with no backlogs up to III semester for registration of Minor and honor degree for SC/ST students.
5. The respective departments shall give a list of standard MOOCs providers including SWAYAM whose credentials are endorsed by respective Chairman Board of Studies.
6. He/ She has to obtain a certificate from the provider in which he/ She has registered and submit the same to the concerned department.

7. Any MOOC course selected by the student shall be of 12 weeks course with 3 credits and also from the reputed provider.
8. If provider explicitly declares letter grade, pass or fail and credits of that particular course, the letter grade can be converted to grade point as per the table given below:

Absolute Marks	Letter Grade	Grade Points assigned	Remark
≥ 90	S (Outstanding)	10	Pass
80 - 89	A (Excellent)	9	Pass
70 - 79	B (Very Good)	8	Pass
60 - 69	C (Good)	7	Pass
50 - 59	D (Average)	6	Pass
40 - 49	E (Below Average)	5	Pass
< 40	F (Fail)	0	Fail
Absent	Ab (Absent)	0	Fail
--	I	0	Result Withheld

9. In case of any deviation in the above clause, the committee appointed by the Principal shall take a decision for converting MOOC results into the relevant grade points.
10. Credits awarded in the MOOC certificate are directly transferred to the grade sheet.
11. If the student fails to complete the MOOCs he/ she has to write two internal tests besides the End examinations conducted by the Institute (offered in place of MOOCs by the department) like other subjects.

Department of Civil Engineering
R20UG - Curriculum

B. Tech. - I Semester

Course code	Category	Course Title	Hours / Week			IM	EM	CR
			L	T	P			
2021101	BSC	Linear Algebra and Calculus	3	0	0	40	60	3
20EP102	BSC	Engineering Physics	3	0	0	40	60	3
2024103	HSMC	Communicative English	3	0	0	40	60	3
2014104	ESC	Basic Electrical & Electronics Engineering	3	0	0	40	60	3
2003105	ESC	Engineering Drawing	1	0	2	40	60	2
2003106	ESC	Engineering Drawing Lab	0	0	2	40	60	1
20EP107	BSC	Engineering Physics Lab	0	0	3	40	60	1.5
2024108	HSMC	Communicative English Lab	0	0	3	40	60	1.5
2014109	ESC	Basic Electrical & Electronics Engineering Lab	0	0	3	40	60	1.5
Total			**13**	**0**	**13**	**360**	**540**	**19.5**

L - Lecture, T - Tutorial, P – Practical

B. Tech. - II Semester

Course code	Category	Course Title	Hours / Week			IM	EM	CR
			L	T	P			
2021201	BSC	Differential Equations and Vector Calculus	3	0	0	40	60	3
20EC202	BSC	Engineering Chemistry	3	0	0	40	60	3
2005203	ESC	C-Programming & Data Structures	3	0	0	40	60	3
2001204	ESC	Strength of Materials	3	0	0	40	60	3
20EW205	LC	Engineering Workshop	0	0	3	40	60	1.5
2005206	LC	IT Workshop	0	0	3	40	60	1.5
20EC207	BSC	Engineering Chemistry Lab	0	0	3	40	60	1.5
2005208	ESC	C-Programming & Data Structures Lab	0	0	3	40	60	1.5
2001209	ESC	Strength of Materials Lab	0	0	3	40	60	1.5
20MC210	MC	Environmental Science	3	0	0	40	0	0.0
Total			**15**	**0**	**15**	**400**	**540**	**19.5**

B. Tech. - III Semester

Course Code	Category	Course Title	Hours / Week			IM	EM	CR
			L	T	P			
2021302	BSC	Probability, Statistics & Numerical Methods	3	0	0	40	60	3
2001302	ESC	Geology and Building materials	3	0	1	40	60	3.5
2001303	PCC	Advanced Strength of materials	3	1	0	40	60	4
2001304	PCC	Fluid Mechanics	3	0	0	40	60	3
2001305	PCC	Geomatics	3	0	0	40	60	3
2001306	PCC (LAB)	Fluid Mechanics Laboratory	0	0	3	40	60	1.5
2001307	PCC (LAB)	Geomatics Lab	0	0	3	40	60	1.5
20013S1	SOC	Civil Engineering Workshop (Skill oriented)	1	0	2	40	60	2
Total Credits			**16**	**1**	**9**	**320**	**480**	**21.5**

B. Tech. - IV Semester

Course Code	Category	Course Title	Hours/Week			IM	EM	CR
			L	T	P			
2025401	HSS	Business Economics and Accounting for Engineers	3	0	0	40	60	3
2001402	PCC	Hydraulics & Hydraulic Machinery	3	0	0	40	60	3
2001403	PCC	Soil Mechanics	3	0	0	40	60	3
2001404	PCC	Structural Analysis	3	0	0	40	60	3
2001405	PCC	Transportation Engineering	3	0	0	40	60	3
2001406	BSC (LAB)	Building Planning and Drawing (AutoCAD)	0	0	3	40	60	1.5
2001407	PCC (LAB)	Soil Mechanics Laboratory	0	0	3	40	60	1.5
2001408	PCC (LAB)	Transportation Engineering Laboratory	0	0	3	40	60	1.5
20014S2	SOC	Advanced Civil Engineering Workshop (Skilloriented-2)	1	0	2	40	60	2
2024410	HSMC	Universal Human Values	3	0	0	40	60	3
Total			**19**	**0**	**11**	**400**	**600**	**24.5**

B. Tech. - V Semester

Course Code	Category	Course Title	Hours / Week			IM	EM	CR
			L	T	P			
2001501	PCC	Hydrology & Irrigation	3	0	0	40	60	3
2001502	PCC	Foundation Engineering	3	0	0	40	60	3
2001503	PCC	Concrete Technology	3	0	0	40	60	3
2001504	PEC-I	Optimization Techniques in Civil Engineering	3	0	0	40	60	3
2001505		Advanced Structural Analysis						
2001506		Remote Sensing & GIS						
	OEC-I		3	0	0	40	60	3
2099510	MC	Management Organizational behaviour	2	0	0	40	00	0
2001507	PCC	Concrete Technology Lab	0	0	3	40	60	1.5
2001508	PCC	Structural Analysis and Design Lab (Staad Pro)	0	0	3	40	60	1.5
20015S3	SC	SketchUp-3D modelling	1	0	2	40	60	2
2001509	PROJ	Community Service Project	0	0	3	100	-	1.5
Total			**18**	**00**	**11**	**460**	**480**	**21.5**

B. Tech. - VI Semester

Course Code	Category	Course Title	Hours / Week			IM	EM	CR
			L	T	P			
2001601	PCC	Environmental Engineering	3	0	0	40	60	3
2001602	PCC	Water Resources Engineering	3	0	0	40	60	3
2001603	PCC	Design of Reinforced Concrete Structures	3	0	0	40	60	3
2001604	PEC-II	Pre-stressed Concrete	3	0	0	40	60	3
2001605		Bridge Engineering						
2001606		Traffic Engineering						
2006601	HSSE	Human Resource Development	3	0	0	40	60	3
2006602		Digital Marketing						
2006603		Project Management						
20993M3	MC	Constitution of India	2	0	0	40	00	0
2001607	PCC	Environmental Engineering Lab	0	0	3	40	60	1.5
2001608	PCC	Computer Aided Design and Drafting Lab	0	0	3	40	60	1.5
2001609	PCC	Advanced Concrete Technology Lab	0	0	3	40	60	1.5
20016S4	SC	Advanced English Communication skills lab	1	0	2	40	60	2
Total			**18**	**00**	**11**	**400**	**540**	**21.5**

B. Tech. - VII Semester

Course Code	Category	Course Title	Hours / Week			IM	EM	CR
			L	T	P			
2001701	PEC-III	Ground Improvement Techniques	3	0	0	40	60	3
2001702		Quantity Estimation of structures						
2001703		Finite Element Methods						
2001704	PEC-IV	Design of Steel Structures	3	0	0	40	60	3
2001705		Water Supply Engineering						
2001706		Advanced Concrete Structures						
2001707	PEC-V	Design and Drawing of Irrigation Structures	3	0	0	40	60	3
2001708		Construction Practice and Management						
2001709		Urban Transportation Planning						
	OEC-II		3	0	0	40	60	3
	OEC-III		3	0	0	40	60	3
	OEC-IV		3	0	0	40	60	3
20015S5	SOC-V	Practices in Geo-Technical Engineering	1	0	2	40	60	2
2001710	PR	Industrial/Research Internship	0	0	6	100	-	3
Total			**19**	**00**	**08**	**380**	**420**	**23**

B. Tech. - VIII Semester

Course Code	Category	Course Title	Hours / Week			IM	EM	CR
			L	T	P			
2001801	PROJ	Project Work/Internship	-	-	30	50	50	12
Total			**-**	**-**	**30**	**50**	**50**	**12**

Open Electives Courses Offered by Department of Civil Engineering:

20OE101	Disaster Management
20OE102	Basics of Civil Engineering
20OE103	Building Materials
20OE104	Solid Waste Management
20OE105	Estimation and Costing
20OE106	Water Management
20OE107	Repair & Rehabilitation of Structures
20OE108	Geo-Environmental Engineering
20OE109	Environmental Impact Assessment
20OE110	Industrial Safety Engineering
20OE111	Surveying
20OE112	Traffic Engineering

I Semester
Syllabus

B. Tech., I Semester

Course Title	Linear Algebra & Calculus				B. Tech. I Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2021101	Basic Science (BSC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs			

Course Objectives:
This course will illuminate the students in the concepts of calculus and linear algebra.
To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
CO 2	Utilize mean value theorems to real life problems.
CO 3	Classify the functions of several variables which is useful in optimization techniques.
CO 4	Evaluate multiple integrals.
CO 5	Define Beta and Gamma functions.

UNIT-I

Matrices: Rank of a matrix by Echelon form, Normal form, Solving system of homogeneous and non- homogeneous linear equations. Eigen values and Eigen vectors for real matrices – Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley–Hamilton theorem. Diagonalisation by orthogonal transformation.

UNIT-II

Mean Value Theorems: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof), related problems.

UNIT-III

Multivariable Calculus: Partial derivatives, total derivative, chain rule, change of variables, Jacobians, Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT-IV

Multiple Integrals: Evaluation of double integrals in Cartesian coordinates and polar coordinates – Change of variables in double integrals – Change the order of integration in double integrals –

Evaluation of triple integrals in Cartesian and polar coordinates – Change of variables between cartesian, cylindrical and spherical polar coordinates.

UNIT-V

Beta and Gamma functions: Beta and Gamma functions and their properties,relation between Beta and Gamma functions, evaluation of definite integrals using Beta and Gamma functions.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-43 edition 2014.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition- 2013.
3. Introductory Linear Algebra with applications, Kolman, Bernard Hill, David R
4. Linear Algebra, Hoffman Kennethkunze Ray

Reference Books:

1. Higher Engineering Mathematics, B.V. Ramana, Mc. Graw Hill Education (India) Pvt. Ltd, New Delhi, 11th Edition, Reprint 2010.
2. Linear Algebra: A Modern Introduction, D Poole, 2nd Edition, Brooks/Cole, 2005.
3. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008
4. Linear Algebra and its applications, Gilbert Strang.

B. Tech., I Semester

<table>
<tr><td>Course Title</td><td colspan="5">Engineering Physics</td><td colspan="3">B. Tech. I Semester</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20EP102</td><td rowspan="2">Basic Science (BSC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1.5 Hrs</td><td colspan="3">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
To make a bridge between the physics in school and engineering courses.
To identify the importance of the optical phenomenon i.e. interference, diffraction related to its Engineering applications.
To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibres along with engineering applications
To open new avenues of knowledge in magnetic materials which find potential in the emerging micro device applications? Considering the significance of micro miniaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterial, their properties and applications in modern emerging technologies are elicited.
To familiarize the concepts of theoretical acoustics to practical use in engineering field. To explain the significance of ultrasound and its application in NDT for diversified engineering application.
To enlighten the periodic arrangement of atoms in crystals, Bragg’s law and to provide fundamentals related to structural analysis through powder diffraction method.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO1</td><td colspan="8">Understand the different realms of physics and their applications in both scientific and technological systems through physical optics.</td></tr>
<tr><td>CO2</td><td colspan="8">Identify the wave properties of light and the interaction of energy with the matter.</td></tr>
<tr><td>CO3</td><td colspan="8">Illustrate the response of magnetic materials to the applied electric and magnetic fields.</td></tr>
<tr><td>CO4</td><td colspan="8">Explain the basic concepts of acoustics and ultrasonic.</td></tr>
<tr><td>CO5</td><td colspan="8">Classify the important properties of crystals like the presence of long-range order, periodicity and structure determination using X-ray diffraction technique.</td></tr>
</table>

UNIT-I

Wave Optics: Interference- Principle of superposition – Interference of light – Conditions for sustained interference - Interference in thin films (Reflection Geometry) – Colors in thin films – Newton’s Rings – Determination of wavelength and refractive index.

Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum.

UNIT-II

Lasers and Fiber optics: Lasers- Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – Nd-YAG laser – He-Ne laser – Semiconductor diode laser- Applications of lasers.

Fiber optics- Introduction – Principle of optical fiber – Acceptance Angle – Numerical Aperture – Classification of optical fibers based on refractive index profile and modes – Block diagram of Optical fiber Communication system – Propagation Losses (qualitative) – Applications.

UNIT-III

Dielectric and Magnetic Materials: Dielectric Materials- Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Electronic, Ionic and Orientation polarizations (Qualitative) – Lorentz internal field – Clausius-Mossotti equation.

Magnetic Materials- Introduction to magnetic materials (Origin of magnetic moment of an atom and Classification of magnetic materials) –Weiss theory of ferromagnetism-soft ferrites and hard ferrites- Hysteresis – Soft and Hard magnetic materials- Applications magnetic materials.

UNIT-IV

Quantum Mechanics, Free Electron Theory: Quantum Mechanics- Dual nature of matter – Schrodinger's time independent and dependent wave equation – Significance of wave function – Particle in a one-dimensional infinite potential well.

Free Electron Theory- Classical free electron theory (Merits and demerits only) – Quantum free electron theory – Equation for electrical conductivity based on quantum free electron theory – Fermi-Dirac distribution – Density of states – Fermi energy.

UNIT – V

Semiconductors and Superconductors: Semiconductors- Introduction – Intrinsic semiconductors – Electrical conductivity – Fermi level – Extrinsic semiconductors –Dependence of Fermi energy on carrier concentration and temperature – Drift and diffusion currents – Einstein's equation – Direct and indirect band gap semiconductors – Hall effect – Hall coefficient – Applications of Hall effect.

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) –High T_c superconductors – Applications of superconductors.

Text books:

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Krishnasagar, S.Chand and Company
2. Optics- Ajoy Ghatak , McGraw Hill Publishers,6th edition,1stJanuary,2018.

3. Fundamental of Physics- Halliday, Resnick and Walker, Wiley publications.
4. Solid State physics, Hall H E, paramount Publications

Reference Books:

1. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers.
2. Acoustic Waves and Oscillations- Sen S N, Prism Publications.
3. Lasers & Non-linear Optics Nelkon M Parker P, Arnold Heinemann Publications
4. Solid State Physics-Kittels-8th edition,1st January-2015, Wiley Publications.

B. Tech., I Semester

Course Title	Communicative English				B. Tech. I Semester		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2024103	**Humanities and Social Sciences Management (HSMC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 1.5 Hrs						**End Exam Duration: 3 Hrs**		

Course Objectives:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: On successful completion of this course, the students will be able to

CO1	Describe the classification of words, sentences and their usage in sentences.
CO2	Understand the difference between spoken and written English
CO3	Analyze the rules in language for changing the form of sentences
CO4	Illustrate the factors that influence grammar and vocabulary in speaking and writing
CO5	Classify the parts of speech, tenses and sentence structures.

UNIT-I

Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Writing:** Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: Parts of Speech; Word formation, synonyms and antonyms; Idioms and Phrases; phrasal verbs.

UNIT-II

Lesson: The Brook: Alfred Tennyson

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Grammar and Vocabulary: Sentence structure; articles; Tenses; Prepositions.

UNIT-III

Lesson: A City Night Peace - Oliver Goldsmith

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing, Paragraph Writing

Grammar and Vocabulary: Voice; Reported Speech; Degrees of Comparison, Subject with agreement.

UNIT-IV

Lesson: Being Rich, Being Good - Chetan Bhagat

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Letter Writing: Official Letters/Report Writing

Grammar and Vocabulary: Information Transfer; Simple, Compound and Complex sentences; Question Tags

UNIT-V

Lesson: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Reading: Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences.

Grammar and Vocabulary: Reading Comprehension; Dialogue Writing; Common Errors.

Text Books:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12th Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
7. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler

Web links:

www.englishclub.com
www.easyworldofenglish.com
www.languageguide.org/english/
www.bbc.co.uk/learningenglish
www.eslpod.com/index.html
www.myenglishpages.com

B. Tech., I Semester

Course Title	Basic Electrical & Electronics Engineering					B. Tech. I Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2014104	Engineering Science (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	60	40	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:
The objective of the course is to learn basics of DC and AC circuits, Electrical Machines, Transformers and Power Systems. Theory, construction, and operation of electronic devices, biasing of BJTs and FETs, design and construction of amplifiers, concepts & principles of logic devices.

Course Outcomes: On successful completion of this course, the students will be able to

CO1	Understand the basic fundamentals of DC & AC circuits, network reduction techniques, machines and power system fundamentals
CO2	Understand theory, construction, and operation of electronic devices, working of diodes and its applications, working of transistors, microcontrollers & their applications.
CO3	Determine the currents, voltages using mesh and nodal analysis, Average and RMS values for different waveforms, equivalent circuit parameters using OC & SC test of single phase transformer.
CO4	Obtain the EMF equation and characteristics of dc machines and Induction motor
CO5	Analyze small signal amplifier circuits to find the amplifier parameters. Design small signal amplifiers using proper biasing circuits to fix up proper Q point

Part A: Basic Electrical Engineering

UNIT-I

DC Circuits: Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem. Simple Numerical Problems.

AC Circuits: Representation of sinusoidal waveforms – Average and RMS values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits, simple numerical problems.

UNIT – II

DC Machines: Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Torque equation – Performance Characteristics of DC Motor, speed control (Flux & Armature control of shunt motor), Simple numerical problems.

Transformers: Principle and operation of Single Phase Transformer – Emf equation, equivalent circuit, OC and SC tests on transformer, simple numerical problems.

Induction Motor: Principle and operation of 3-phase Induction Motor [Elementary treatment only].

UNIT – III

Basics of Power Systems: Typical AC power supply scheme – Generation of 3-phase supply, Definition of short, medium and long transmission lines – Concepts of AC & DC distribution system.

Text Books:

1. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. V.K. Mehta & Rohit Mehta, "Principles of Power System" – S.Chand – 2018.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

Reference Books:

1. L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.
3. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.
4. Fundamentals of Electric Circuits Charles K. Alexander and Matthew. N. O. Sadiku, Mc Graw Hill, 5th Edition, 2013.

Part B: Basic Electronics Engineering

UNIT – I

Diodes and Applications: Semiconductor Diode, Diode as a Switch& Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Operation and Applications of Zener Diode, LED, Photo Diode.

Transistor Characteristics: Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Biasing of Transistor Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Concepts of Small Signal Amplifiers –CE & CC Amplifiers.

UNIT – II

Operational Amplifiers and Applications: Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground; Op-Amp Applications - Inverting, Non-Inverting, Summing and Difference Amplifiers, Voltage Follower, Comparator, Differentiator, Integrator.

UNIT – III

Digital Electronics: Logic Gates, Simple combinational circuits–Half and Full Adders, BCD Adder. Latches and Flip-Flops (S-R, JK and D), Shift Registers and Counters. Introduction to Microcontrollers and their applications (Block diagram approach only).

Text Books:

1. R.L.Boylestad& Louis Nashlesky, Electronic Devices &Circuit Theory, Pearson Education,2007.
2. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, 4thEdition, Pearson, 2017.
3. R. P. Jain, Modern Digital Electronics,3rd Edition, Tata Mcgraw Hill,2003.
4. David A. Bell, "Electronic Devices and Circuits", Oxford; Fifth edition.

Reference Books:

1. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
2. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum"s outlines series, 3rd edition, McGraw-Hill (India), 2010.
3. R. S. Sedha, A Text Book of Electronic Devices and Circuits, S. Chand & Co, 2010.
4. Anil K. Maini, Varsha Agrawal, "Electronic Devices and Circuits", John Wiely, 2nd edition.

B. Tech., I Semester

Course Title	Engineering Drawing				B. Tech. I Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2003105	Engineering Science (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		1	0	2	2	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- Bring awareness that Engineering Drawing is the Language of Engineers.
- Familiarize how industry communicates technical information.
- Teach the practices for accuracy and clarity in presenting the technical information.
- Develop the engineering imagination essential for successful design.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Draw various curves applied in engineering
CO 2	Show projections of solids and sections graphically.
CO 3	Draw the development of surfaces of solids.
CO 4	Know draw orthographic and isometric projections.
CO 5	Evaluate different methods of perspective view.

UNIT-I

Introduction to Engineering Drawing: Principles of Engineering Drawing and its Significance-Conventions in drawing-lettering - BIS conventions.

a) Conic sections including the rectangular hyperbola- general method only,

b) Cycloid, epicycloids and hypocycloid c) Involutes.

UNIT – II

Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

Projections of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

UNIT – III

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

UNIT – IV

Orthographic Projections: Systems of projections, conventions and application to orthographic projections - simple objects.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids.

UNIT – V

Perspective projection –applications of perspective view –terminology of perspective view-methods of drawing perspective view-simple problems.

Text Books:

1. K.L. Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers,2016.
3. Interpreting Engineering DrawingsBook by Ted Branoff.
4. Mechanical Drawing: Board & CAD TechniquesBook by Jay D. Helsel.

Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right,2009
2. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers,2000
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education,2009
4. K.C.John, Engineering Graphics, 2/e, PHI,2013

B. Tech., I Semester

Course Title	Engineering Drawing Lab				B. Tech. I Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2003106	Engineering Science (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	2	1	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives:

- Familiarize how industry communicates technical information.
- Teach the practices for accuracy and clarity in presenting the technical information.
- Develop the engineering imagination essential for successful design.
- Bring awareness that Engineering Drawing is the Language of Engineers.

On successful completion of this course, the students will be able to	
CO 1	Use computers as a drafting tool.
CO 2	Draw isometric drawings using CAD packages.
CO 3	Analyze orthographic drawings using CAD packages.

Computer Aided Drafting:

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, poly lines, trimming, extending, stretching, fillets, arrays, dimensions.
Dimensioning principles and conventional representations.

Orthographic Projections: Systems of projections, conventions and application to orthographic projections - simple objects.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids.

Text Books:

1. K. Venugopal, V. Prabhu Raja, Engineering Drawing + Auto Cad, New Age International Publishers.
2. Kulkarni D.M, AP Rastogi and AK Sarkar, Engineering Graphics with Auto Cad, PHI Learning, Eastern Economy editions.
3. Mechanical Drawing: Board & CAD TechniquesBook by Jay D. Helsel.
4. A Textbook of Engineering Drawing: For Undergraduate ...Book by Addisu Dagne Zegeye

Reference Books:

1. T. Jayapoovan, Engineering Graphics using Auto Cad, Vikas Publishing House
2. Linkan Sagar, BPB Publications, Auto Cad 2018 Training Guide.
3. K.C.John, Engineering Graphics, 2/e, PHI,2013
4. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

B. Tech., I Semester

Course Title	Engineering Physics Lab				B. Tech. I Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20EP107	Engineering Science (BSC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---					End Exam Duration: 3 Hrs		

Course Objectives:

- Understand the role of Optical fiber parameters in engineering applications
- Identify the generation of magnetic field through current carrying conductor.
- Apply the concepts of interference and diffraction.
- Illustrates the magnetic materials applications.
- Recognize the significance of laser by studying its characteristics and its application in finding the particle size.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Operate various optical and electronic instruments.
CO 2	Apply the concepts of interference and diffraction to determine various parameters
CO 3	Estimate wavelength of laser and particles size using laser.
CO 4	Evaluate the acceptance angle of an optical fiber and numerical aperture.
CO 5	Plots the intensity of the magnetic field of circular coil carrying current with distance

Note: In the following list, out of 12 experiments, any 8 experiments must be performed in a semester

List of Experiments:

1. Determine the thickness of the wire using wedge shape method

   Experimental outcomes:

   Operates optical instrument like travelling microscope.

   Estimate the thickness of the wire using wedge shape method.

   Identifies the formation of interference fringes due to reflected light from non-uniform thin film.

2. Determination of the radius of curvature of the lens by Newton's ring method

   Experimental outcomes:

   Operates optical instrument like travelling microscope.

   Estimate the radius of curvature of the lens.

   Identifies the formation of interference fringes due to reflected light from non-uniform thin film.

   Plots the square of the diameter of a ring with no. of rings.

3. Determination of wavelength by plane diffraction grating method

   Experimental outcomes:

Operates optical instrument like spectrometer.
Estimate the wavelength of the given source.
Identifies the formation of grating spectrum due diffraction.

4. Determination of dispersive power of prism.
Experimental outcomes:
Operates optical instrument like spectrometer.
Estimate the refractive index and dispersive power of the given prism.
Identifies the formation of spectrum due to dispersion.

5. Determination of wavelength of LASER light using diffraction grating.
Experimental outcomes:
Operates various instrument.
Estimate the wavelength of laser source.
Identifies the formation of grating spectrum due diffraction.

6. Determination of particle size using LASER.
Experimental outcomes:
Operates various instrument.
Estimate the Particles size using laser.
Identifies the application of laser.

7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
Experimental outcomes:
Operates various instruments and connect them as per the circuit.
Estimate the numerical aperture and acceptance angle of a given optical fiber.
Identifies the significance of numerical aperture and acceptance angle of an optical fiber in various engineering applications.

8. Determination of dielectric constant by charging and discharging method.
Experimental outcomes:
Operates various instruments and connect them as per the circuit.
Estimate the dielectric constant of the given substance.
Identifies the significance of dielectric constant in various devices.

9. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method.
Experimental outcomes:
Operates various instruments and connect them as per the circuit.
Estimate the magnetic field along the axis of a circular coil carrying current.
Plots the intensity of the magnetic field of circular coil carrying current with distance

10. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
Experimental outcomes:
Operates various instruments and connect them as per the circuit.
Estimate the hysteresis loss, coactivity and retentivity of the ferromagnetic material.

Classifies the soft and hard magnetic material based on B-H curve.
Plots the magnetic field H and flux density B

11. To determine the resistivity of semiconductor by Four probe method
Experimental outcomes:
Operates various instruments and connect them as per the circuit.
Estimate the resistivity of a semiconductor.
Identifies the importance of four probe method in finding the resistivity of semiconductor.

12. To determine the energy gap of a semiconductor
Experimental outcomes:
Operates various instruments and connect them as per the circuit.
Estimate the energy gap of a semiconductor.
Illustrates the engineering applications of energy gap.
Plots 1/T with log R.

Text books:

1. S.Balasubramanian, M.N.Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
2. Physics Laboratory Manual by Loyd D H, Cengage learning, 4Th International Edition 2014.
3. Et.Al. Engineering Physics Lab Manual by Madhusudhana Rao, SCITECH PUBLICATIONS (INDIA) PVT. LTD, 2015.
4. Practical Physics by K. Venugopalan (Author), Vimal Saraswat (Author), Himanshu Publications (1 January 2018)

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Reference Books:

1. Physics Laboratory Experiments, by Jerry Wilson (Author), Cecilia A. Hernandez Hall (Author), Brooks/cole; 7th edition (11 June 2009)
2. Lab manual Physics, R Rangarajan, R P Manchanda, R K Gupta, Rajesh Kumar Neena Sinha- New Saraswati House
3. Practical Physics by Kumar P. R. Sasi, Prentice-Hall of India Pvt.Ltd

Weblink:

1. http://vlab.amrita.edu/index.php - Virtual Labs, Amrita University.

B. Tech., I Semester

Course Title	Communicative English Lab				B. Tech. I Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2024108	Humanities and Social Sciences Management (HSMC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives

- Students will be exposed to a variety of self-instructional, learner friendly modes of language learning
- Students will learn better pronunciation through stress, intonation and rhythm
- Students will be trained to use language effectively to face interviews, group discussions, public speaking
- Students will be initiated into greater use of the computer in resume preparation, report writing, format making Etc.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe objects, places and persons
CO 2	Understand the listening process and answer the questions related to it.
CO 3	Analyze phonetics with examples
CO 4	Illustrate different modes of communication skills
CO 5	Classify LSRW Skills

UNIT-I

- Listening Skills
- Phonetics
- Introducing oneself

UNIT-II

- Describing objects
- JAM / Interpretation of Hypothetical Situations
- Role play

UNIT-III

- Hypothetical situations (If…….. were)
- Elocution
- TED talks videos

UNIT-IV

- Visual Description

- Situational conversations

UNIT-V

- Oral Presentations
- PowerPoint presentations

Suggested Software:

- Orell
- Walden Infotech
- Young India Films
- K-Van solutions

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Web Links:

www.esl-lab.com
www.englishmedialab.com
www.englishinteractive.net

B. Tech., I Semester

Course Title	Basic Electrical & Electronics Engineering Lab					B. Tech. I Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2014109	Basic Science (BSC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives:
The objective of the course is to verify KCL, KVL, superposition theorem, measurement of real & reactive power for RL & RC circuits, performance characteristics of DC machines and transformers. Analyze the characteristics of Diodes, BJT, MOSFET, UJT, design the amplifier circuits from the given specifications and verification of truth tables.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Verify Kirchhoff's laws, superposition theorem theoretically and practically for any given circuit, truth table for different logic gates and measure real & reactive power for RL & RC circuits
CO 2	Illustrate various characteristics of DC machines from the measured data (Practically)
CO 3	Obtain the efficiency and regulation for single phase transformer
CO 4	Learn the characteristics of basic electronic devices like PN junction diode, Zener diode & BJT
CO 5	Analyze the application of diode as rectifiers, clippers and clampers and other circuits

Part– A

Basic Electrical Engineering Lab (Any 5 experiments)

List of experiments

1. Verification of Kirchhoff laws
2. Verification of Superposition Theorem
3. Magnetization characteristics of a DC Shunt Generator
4. Speed control of DC Shunt Motor
5. OC & SC test of 1 – Phase Transformer
6. Load test on 1-Phase Transformer
7. Brake test on DC Shunt Motor
8. Measurement of Real & Reactive Power by single phase RL, RC circuits

Part – B

Basic Electronics Engineering Lab (Any 5 experiments)

List of Experiments

1. PN Junction diode characteristics A) Forward bias B) Reverse bias
2. Zener diode characteristics and Zener as voltage Regulator

3. Full Wave Rectifier with & without filter
4. Wave Shaping Circuits. (Clippers & Clampers)
5. Input & Output characteristics of Transistor in CB / CE configuration.
6. Frequency response of CE amplifier.
7. Inverting and Non-inverting amplifiers using Op-AMPs.
8. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
9. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

II Semester
Syllabus

B. Tech., II Semester

Course Title	Differential Equations and Vector Calculus				B. Tech. II Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2021201	Basic Science (BSC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To enlighten the learners in the concept of differential equations.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Classify second and higher order liner D.E's with constant coefficients.
CO 2	Solve partial differential equations.
CO 3	Analyze the applications of partial differential equations.
CO 4	Understand vector differentiation concepts.
CO 5	Apply vector integration concepts.

UNIT-I

Linear differential equations of higher order (constant coefficients): Definitions, homogeneous and non- homogeneous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters.

UNIT-II

Partial Differential Equations: Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's method.

UNIT-III

Applications of Partial Differential Equations: Classification of PDE, method of separation of variables for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation.

UNIT-IV

Vector differentiation: 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: 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) and applications of these theorems.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-43 edition 2014.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition- 2013
3. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, Pearson, 9th Edition, Reprint, 2002.
4. Advanced Engineering Mathematics, Greenberg Michael D, Cengage Publishers.

Reference Books:

1. Higher Engineering Mathematics, B.V. Ramana, Mc. Graw Hill Education (India) Pvt. Ltd, New Delhi, 11th Edition, Reprint 2010.
2. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008.
3. Applied Calculus, Hegarty John C
4. Advanced Calculus, Widder V David, Pearson Publishers

B. Tech., II Semester

Course Title	Engineering Chemistry					B. Tech. II Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20EC202	Basic Science (BSC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

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

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Evaluate the amount of hardness and dissolved oxygen present in water sample.
CO 2	Demonstrate the corrosion prevention methods and factors affecting corrosion.
CO 3	Explain the preparation, properties, and applications of thermoplastics & thermosetting, Elastomers & conducting polymers
CO 4	Understand the setting and hardening of cement and concrete phase.
CO 5	Analyze the concepts of colloids, micelle and nanomaterials.

UNIT-I

Water Technology: Introduction –Soft Water and hardness of water, hardness of water by EDTA Method, Estimation of dissolved oxygen (Winkler's method)-Boiler troubles **–**Priming, foaming**,** scale and sludge, Caustic embrittlment, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT-II

Electrochemistry and Applications: Introduction to electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithium ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bed worth ratios and uses, Factors affecting the corrosion, Cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

UNIT-III

Polymers and Fuel Chemistry: Introduction to polymers, Polymer dispersion index, functionality of monomers, Mechanism of chain growth, step growth and coordination polymerization.

Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC and Bakelite

Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol

Fuels – Types of fuels, calorific value, numerical problems based on calorific value; Analysis of coal, Liquid Fuels refining of petroleum, fuels for IC engines, knocking and anti-knock agents, Octane and Cetane values, cracking of oils; alternative fuels- propane, methanol and ethanol, bio-fuels.

UNIT-IV

Advanced Engineering Materials: Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point.

Building materials- Portland cement, constituents, phases and reactivity of clinker, Setting and Hardening of cement.

UNIT-V

Surface Chemistry and Applications: Introduction to surface chemistry, colloids, micelle formation, synthesis of colloids (Dispersion method), chemical and electrochemical method (chemical vapour deposition) of preparation of nano metals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, applications of colloids and nanomaterials – medicine.

Text Books:

1. A textbook of Engineering chemistry by Shashi Chawla, Dhanpat Rai & Co publications
2. Text Book of Physical Chemistry, Samuel Glasstone, Mcmillian publications.
3. Textbook of Polymer Science, Third Edition, Fred W. Billi Meyer, TR, A Wiley-Inter Science Publications.
4. An Introduction to Electrochemistry, Glasstone, Arihant Publications.

Reference Books:

1. Textbook of Engineering Chemistry, Jain and Jain, DhanpatRai& Co publications, 2013
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman,1992.
3. Water Technology, 2nd Edition, N.F. Gray, Elsevier publications, 2005.
4. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.

B. Tech., II Semester

Course Title	C Programming & Data Structures					B. Tech. II Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005203	Engineering Science (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:
The course aims to provide exposure to problem-solving through programming and to train the student to the basic concepts of the C programming language
Gain knowledge of data structures and their applications

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Formulate simple algorithms for arithmetic and logical problems and to translate the algorithms to programs (in C Language)
CO 2	Choose the loops and decision-making statements to solve the problem
CO 3	Implement different Operations on arrays
CO 4	Use functions to solve the given problem and Understand structures, unions and pointers
CO 5	Understand need of data structures in real time situations

UNIT-I

Introduction to C programming: C language elements, variable declarations and data types, operators and expressions, decision statements - If and switch statements, loop control statements - while, for, do-while statements. Jumping statements: break, continue and goto statements.

UNIT – II

Arrays: Introduction, Declaration and initialization of 1D and 2D arrays, Functions: types of functions, Recursion and argument passing, pointers, storage allocation, pointers to functions, expressions involving pointers, Storage classes – auto, register, static, extern. Strings: string handling functions, and Command line arguments.

UNIT – III

Pointers: Introduction to pointers, declaring and initialization of pointer variable, accessing the address of variables, accessing a variable through its pointer, chain of pointers. Structures and unions: Introduction, defining a structure, declaring structure variable, structure initialization, accessing members of structure, copying and comparing structure variables, structures within structures, array of structures, and introduction of union.

UNIT – IV

Data Structures: Overview of data structures, stacks and queues, representation of a stack, stack related terms, operations on a stack, implementation of a stack, evaluation of arithmetic

expressions, infix, prefix, and postfix notations, evaluation of postfix expression, conversion of expression from infix to postfix, recursion, queues - various positions of queue, representation of queue, insertion, deletion, searching operations.

Searching and sorting:

linear search, binary search, bubble (exchange) sort, selection sort, insertion sort.

UNIT – V

Linked Lists – Single linked list, Operations on Single Linked List: insertion, deletion and searching operations, doubly linked lists and its operations, circular linked lists and its operations.

Trees - Tree terminology, representation, Binary trees, representation, binary tree traversals. Binary tree operations.

Text Books:

1. E. Balagurusamy, C Programming and Data structures,Fourth Edition, McGrawHill.
2. Rema Theraja, Programming in C, second edition,Oxford.
3. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Computer Science Press.
4. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. R.G. Dromey, How to solve it by Computer,Pearson.
3. YashavantKanetkar, Let us C, 15th edition, BPBPublications.
4. Dr. P. ChennaReddy, Computer Fundamentals and C Programming, SecondEdition

B. Tech., II Semester

Course Title	Strength of Materials					B. Tech. II Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001204	Engineering Science (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To make the students understand the effect of forces on rigid body & to calculate CG and moment of inertia of solids and surfaces.
- To make students learn the basic concepts of strength of materials, elastic moduli and their relations and temperature stresses.
- To impart procedure for drawing shear force and bending moment diagrams for determinate beams.
- To make the student able to analyze flexural stresses in various sections due to different loads.
- To make the student able to analyze shear stresses in various sections due to different loads and analyze determinate trusses.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the different types of forces systems and its effect on rigid bodies and to locate CG and moment of inertia of different geometrical shapes
CO 2	Understand the concepts of stress, strain, elastic moduli, stresses in composite bars and temperature stresses.
CO 3	Develop shear force and bending moment diagrams of determinate beams for different loads.
CO 4	Compute the flexural stresses of different cross-sections under different loads.
CO 5	Compute and visualize the shear stresses variation across depth of sections under different loads.

UNIT-I

Introduction to Mechanics: Basic Concepts, system of Forces -Coplanar Concurrent Forces - Components in Space Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial systems- **Center of Gravity, Centroid and moment of inertia:** Introduction – Center of gravity/centroid and Moment of Inertia of rectangular, circular, Triangular, I, L and T sections - built up sections.

UNIT – II

Simple Stresses and Strains: 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 – Composite

bars – Temperature stresses. Strain energy – Resilience – Gradual, Sudden, impact and shock loadings – simple applications.

UNIT – III

Shear Force and Bending Moment: Definition of beam – types of beams – types of supports – types of loads - Concept of Shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and over changing beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads – point of contra flexure – Relation between S.F, B.M and rate of loading at a section of a beam.

UNIT – IV

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

UNIT – V

Shear Stresses: Derivation of Formula-Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections. Combined bending and shear.
Analysis of trusses by Method of Joints & Sections.

Text Books:

1. S. Timoshenko, D.H. Young and J.V. Rao, "Engineering Mechanics", Tata McGraw-Hill Company.
2. E.P. Popov, "Mechanics of Materials", Hardcover, Prentice-Hall, 1958.
3. R.K. Rajput, "Strength of Materials", S.Chand Publishers.
4. R. K. Bansal, "Strength of Materials", Lakshmi Publications House Pvt. Ltd.

Reference Books:

1. S.S. Bhavikatti, "Strength of materials", Vikas publishing house Pvt. Ltd.
2. R. Subramanian, "Strength of Materials", Oxford University Press.
3. F. L. Singer and A. Pytel, "Strength of materials", 4th edition, Longman, 1990
4. Stephen P. Timoshenko, History of Strength of Materials (Dover Civil and Mechanical Engineering), Dover Publications Inc.

B. Tech., II Semester

Course Title	Engineering Workshop					B. Tech. II Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20EW205	Laboratory (LC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives: To familiarize students with

- Sheet metal operations
- Fitting
- Electrical house wiring skills
- Wood working

Course Outcomes: On successful completion of this course, the students will be able to

CO 1:	Apply wood working skills in real world applications
CO 2:	Build different objects with metal sheets in real world applications
CO 3:	Apply fitting operations in various applications.
CO 4:	Apply different types of basic electric circuit connections
CO 5:	Use soldering and brazing techniques

Wood Working:

Familiarity with different types of woods and tools used in wood working and make following joints

Half – Lap joint

Mortise and Tenon joint

Corner Dovetail joint or Bridle joint

Sheet Metal Working:

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

Fitting:

Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit b) Dovetail fit c) Semi-circular fit d) square fitting

Electrical Wiring:

Familiarities with different types of basic electrical circuits and make the following connections

a) Parallel and series b) Two-way switch c) Go down lighting d) Tube light

e) Three phase motor f) Soldering of wires

Note: In each section a minimum of three exercises are to be carried out.

B. Tech., II Semester

Course Title	IT Workshop					B. Tech. II Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005206	Laboratory (LC)	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives:

- To make the students know about the internal parts of a computer, assembling and dissembling a computer from the parts, preparing a computer for use by installing the operating system.
- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations and LAteX.
- To learn about Networking of computers and use Internet facility for Browsing and Searching.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Disassemble and Assemble a Personal Computer and prepare the computer ready to use
CO 2	Prepare the Documents using Word processors and Prepare spread sheets for calculations .using excel and also the documents using LAteX
CO 3	Prepare Slide presentations using the presentation tool
CO 4	Interconnect two or more computers for information sharing
CO 5	Access the Internet and Browse it to obtain the required information

Preparing your Computer:

Task 1:

Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2:

Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods.

Task 3:

Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4:

Operating system features: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

Networking and Internet:

Task 5:

Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc. should be done by the student. The entire process has to be documented.

Task 6:

Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating email account.

Task 7:

Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

Productivity tools:

Task 8:

Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

Task 9:

Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show.

Task 10:

Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet.

Task 11:

LateX: Introduction to Latex and its installation and different IDEs. Creating first document using Latex, using content into sections using article and book class of LaTeX. Styling Pages: reviewing and customizing different paper sizes and formats. Formatting text (styles, size, alignment, colors and adding bullets and numbered items, inserting mathematical symbols, and images, etc.). Creating basic tables, adding simple and dashed borders, merging rows and columns. Referencing and Indexing: cross-referencing (refer to sections, table, images), bibliography (references).

Reference Books:

1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, PowerPoint & Outlook Exams, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs, Bigelows, TMH
6. Lamport L. LATEX: a document preparation system: user's guide and reference manual. Addison-wesley; 1994.

B. Tech., II Semester

Course Title	Engineering Chemistry Lab					B. Tech. II Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20EC207	Basic Science (BSC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives:

- To verify the fundamental concepts with experiments.
- The student will have exposure to various experimental skills and hand-on experience which is very essential for an Engineering student.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Determine the cell constant and conductance of solutions by using conductometer & pH meter
CO 2	Synthesis of advanced polymer materials
CO 3	Compare the physical properties like adsorption and viscosity.
CO 4	Evaluate the Iron and Calcium in cement.
CO 5	Estimate the hardness & dissolved oxygen content in water.

Note: In the following list, out of 12 experiments, any 8 experiments must be performed in a semester

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of dissolved oxygen by Winkler's method
3. pH metric titration of strong acid vs. strong base.
4. pH metric titration of weak acid vs. strong base
5. Determination of cell constant and conductance of solutions
6. Potentiometry - determination of redox potentials and emfs
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of a polymer (Bakelite).
9. Determination of percentage of Iron in Cement sample by colorimetry
10. Estimation of Calcium in port land Cement
11. Preparation of nanomaterials by precipitation.
12. Adsorption of acetic acid by charcoal
13. Determination of percentage Moisture content in a coal sample
14. Determination of Viscosity of lubricating oil by Redwood Viscometer 1.
15. Determination of Viscosity of lubricating oil by Redwood Viscometer 2.

Text Books:

1. Vogel's Text book of Quantitative Chemical Analysis, J. Mendham et.al., Pearson Education, Sixth Edition, 2012.

2. Laboratory manual on Engineering Chemistry, Anupama Rajput, Dhanpat Rai& Co Publications.
3. Essentials of Experimental Engineering Chemistry, Shashi Chawla, Dhanpat Rai& Co Publications.

Reference Books:

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.
3. Essentials of Physical Chemistry, Bhal & Tuli. (S. Chand Publications).
4. Advanced Inorganic Analysis, Agarwal & Keemtilal (Pragati prakashan)

B. Tech., II Semester

Course Title	C Programming & Data Structures Lab					B. Tech. II Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005208	Engineering Science (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration:---						End Exam Duration: 3 Hrs		

Course Objectives:

- To know how to write and debug programs.
- To know the principles of designing structured programs
- To Write basic C programs using, Selection statements, Repetitive statements
- To understand Functions, Pointers, Arrays, Strings and structures
- To apply suitable data structure to solve real world problems

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Formulate the algorithms for simple problems, Translate given algorithms to a working and correct program
CO 2	Correct syntax errors as reported by the compilers, Identify and correct logical errors encountered at runtime
CO 3	Write iterative as well as recursive programs
CO 4	Represent data in arrays, strings and structures and manipulate them through a program
CO 5	Write programs on data structures like stack, queue, liked list, trees etc

1. Ramesh ‘s basic salary is input through the keyboard. His dearness allowance is 40% of basic salary and house rent allowance is 20% of basic salary. Write a C program to calculate his gross salary.
2. Write a program to take input of name, roll no and marks obtained by a student in 5 subjects each have its 100 full marks and display the name, roll no with percentage score secured.
3. a) Write a C program to find out whether a given number is even number or odd number.
b) Write a C program to check whether a given year is leap year or not.
4. Design and develop an algorithm that takes three coefficients (a, b, and c) of a Quadratic equation ($ax^2+bx+c=0$) as input and compute all possible roots. Implement a C program for the developed algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages.
5. If the ages of the Ramesh, Suresh and Mahesh are input through the keyboard, write a C program to determine youngest of the three.
6. A character is entered through keyboard. Write a C program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol using if- else and switch case. The following table shows the range of ASCII values for various characters.

Characters	ASCII values
A–Z	65 – 90

a– z	97 – 122
0 – 9	48 – 57
Special symbols	0 – 47, 58 – 64, 91 – 96, 123 – 127.

7. Write a C program which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use switch statement).
8. Design and develop an algorithm to find whether a given number is Armstrong number or not. Implement a C program for the developed algorithm.
9. Design and develop an algorithm to check whether a given number is palindrome or not. Implement a C program for the same.
10. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
11. Write a C program to generate the first N terms of Fibonacci sequence.
12. Write a C program to find the smallest and largest number in a given array.
13. Write a C program to find the frequency of a particular number in a list of integers.
14. Write a C program to sort the list of elements using
    a) Bubble Sort b) Selection sort.
15. Write a C program to search for an element in a list of elements using
    a) Linear search b) Binary search
16. Write a C program to read two matrices and perform the following operations
    a) Addition of two matrices
    b) Multiplication of two matrices
17. Partitioning an array

Given a randomly ordered array of n elements, write a C program to partition the elements into two subsets such that elements $\leq X$ are in one subset and elements $\geq X$ are in another subset.

18. Write a C program to rearrange the elements in an array so that they appear in reverse order.
19. If a string and its reversed string are same then the string is called as palindrome string. Design and develop an algorithm to check whether a given string is a palindrome or not and implement a C program for the same.
20. Write a C program to read two strings and perform the following operations without using built string library functions.

i) String length ii) String reversing
iii) Comparison of two strings iv) Concatenation of two strings

21. Write a C program to count the number of vowels, consonants, digits, blank space sand special characters in a given string.
22. Write a C program to swap the contents of two variables using
    a) Call by value
    b) Call by reference.
23. Write a C program using recursion to
    a) Find the factorial of a given number

b) Print the Fibonacci series up to a given number.

c) Find the GCD of two integers.

24. Write a C program to define a structure with the following members.

Roll No., Name, marks in Sub1, Sub2, Sub3. Read the n students records and find the total marks of each student and print the result in the following format.

Roll No.	Name	Sub1	Sub2	Sub3	Total marks	Result
189Y1A0501	Kavya	80	70	75	225	Distinction

25. Write C programs that implement stack (its operations) using

i) Arrays

ii) Pointers

26. Write C programs that implement Queue (its operations) using

i) Arrays

ii) Pointers

27. Write a C program that uses Stack operations to perform the following:

i) Converting infix expression into postfix expression

ii) Evaluating the postfix expression

28. Write a C program that uses functions to perform the following operations on single linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

29. Write a C program that uses functions to perform the following operations on Double linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

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

i) Creating a Binary Tree of integers

ii) Traversing the above binary tree in preorder, inorder and postorder.

Text Books:

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.
2. B.A.Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
3. Richard F. Gilberg& Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011
4. E. Balagurusamy, Programming in ANSI C, Fifth Edition, McGrawHill.

B. Tech., II Semester

Course Title	Strength of Materials Lab				B. Tech. II Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001209	Engineering Science (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives:

- To enhance the knowledge of students on stress at a point under tension, compression and shear.
- To enable students, understand the energy absorption capacity of the springs.
- To enable student to assess hardness of various metals.
- To enable students, distinguish between sagging and hogging deflections of different beams under loading conditions.
- To give light on basic mechanical properties of materials used in engineering practice.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Visualize the stress-strain relationships for MS bas/HYSD bar
CO 2	Analyse the compressive and shear strength properties of wood/concrete and metal
CO 3	Determine the stiffness of the spring and bar element
CO 4	Deflection of various metallic beams under point load condition(s)
CO 5	Compute Hardness Number and impact strength of different metals

List of Experiments

1. Tension test on HYSD bar.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on a simply supported beam.
4. Torsion test on mild steel specimen.
5. Hardness test on metals.
6. Compression test on Open coiled springs
7. Tension test on Closely coiled springs
8. Compression test on wood/concrete
9. Izod / Charpy Impact test on a mild steel specimen
10. Shear test on a mild steel specimen

List of Augmented Experiments:

1. Continuous beam–deflection test.
2. Verification of Maxwell's reciprocal theorem.

Reference Books:

1. R.K. Rajput, "Strength of Materials", S. Chand Publishers.
2. R. Subrahmanyam , "Strength of materials", Oxford university press

B. Tech., II Semester

Course Title	Environmental Science					B. Tech., II Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20MC210	Mandatory (MC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	0	40	--	--
Mid Exam Duration: 1.5 Hrs						End Exam Duration: ---		

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life.
- To save earth from the inventions by the engineers.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Explain** multidisciplinary nature of environmental studies and various Renewable and Nonrenewable resources.
CO 2	**Understand** the Energy flow, bio-geo chemical cycles and ecological pyramids
CO 3	**Illustrate** various causes of pollution and related preventive measures.
CO 4	**Summarize** Solid waste management, Social issues related to environment and their protection acts.
CO 5	**Evaluate** Causes of population explosion, value education and welfare programmes.

UNIT – I

Multidisciplinary Nature Of Environmental Studies: –Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems

Forest resources: deforestation, case studies – Mining, dams and other effects on forest and tribal people

Water resources: Use and over utilization of surface and ground water conflicts over water. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

Energy resources: Renewable &Non-Renewable.

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Food chains, food web- Ecological succession and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.

b. Desert ecosystem
c. Aquatic ecosystems (lakes, rivers and oceans)

Biodiversity And Its Conservation : Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of:

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

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

Social Issues and The Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents. Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act.

UNIT – V

Human Population and The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses, Erach Bharucha for University Grants Commission, Universities Press.
2. Fundamental Concepts of Environmental Chemistry- Sodhi G S – Oxford University
3. Environmental Chemistry- Anil Kumar De-Willey Publications
4. Environment Impact Assessment- Larry W. Canter- Mc Graw Hill publications

Reference Books:

1. G. R. Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
2. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.
3. Environmental Science, A Global Concerns, William P. Cunningham, Mary Ann Cunningham, Mc Graw Hill publications.
4. Environmental Science & Engineering, Glynn Henry J, Heinke Gary w, Pearson publications

III Semester
Syllabus

B. Tech., III Semester

Course Title	Probability, Statistics & Numerical Methods				B. Tech. III Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2021302	Basic Science (BSC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- The objective of this course is to familiarize the students' knowledge in basic concepts and few techniques in probability and statistics in relation to the engineering applications.
- Also, to impart with numerical methods of solving the non-linear equations and interpolation.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply discrete and continuous probability distributions.
CO 2	Infer the statistical inferential methods based on large sampling tests.
CO 3	Infer the statistical inferential methods based on small sampling tests.
CO 4	Determine the roots of polynomial and transcendental equations by different methods.
CO 5	Estimate an unknown quantity by using related known values.

UNIT-I

Probability: Explaining basic concepts of Random variables (Without Problems)

Probability distributions: Binomial - Poisson approximation to the binomial distribution and normal distribution-their properties.

UNIT-II

Testing of Hypothesis: Formulation of null hypothesis, critical regions, level of significance. Large sample tests. Tests based on normal distribution –z -test for means and proportions.

UNIT-III

Small Sample Tests: t-test for one sample, two samples problem and paired t-test, F-test - Chi-square test (testing of goodness of fit and independence).

UNIT-IV

Solution of algebraic and transcendental equations: Bisection method – False - position method – Newton - Raphson method.

Solution of System of equations: Jacobi's iteration method – Gauss- Seidel iteration method.

UNIT-V

Interpolation: Finite differences - Forward differences - Backward differences - Newton's forward and backward difference formulae for interpolation - Lagrange's formula for unequal intervals- Inverse interpolation.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, 44/e, Khanna Publishers, 2017.
2. Probability & Statistics for Engineers & Scientists, Walpole, Myers, Myers, Ye, Seventh Edition, Pearson Education Asia.
3. Applied Numerical Analysis, Curtis F.Gerald, Patrick O.Wheatley, Seventh Edition, Pearson Education.
4. Numerical Methods, P. Kandasamy, K. Thilagavathy, K. Gunavathi, S. Chand & Company, 2/e, Reprint 2012.

Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition-2013.
2. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal,Laxmi Publications, Reprint, 2010.
3. Numerical Methods, S Arumugam, A.Thangapandi Issac, A Somasundaram SCITECH Publishers, Second edition Reprint 2013.
4. Probability and Statistics for Engineers, Johnson, Fifth edition, Prentice Hall of India.

B. Tech., III Semester

Course Title	Geology and Building materials					B. Tech. III Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001302	Engineering Science (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	1	3.5	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To give the basics knowledge of Geology that is required for constructing various Civil Engineering Structures, basic Geology.
- The ability to know the weathering procedure of rocks.
- The ability to understand Engineering properties of Rocks and their Minerals.
- To study the Engineering Properties of Building materials.
- To study the modern Engineering materials used in construction.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the geological structures and weathering of Rocks.
CO 2	Classify the minerals and summarise the engineering properties of Rocks.
CO 3	Study the various physical and engineering properties of basic materials used for construction.
CO 4	Understand the uses and practical application of roofing and Flooring materials.
CO 5	Know the various modern building materials and its applications in Civil Engineering domain.

UNIT – I

Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies. **Structural Geology:** Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism, and their importance in Civil Engineering. **Weathering:** Weathering of rocks, Geological agents, weathering process of Rock, Rivers, and geological work of rivers.

UNIT-II

Mineralogy: Definition of mineral; Significance of different physical properties of minerals. Study of Common rock forming minerals and their identification; Clay minerals, Study of common economic minerals –Hematite, Magnetite, Galena. Graphite, Bauxite, Coal. Petrology: Definition of rock: Geological classification of rocks.Study of different group of minerals, physical properties and their identification.

Engineering Properties of Rocks: Different Engineering properties of rocks. Study of common Rocks – Granite - Basalt – Dolerite – Pegmatite – Sandstone – Limestone – Shale – Laterite - Granite gneiss – schist – Marble - quartzite – khondalite – Charnockite.Study of identification of rocks (Igneous, sedimentary and metamorphic rocks) and structural geology problems. Study of topographical features from geological maps.

UNIT – III

Introduction: Physical, chemical, and engineering properties of building materials. Application of building materials. **Bricks:** Types of bricks, manufacturing process of bricks, Test on bricks, Standard requirements, and grades of bricks as per BIS. **Cement:** Types of cement with their specific use, Grade of cement as per BIS, Engineering properties of cement, Field, and laboratory test of cement as per BIS, Methods of storing the cement. **Lime and pozzolan:** Sources and classification of Lime, Uses of lime with specific field situation, Types of pozzolanic materials, Advantages of addition of pozzolanic material. **Timber:** Types of timber, Uses and application of timber, Defects in timber and wood, Seasoning, Wood products with specific uses.

UNIT – IV

Roofing Material: Structural Steel and Aluminium – Roofing Material - Physical description of asbestos sheets, GI sheets, tubes, and light weight roofing materials.

Flooring Materials: Functional requirement of flooring, types of floor finishes, Types of flooring: timber flooring, cement concrete flooring, mosaic flooring, ceramic flooring, terrazzo flooring, tiled flooring, rubber flooring, epoxy asphalt flooring. Industrial flooring: Vacuum Dewatered Flooring – Bitumen – forms of bitumen - functions of bituminous materials – Tests for bituminous materials.

UNIT – V

Modern Building Materials: Fibre glass reinforced plastic – Clay products –Refractories – Composite materials – Types – Applications of laminar composites – Fibre Textiles – Geosynthetics for Civil Engineering applications -Recycling of Industrial waste as building material - Polymers in Civil Engineering.

Text Books:

1. Engineering Geology by N. Chennakesavulu, Laxmi publications, 2nd Edition, 2016.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing House Pvt. Ltd., 2017.
3. Parbin Singh, Engineering and General Geology, Katson Publication House, 1987.
4. Krynine and Judd, Engineering Geology and Geotechniques, McGraw Hill Book Company,New Delhi, 1990.

Reference Books:

1. F.G. Bell, Fundamentals of Engineering Geology, Butterworth-Heinemann, Kindle Edition, 2016.
2. Legeet, Geology and Engineering, McGraw Hill Book Company, New Delhi 1998.
3. Bangar, K.M., Principles of Engineering Geology, Standard Publishers & Distributors, New Delhi, 2nd Edition, 2007.
4. Engineering Geology for Civil Engineers – P.C. Varghese PHI, 2012.

B. Tech., III Semester

Course Title	Advanced Strength of Materials					B. Tech. III Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001303	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	1	4	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

Objective of this course is to make the students

- To understand calculation of deflection of beams under different loading conditions
- To understand the basic torsion concepts behind the shafts design and engineering knowledge behind the springs.
- To understand the stress at a point due to uniaxial and by-axial loading on a member and theory of failures from energy theories.
- To understand the fundamentals of Euler's theorem for columns and critical load carrying capacity of columns.
- To understand stresses in closed cylinders and design of thin and thick cylinders.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Use double integration and Macaulay's methods to calculate deflection of beams.
CO 2	Apply torsion theory for design of shafts and springs.
CO 3	Estimate the principal stresses and principal strains in a body.
CO 4	Calculate load carrying capacity of short columns and long columns using Euler's and Rankin's theorem.
CO 5	Find the stresses and strains in thin cylinders and application of Lame's theorem for thick cylinders.

UNIT – I

Deflection of Beams: Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L,uniformly varying load and couple -Mohr's theorems – Moment area method – Application to simple cases.

UNIT – II

Torsion: Theory of pure torsion, Torsional equation, Torsional moment of resistance, Polar section modulus, Power transmitted by shafts; combined bending, torsion and end thrust; Design of shafts.

Springs: Deflection of close and open coiled helical springs under axial load and axial twist, Springs in series and parallel.

UNIT – III

Principal Stresses and Strains: Stresses on an inclined plane 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, Triaxial state of stresses, Principal stresses and strains.

Theories of Failure: Maximum principal stress theory, Maximum principal strain theory, Maximum shear stress theory, Maximum strain energy theory, Maximum shear strain energy theory.

UNIT – IV

Columns and Struts: Short, medium and long columns, axially loaded compression members, Euler's theorem for long columns, Euler's critical load, Equivalent length of a column, Slenderness ratio, Limitations of Euler's theory, Rankine–Gordon formula, long columns subjected to eccentric loading.

UNIT-V

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

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

Text Books:

1. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, Mechanics of Materials, Laxmi Publications Pvt. Ltd., 2001.
2. Bhavikatti, S. S., Strength of Materials, Vikas Publishing House, 3rd Edition, 2010.
3. Strength of Materials by R. Subramanian, Oxford University Press
4. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press

Reference Books:

1. Rajput, R. K., Strength of Materials (Mechanics of Solids), S. Chand & Company LTD, 5th Edition, 2006.
2. Basu, A. R., Strength of Materials, Dhanpat Rai & Co. (P) Ltd., 2nd Revised Edition, 2015.
3. Junnarkar, S. B. and Shah, H. J., Mechanics of Structures – Vol. I (Strength of Materials), Charotar Publishing House Pvt. Ltd., 27th Revised and Enlarged Edition, 2008.
4. Khurmi, R. S., Strength of Materials, S. Chand & Company Ltd., 23rd Edition, 2005.

B. Tech., III Semester

Course Title	Fluid Mechanics					B. Tech. III Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001304	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To develop a basic understanding about the properties of fluids and the applications of fluid mechanics.
- To formulate and analyse the problems related to calculation of forces in fluid structure interaction.
- To understand the concept of fluid measurement, types of flows.
- To enable the students to apply the basic principles of fluid mechanics on pipe flow network.
- To demonstrate the flow under laminar and turbulent, analyze the model studies of fluid flow problems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Describe** the significance of fluid properties, **measure** the pressure and hydrostatic pressure and **analyze** forces on floating bodies.
CO 2	**Know** the basics of fluid kinematics, dynamics and **understand** and **apply** the Bernoulli principle.
CO 3	**Know** the applications of Bernoulli's equation in devices like venturimeter, orifice meter and flow through notches and weirs.
CO 4	**Categorize** fluid flow through pipes in series, parallel and pipe networks.
CO 5	**Analyze** the pipe network under laminar and turbulent and **demonstrate** model studies for fluid flow problems.

UNIT- I

Properties of Fluid: Distinction between a fluid and a solid, Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Fluid Statics: Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube manometer, single column manometer, U-Tube differential manometer, Micromanometers, pressure gauges. Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT – II

Fluid Kinematics: Classification of fluid flow - Steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and

incompressible flow; ideal and real fluid flow; one,two and three dimensional flows; stream line, path line, streak line and stream tube; stream function, velocity potential function. One,two and three dimensional continuity equations in Cartesian coordinates.

Fluid Dynamics: Surface and body forces - Euler's and Bernoulli's equation; Energy correction factor; Momentum equation. Vortex flow – Free and Forced. Bernoulli's equation to real fluid flows.

UNIT – III

Flow Measurement in Pipes: Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend.

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

UNIT – IV

Analysis of pipe flow: Reynolds experiment, Reynolds number**,** loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy line, hydraulic grade line, pipes in series, equivalent pipes, pipes in parallel, siphon, branching of pipes, three reservoir problem, power transmission through pipes. Analysis of pipe networks: Hazen-Williams formula, Hardy Cross method, water hammer in pipes and control measures.

UNIT – V

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.

Hydraulic Similitude: Dimensional analysis - Rayleigh's method and Buckingham's pi theorem - Model studies – Geometric, kinematic and dynamic similarities - Dimensionless numbers – Model laws – Scale effects.

Text Books:

1. Fluid Mechanics by Modi and Seth, Standard Book House, 20th edition 2018.
2. Fluid Mechanics and Hydraulic Machines by Manish Kumar Goyal, PHI learning Private Limited, 2015,Kindle edition 2015.
3. Fluid Mechanics by R.C.Hibbeler, Pearson India Education Services Pvt. Ltd, 2ndedition 2016.
4. Fluid Mechanics and Hydraulilc Machines, R.K. Bansal, Laxmi Publication Pvt Ltd. 9th edition 2016.

Reference Books:

1. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill, 1993, First edition.
2. Introduction to Fluid Mechanics and Fluid Machines by S K Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Pvt. Limited, 3rd Edition, 2016.
3. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010, First edition.
4. Fluid mechanics & Hydraulic Machines, Domkundwar&DomkundwarDhanpat Rai & Co, 9th edition 2015.

B. Tech., III Semester

Course Title	Geomatics					B. Tech. III Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001305	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- Improve the knowledge working principles of survey instruments.
- Perform field work for plane table and levels by levelling instrument for prepare maps with levels.
- Perform traverse calculations, horizontal and vertical positions and angles through Theodolite surveying and Tacheometric surveying.
- To evaluate areas and volumes of earth work and setting of curves.
- To describe the modern surveying tools are usage by EDM and drone surveying.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Compute linear and areal measurements by using chain and compass.
CO 2	Gain the knowledge on levelling and contouring techniques and its applications.
CO 3	Understand the basics on linear and angular measurements with the help of Theodolite and Tacheometer.
CO 4	Compute areas and volumes of a field for different practical conditions and curve setting.
CO 5	Apply the modern surveying techniques for various field problems.

UNIT - I

Introduction: Introduction, Objectives, classification and principles of surveying.

Chain Surveying: Principles of Chain Surveying, Chaining, Type of chains, Recording the measurement, Offsets and their types, Number of offsets, Computation of areas, Errors in lengths due to incorrect chain, Correction for slopes, Error in chaining with tape and corrections, Numerical on chain and tape corrections

Compass Surveying: Types of compass, Bearings, Included angles, Errors and adjustments.

UNIT – II

Plane Table Surveying: Equipment, Methods of plane tabling, Errors, Two- and three-point problems.

Levelling and Contouring: Types of levelling, Types of levelling instruments, Temporary and permanent adjustments, Height of instrument and rise and fall methods, Plotting longitudinal sections and cross sections, Effect of curvature and refraction, Characteristics of contours, Uses of contour maps.

UNIT – III

Theodolite Surveying: Description of theodolite, Temporary and permanent adjustments of vernier transit, Measurement of horizontal and vertical angles, Heights and distances,

Traversing, closing error and distribution, Gale's traverse table, omitted measurements. **Tacheometric Surveying:** Principle of stadia method, Distance and elevation formulae for staff held vertical and normal, Instrumental constants, Analytic lens, Tangential method.

UNIT – IV

Computation of Areas: Areas dividing into number of triangles, By offsets to a base line, By coordinates, Areas from maps.

Computation of Volumes: Volume from cross-section, Embankments and cutting for a level section and two-level sections with and without transverse slopes, Determination of the capacity of reservoir.

Route surveying – Curves: Curves - Types - Elements of a curve - Simple curves - Setting out of curves using various methods – Geometry of compound curves and reverse curves – Introduction to transition and vertical curves.

UNIT – V

Electromagnetic distance measurement (EDM) – Principle of EDM, Modulation, Types of EDM instruments, Distomat.

Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Introduction to Astronomical terms, Field Procedure for total station survey, Errors in Total Station Survey

Drone Surveying: Working principle, Benefits of drones in surveying, Applications, Interior and exterior drone surveying, Calculation of length, area and stockpile volume.

Text Books:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Surveying – Vol. I, II and III, Laxmi Publications (P) Ltd., 17th Edition, 2016.
2. R. Subramanian, Surveying and Levelling, Oxford University Press, 2nd Edition, 2012.
3. Chandra, A.M, Plane Surveying, 2nd Edition, New Age International Publishers, New Delhi, 2010.
4. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

Reference Books:

1. S. K. Duggal, Surveying – Vol. I and II, Tata McGraw–Hill Publishing Co. Ltd., 4th Edition, 2013.
2. Arthur R. Benton and Philip J. Taetz, Elements of Plane Surveying, McGraw-Hill, 3rd Edition,2010.
3. Arora, K. R., Surveying – Vol. I and II, Standard Book House, 14th Edition, 2011.
4. T. P. Kanetkar and S. V. Kulkarrni, Surveying and Levelling, Pune Vidyarthi Griha Prakashan, Pune, 24th Edition, 2013

B. Tech., III Semester

Course Title	Fluid Mechanics Laboratory					B. Tech. III Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001306	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To identify the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
- To explain the standard measurement techniques of fluid mechanics and their applications.
- To illustrate the components and working principles of the hydraulic machines-different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- To analyze the laboratory measurements and to document the results in an appropriate format.
- To actively apply technical knowledge and skill for solving day to day civil engineering problems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the fluid flow concepts and get familiarity with flow measuring devices
CO 2	Understand the sources of major and minor losses and its particle conditions.
CO 3	Illustrate the effect of change in pressure head, flow rate & coefficient of discharge of flow meters
CO 4	Perform the experiment on the working and characteristics of hydraulic pumps
CO 5	Demonstrate practical understanding of the various equations of Bernoulli

List of Experiments:

1. Determination of coefficient discharge for Venturimeter.
2. Determination of coefficient discharge for Orifice meter.
3. Study of the Impact of Jet on vanes.
4. Determination of the Friction factor of a pipeline.
5. Losses in pipes due to contraction.
6. Study on performance characteristics of single-stage Centrifugal Pump.
7. Study on performance characteristics of multistage Centrifugal Pump.
8. Study on performance characteristics of Reciprocating Pump.
9. Study on performance characteristics of Pelton wheel turbine.
10. Verification of Bernoulli's Equation

Augmented experiments:

1. Calibration of contracted rectangular notch / triangular Notch
2. Performance characteristics of Kaplan turbine
3. Performance characteristics of Francis turbine

Reference Books/Laboratory Manuals:

Fluid mechanics and hydraulic machinery laboratory manual, Department of civil engineering, KSRMCE, Kadapa.

B. Tech., III Semester

Course Title	Geomatics Laboratory					B. Tech. III Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001307	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

By performing this laboratory, the student will be able

- to know the usage of various surveying equipment's and their practical applicability.
- To acquire practical knowledge on handling basic chain survey equipment's
- To have the ability to prepare plan and levels of ground surface by using Plane table survey and leveling instrument.
- To possess knowledge about the Theodolite Surveying and Tacheometric Surveying
- To have the ability to calculate area, volume and curve setting.
- To possess knowledge about the advanced surveying instruments and it's handling.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Measurement of an area by chain survey obtain the direction of a surveying line with a prismatic and surveyors compass
CO 2	Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically.
CO 3	Record the reduced levels using various methods of levelling and measurement of horizontal & vertical angles by Theodolite.
CO 4	Estimate areas, volumes of cutting and filling during the construction of various civil engineering infrastructure.
CO 5	Measure and extract the data from total station and interpret the collected data to make construction layout of different activities.

List of Experiments:

1. Survey of an area by chain, compass survey (closed traverse) & Plotting.
2. Determination of distance between two inaccessible points with compass.
3. Radiation method, intersection methods by plane table survey.
4. Levelling – Longitudinal and cross-section and plotting.
5. Measurement of Horizontal and vertical angle by theodolite.
6. Trigonometric levelling using theodolite.
7. Determination of height, remote elevation, distance between inaccessible points using total station.
8. Determination of Area using total station and drawing map.
9. Stake out using total station.
10. Setting out Curve using total station

Augmented experiments:

1. Profile levelling using Auto level
2. Fly levelling using Auto level (differential levelling)

Reference Books/Laboratory Manuals:

Survey laboratory manual, Department of civil engineering, KSRMCE, Kadapa.

B. Tech., III Semester

Course Title	Civil Engineering Workshop (Skill oriented)				B. Tech. III Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20013S1	Skill oriented (SOC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		1	0	2	2	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

By performing this laboratory, the student will be able

- To Understand the basic properties of materials
- To inculcate the dignity of labor among all students
- Measure to be taken for Safety at workplace and selection of tools
- To work as a member in Team & learn teamwork

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Do setting out of a building plan as per drawings using tape and cross staff.
CO 2	Differentiate different brick bonds and its applications for construct of different masonry walls.
CO 3	Understand the plumbing layout, installation procedure and fixtures used for plumbing.
CO 4	Get awareness on working procedures of plastering, painting & laying of tiles and the materials used for construction of the same.
CO 5	Prepare and test the different composite blocks.

List of Experiments:

1. Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape only.
2. Setting out of a building: The students should set out a building (single room only) as per the given building plan using tape and cross staff.
3. Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required)-corner portion–length of side walls 60cm.
4. Construct a wall of height 50 cm and wall thickness 2 bricks using English bond (No mortar required) - corner portion – length of side walls 60cm.
5. Computation of Centre of gravity and Moment of inertia of a given rolled steel section by actual measurements.
6. Installation of plumbing and fixtures like Tap, T-Joint, Elbow, Bend, Threading.
7. Plastering and finishing of walls.
8. Application of wall putty and painting a wall.
9. Application of base coat and laying of Tile flooring of one square meter
10. Preparation of soil cement blocks for masonry and testing for compressive strength.

Augmented experiments:

1. Casting and testing of Flyash Block.

2. Preparation of cover blocks for providing cover to reinforcement.

Reference Books/Laboratory Manuals:

Civil Engineering Workshop manual, Department of civil engineering, KSRMCE, Kadapa.

IV Semester
Syllabus

B. Tech., IV Semester

Course Title	Business Economics and Accounting for Engineers				B. Tech. IV Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2025401	Humanities Social Sciences (HSS)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To equip the budding engineering student with an understanding of concepts and tools
- of economic analysis.
- To provide knowledge of Business economics through differential economics concepts and theories.
- To make aware of accounting concepts to analyze and solve complex problems relating financial related matters in industries.
- To understand professional and ethical responsibility and ability to communicate effectively.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the concept of Business Economics and able to apply techniques for demand forecasting
CO 2	Understand and application the production functions for making business decisions.
CO 3	To Analyze the markets conditions and determine price-output relations.
CO 4	To understand the concepts of accounting and able to prepare the financial statements of a business firm.
CO 5	To evaluate, analyze and interpret the financial performance of a business.

UNIT – I

Introduction to Business Economics: Meaning, Definition, Nature and scope of Business Economics, Demand Analysis: Concept of Demand, Determinants of demand, Law of Demand and its exceptions, Elasticity of Demand – Types, Measurement of Elasticity of Demand, Demand Forecasting – Techniques of Demand Forecasting.

UNIT – II

Theory of Production and Cost Analysis:

Production Functions: Law of variable proportion, Isoquants and Isocost, least cost combination of inputs, Returns to Scale and Cobb- Douglas production function. Internal and external economies of scale.

Cost Analysis: Cost concepts – Break-Even Analysis (BEA) – Break Even Point – significance and limitations of BEA.

UNIT – III

Classification of Markets and Pricing Methods:

Markets structures: Perfect and Imperfect competition – Features of Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly. Price- Output determination under perfect competition, monopoly and monopolistic competition – Price rigidity in Oligopoly.

Methods of pricing – cost plus pricing, marginal cost pricing, skimming pricing, penetration pricing, differential pricing and administrative pricing.

UNIT – IV

Introduction to Accounting: Definition to Accounting, objective and need for Accounting, Double Entry Bookkeeping – Accounting process, Journal Ledger, Trial Balance, and Final Accounts – Trading Account, Profit and Loss Account and Balance sheet with simple problems.

UNIT – V

Financial Analysis Through Ratios: Concept of Financial Ratios - Types of Ratios – Liquidity Ratio, Turnover Ratio, Capital Structure Ratio, Profitability Ratio (Simple problems).

Text Books:

1. Varshney & amp; Maheswari: Managerial Economics, Sultan Chand Publishers, 2009.
2. Prasad and K.V.Rao: Financial Accounting, jaibharth Publishers, Vijayawada.
3. Paul A Samuleson and William nordhaus: Economics, Oxford University Publications. M L Jhingan: Micro Economics & Macro Economics, VrindaPublacations (P) Ltd.
4. Lipsey & Chrystel, Economics, Oxford University Press

Reference Books:

1. P.L Mehtha: Managerial Economics, Sulthan Chand Publishers
2. K KDewett - Managerial Economics,S. Chand Publishers
3. S.P Jain & K.L Narang: Financial Accounting, Kalyani publishers.
4. M.Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi, 2013.

B. Tech., IV Semester

Course Title	Hydraulics & Hydraulic Machinery				B. Tech. IV Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001402	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To identify the effect of boundary layer aspects and flow around submerged bodies.
- To illustrate the flow characteristics and most economical sections of open channel flow.
- To study the performance characteristics and work done and efficiency curves on impact of jet on vanes.
- Develop students to know the installation, working principles and characteristics of centrifugal pumps.
- Analyze the working principles and operating characteristics of pumps.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Acquire knowledge on boundary layer theory and its applications in various fields.
CO 2	Understand the hydro dynamic properties of fluids to design economical open channels.
CO 3	Analyse the hydro-dynamic forces on vanes and evaluate velocity triangles.
CO 4	Classify and study performance characteristics of hydraulic turbines.
CO 5	Get knowledge on Classification, losses, efficiencies and limitations of different pumps.

UNIT – I

Boundary Layer Theory: Boundary layer concepts – Thickness of boundary layer - Characteristics of boundary layer along a thin flat plate - Vonkarmen momentum integral equation - Laminar and turbulent boundary layers (no derivation) - Laminar sub-layer separation of boundary layer - Control of boundary layer- Flow around submerged objects – Drag and lift - Magnus effect.

UNIT – II

Open channel flow: Types of flows, Types of channels, Velocity distribution, Chezy's, Manning's and Bazin's formulae for uniform flow, Most Economical sections, Critical flow, Specific Energy, Critical depth, Computation of critical depth; Critical, subcritical and supercritical flows, non-uniform flow, Dynamic equation for gradually varied flow, Types of slopes, Surface profiles, rapidly varied flow, Hydraulic jump and its applications, Surges.

UNIT – III

Impact of Jet on Vanes: Hydrodynamic force of jets on stationary and moving, vertical, inclined and curved vanes, Series of vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, Expressions for work done and efficiency.

UNIT – IV

Hydraulic Turbines: Layout of a typical hydropower installation, Heads and efficiencies, Classification of turbines, Pelton wheel, Francis turbine, Kaplan turbine, Working and working proportions, Velocity diagrams, Work done and efficiency, Hydraulic design, Runaway speed, Draft tube theory, Function and efficiency. Governing of turbines, Surge tanks, Unit quantities and specific speed, Performance of turbines, Characteristic curves, Cavitation, Causes, Effects, Classification of hydropower plants, Load factor, Utilization factor, Capacity factor, Estimation of hydropower potential.

UNIT – V

Pumps: Pumps - Components, Classification; Centrifugal pumps - Classification, Heads, Losses and efficiencies, Limitation of suction lift, Work done, Minimum starting speed, Specific speed; Multistage pumps, Pumps in parallel and series, Performance of pumps, Characteristic curves, Net positive suction head, Priming, Cavitation, reciprocating pumps - Classification, Work done, Slip, Limitations; Special pumps – Self priming pump, Gear pump, Jet pump, Airlift pump; Latest developments in pumps.

Hydropower Engineering: Classification of hydropower plants – Load factor - Utilization factor - Capacity factor – Estimation of hydropower potential.

Text Books:

1. R. K. Rajput, a Textbook of Fluid Mechanics, S. Chand Publishers, 5th Edition, 2013.
2. R. K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publishers, 9th Edition, 2011.
3. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited
4. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015

Reference Books:

1. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics Including Hydraulic Machines, Standard Book House, 20th Edition, 2011**.**
2. Domkundwar and Domkundwar, A Textbook of Fluid Mechanics and Hydraulic Machines, Dhanpat Rai and Co, 6th Edition, 2014.
3. V.T. Chow, Open Channel Flow, 3rd Edition, McGraw–Hill Publishers, 2009.
4. K. Subramanya, Flow in Open Channels, 3rd Edition, Tata McGraw Hill Publishers, 2010.

B. Tech., IV Semester

Course Title	Soil Mechanics				B. Tech. IV Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001403	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To familiarize soils' index properties and behavior under different conditions.
- To understand concepts of soil permeability & seepage & their role in groundwater flow.
- To understand the importance of stress distribution in soils and different loaded areas.
- To learn principles of soil compaction &consolidation & their applications in engineering projects.
- To understand the concept of shear strength and familiarize oneself with laboratory testing techniques for soil shear strength and their interpretation.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe soil characteristics by analyzing the soil's physical and index properties.
CO 2	Apply principles of permeability and seepage to solve problems related to groundwater flow.
CO 3	Estimate stress distribution in soils under various loading conditions.
CO 4	Analyze soil behavior by interpreting the compaction, consolidation properties, and soil settlements.
CO 5	Determine the shear strength of soils by interpreting the laboratory test results.

UNIT - I

Introduction: Definition, origin and formation of soil, List of different soil types, Definition of mass, weight- Relation between mass and weight- Units of mass and weight in SI units- Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density, and their interrelationships -clay mineralogy and soil Structure.

Index Properties of Soils and Their Determination: Index Properties of soils and their significance. Various index properties and their Laboratory determination, -Water content, Specific Gravity, Particle size distribution (Sieve analysis and Hydrometer analysis), Relative density, Consistency limits and their indices, in-situ density, Activity of Clay, thixotropy of clay, IS classification - Plasticity chart and its importance.

UNIT - II

Permeability: Types of soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered systems.**Seepage Through Soils:** seepage velocity,

Seepage pressure, seepage through soils- total, neutral and effective stresses – quicksand condition — flow nets: characteristics and uses.

UNIT - III

STRESS DISTRIBUTION IN SOILS: Importance of estimation of stresses in soils – Boussinesq's and Westergaard's theories for point loads, stress distribution in different loaded areas-line load, uniformly loaded circular, strip footing, pressure bulb, variation of vertical stress under point load along the vertical and horizontal planes – Newmark's influence chart.

UNIT - IV

Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties – Field compaction Equipment – compaction control – ZAVL.

Consolidation: Types of compressibility, Types of compressibility – Immediate settlement – Primary consolidation and secondary consolidation – Stress history of clay, normally consolidated soil, over consolidated soil and under consolidated soil, pre-consolidation pressure and its determination- Estimation of settlements -Terzaghi's 1-D consolidation theory – Coefficient of consolidation and its determination.

UNIT -V

Shear Strength of Soils: Definition and use of shear strength - Source of shear strength- Normal and Shear stresses on a plane – Mohr's stress circle- Mohr-Coulomb failure theory- Measurement of shear strength, Drainage conditions -Direct shear test, Triaxial shear test, Unconfined compression test and vane shear test – shear strength of granular soil, shear strength of clay, Factors affecting shear strength of granular soils and clay, Liquefaction.

Text Books:

1. Gopal Ranjan and A. S. R. Rao, Basic and Applied Soil Mechanics, New Age International Pvt. Ltd., 2nd Revised Edition, 2014.
2. K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers and Distributors, 7th Edition, 2014.
3. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi.
4. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors

Reference Books:

1. Braja M. Das, Principles of Geotechnical Engineering, Cengage Learning India, 7th Edition, 2009.
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundation, Laxmi Publications Pvt. Ltd., 16thEdition, 2014.
3. C. Venkatramaiah, Geotechnical Engineering, New Age International Publishers, 3rd Edition, 2010.
4. Lambe, T. W. and Whitman, R. V., Soil Mechanics, John Wiley and Sons, Singapore, 2000.

B. Tech., IV Semester

Course Title	Structural Analysis				B. Tech. IV Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001404	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To demonstrate analytical methods for determining strength & stiffness and assess stability of structural members.
- To enable the student, analyze indeterminate trusses
- To make the student to understand the analysis procedures for analyzing fixed andContinuous beams.
- To enable the student to undergo analysis procedure using moment distribution method.
- To enable the student to analyze the two hinged and three hinged arches.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyse the statically indeterminate trusses.
CO 2	Analyse fixed and continuous beams for various loading conditions.
CO 3	Analyse frames and continuous beams using Slope-Deflection Method.
CO 4	Analyse frames and continuous beams using Moment distribution Method.
CO 5	Analyse two hinged and three hinged arches.

UNIT – I

Indeterminate Structural Analysis: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear force – Castigliano's first theorem - Deflections of simple beams and pin jointed trusses - Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses up to two degrees of internal and external indeterminacy – Castigliano's second theorem.

UNIT – II

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

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

UNIT - III

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 frame including side sway.

UNIT – IV

Moment Distribution Method: Introduction to moment distribution method- application to continuous beams with and without settlement of supports. Analysis of single storey, portal frames – including Sway

UNIT – V

Arches: Introduction- hinges-transfer of load to arches-linear arch-hinges in the arch-arch action-Horizontal force – three hinged arches – circular arches – springs at different level-Two hinged arches- two hinged circular arches – fixed arches (only theory) - Temperature stresses in arches.

Text Books:

1. Basic Structural Analysis, C. S. Reddy Tata Mc.Graw-Hill, New Delhi.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.
3. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi.
4. Structural Analysis I Analysis of Statically Determinate Structures, P. N. Chandramouli, Yesdee Publishing Pvt Limited, Chennai

Reference Books:

1. Theory of Structures, B. C Punmia, A. K Jain & Arun K. Jain, Lakshmi Publications.
2. Theory of Structures, R.S. Khurmi, S. Chand Publishers.
3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi.
4. Structural Analysis-I, Hemanth Patel, Yogesh Patel, Synergy Knowledge ware, Mumbai

B. Tech., IV Semester

Course Title	Transportation Engineering					B. Tech. IV Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001405	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hours						End Exam Duration: 3 Hours		

Course Objectives:
This course is taught to impart the knowledge in highway planning, alignment, geometric design of different elements of highway, different traffic surveys, traffic regulation and management and pavement design.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Conduct different engineering surveys and take up different highway alignment projects.
CO 2	Design highway pavement geometrics.
CO 3	Collect traffic data, analyze the data and design suitable traffic management systems
CO 4	Do structural design of flexible and rigid pavements.
CO 5	Conduct laboratory tests on pavement materials to evaluate their suitability and adaptability for different pavement construction.

UNIT-I

Highway Development and Planning: Highway development in India – Necessity for Highway Planning – Different Road Development Plans – Classification of Roads – Road Network Patterns.

Highway Alignment: Factors controlling alignment, engineering surveys, Drawing and report.

UNIT-II

Highway Geometric Design: Importance of Geometric Design - Highway Cross Section Elements-Sight Distance Elements - Stopping sight Distance, Overtaking Sight Distance, and intermediate Sight Distance - Design of Horizontal Alignment - Design of Super Elevation-Design of Transition Curves -Design of Vertical alignment – Gradients – Vertical curves.

UNIT-III

Traffic Engineering: Basic Parameters of Traffic -Volume, Speed and Density– Highway Capacity-Traffic Volume Studies - Speed studies - Road Accidents – Condition Diagram and Collision Diagrams. Traffic Regulation and Management: Road Traffic Signs – Road markings -Types of Road Markings- Design of Traffic Signals – Webster Method –Saturation flow – Phasing and timing diagrams – Numerical problems.

UNIT-IV

Pavement Design: Types of pavements – Difference between flexible and rigid pavements – Pavement Components – Functions of pavement components – Design Factors – Design

methods – IRC methods only (as per IRC 37-2002) – Design of Rigid pavements – Critical load positions – Westergaard's stress equations – Stresses in rigid pavements.

UNIT-V

Highway Materials and construction practice: Desirable Properties and Testing of Highway Materials-Aggregate-Crushing, Abrasion, Impact Tests, Water absorption, Flakiness and Elongation Indices-Tests on Bitumen-Penetration, Ductility, Viscosity and Softening point Tests-Construction Practice-Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORT&H specifications]-Highway Drainage.

Text Books:

1. S K Khanna, C E G Justo, and A. Veeraragavan "Highway Engineering", Nemchand Publications, New Delhi.
2. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition, Third Impression; Pearson Education, 2018
3. Subhash C Saxena, Text Book of Highway and Traffic Engineering; First Edition; CBS Publishers and Distributors. New Delhi, 2014
4. Nicholas J Garber and Lester AHoel, Traffic and Highway Engineering, 5th Edition, Cengage Learning India Private Limited, New Delhi, 5th Indian Reprint, 2018

Reference Books

1. G V Rao "Principles of Transportation and Highway Engineering", Tata McGraw-Hill Companies, Inc. New York.
2. L R Kadiyali "Principles and Practice of Highway Engineering", Khanna Publishers, New Delhi.
3. ParthaChakroborthy, Animesh Das, "Principles of Transportation Engineering", Prentice Hall of India, New Delhi.
4. S P Bindra "Highway Engineering", Dhanpath Rai & Sons, New Delhi.

B. Tech., IV Semester

Course Title	Building Planning and Drawing (AutoCAD)				B. Tech. IV Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001406	Engineering Science (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---					End Exam Duration: 3 Hrs		

Course Objectives:

- To Understand various types of conventional signs and brick bonds.
- To Draw the plan section and elevation for doors, trusses, and staircases.
- To Use AutoCAD tools to draw building plans, sections and elevations from a given line diagram and specifications.
- To prepare plan, section & elevation of residential building
- To Develop working drawings of residential buildings.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Interpret the symbols, signs, and conventions from the given drawing.
CO 2	Create layout plan, sanction drawings of doors, trusses and staircases.
CO 3	Prepare any type of building drawing using AutoCAD software.
CO 4	Draw plan, elevation, and sections in AutoCAD
CO 5	Develop working layouts of Electrical and plumbing drawings for residential building

List of Experiments:

1. Introduction to Computer Aided Drafting and Conventional Signs.
2. Brick bonds: English bond & Flemish bond – Odd and Even courses.
3. Drawing elevation of a King Post Truss.
4. Drawing elevation and section of a fully panelled door.
5. Developing plan and section of dog-legged staircase.
6. Developing plan of single storied residential building.
7. Developing section and elevation of single storied residential building.
8. Developing plan of two storied residential building.
9. Developing section and elevation of two storied residential building.
10. Development of working drawing of building – Electrical and Plumbing Layout

Text Books:

1. Civil Engineering Drawing-I by N. Sreenivasulu, S. Rama Rao – Radiant PublishingHouse.
2. Civil Engineering Drawing-II by N. Sreenivasulu – Radiant Publishing House.

Reference Books:

1. Engineering Graphics by P. J. Sha - S. Chand & Co.
2. Civil Engineering Drawing-I by S. Mahaboob Basha – Falcon Publishers
3. Building drawing by M. G. Shah - Tata McGraw-Hill Education.

B. Tech., IV Semester

Course Title	Soil Mechanics Laboratory					B. Tech. IV Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001407	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ----						End Exam Duration: 3 Hrs		

Course Objectives:

- To Identify index properties of soil and determine the field density.
- To Analyze the shear parameters and engineering properties of soil.

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

CO 1	Understand the index properties of soil with reference to Indian Standard Code of Practice.
CO 2	Identify the stress history and general properties of soil met with construction.
CO 3	Analyse the field compaction control and compare its results to the laboratory compaction test.
CO 4	Compare the shear characteristics of soil for testing, performing the test, collecting and analyzing data according to ASTM.
CO 5	Apply the laboratory results to problem identification, quantification, and basic soil mechanics related design problem.

Index Properties of Soil:

1. Determination of water content and specific gravity.
2. Grain size analysis – sieve analysis and hydrometer analysis.
3. Tests for Atterberg's limits.
   a) Determination of liquid limit – Casagrande's method and cone penetrometer method.
   b) Determination of plastic limit.
   c) Determination of shrinkage limit.
4. Determination of field density – core cutter method and sand replacement method.

Engineering Properties of Soil:

5. Standard Proctor's compaction test and Modified compaction test.
6. Permeability of soil – constant head test and variable head test.
7. CBR Test.
8. Direct shear test.
9. Unconfined compression test.
10. Vane shear test

Augmented experiments:

1. Tri–axial compression test.
2. Consolidation test.

Reference Books/Laboratory Manuals:

Geotechnical Engineering Laboratory Manual, KSRMCE, Kadapa.

B. Tech., IV Semester

Course Title	Transportation Engineering Laboratory				B. Tech. IV Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001408	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ----						End Exam Duration: 3 Hrs		

Course Objectives:
Identify the properties and behavior of highway material for different loading patterns.
Demonstrate tests on transportation materials like aggregate, sand etc. and check their Suitability.
Understand the properties of aggregates by conducting specific gravity and shape of aggregates.
Identify the various properties of bitumen material and to obtain the grade of bitumen used for application of aggregate mix.

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

CO 1	Recall the basic properties of sand and aggregates for determining their suitability through various laboratory tests.
CO 2	Identify the problems associated with roads based on the properties to suggest the appropriate remedy.
CO 3	Determine mechanical properties of aggregates in laboratory for deciding its suitability in construction practice.
CO 4	Outline the various properties of bitumen material to obtain the grade of bitumen.
CO 5	Utilize the concept on properties of aggregates and binding materials for design of roads.

List of Experiments

Road Aggregates:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

Bituminous Materials:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.

Text Books:

1. G Venkatappa Rao, K Ramachandra Rao, Kausik Pahari and D V Bhavanna Rao "Highway Material Testing and Quality Control", I K International Publishing House Pvt. Limited, New Delhi.

Reference Books:

1. Ajay K Duggal and Vijay P Puri "Laboratory Manual in Highway Engineering", New Age International (P) Limited, Publishers, New Delhi.
2. S K Khanna, C E G Justo and A Veeraraghavan "Highway Engineering", Nem Chand & Bros Publishers, Roorkee, Uttarakhand.

B. Tech., IV Semester

Course Title	Advanced Civil Engineering Workshop				B. Tech. IV Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20014S2	Skill Oriented (SOC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		1	0	2	2	40	60	100
Mid Exam Duration: ----					End Exam Duration: 3 Hours		

Course Objectives:

- To enable the students to determine the properties, identification of civil engineering materials and Tests on Brick.
- To enable the students to determine test on Cement and Aggregate.
- To enable the students to know about of Construction of masonry brick wall.
- To know the Design concrete mixes as per IS codes.
- To enable the students give demonstration about bar bending, house wiring and painting.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
CO 2	Demonstrate cement and aggregate properties for construction purpose
CO 3	Construction of masonry brick walls by using Bonds
CO 4	Design concrete mixes as per IS codes
CO 5	To reveal the importance of Wall Painting, House wiring, Shuttering and Scaffolding

1. **Properties and Identification of Civil Engineering Materials:**
   Properties and identification of building materials-Market survey for building materials.
2. **Tests on Brick:**
   Visual inspection test for colour, shape and size-Soundness of brick-Water absorption test of brick-Efflorescence test of brick-Compressive strength of brick.
3. **Tests on Cement:**
   Fineness of cement by dry sieving-Standard consistency of cement.
4. **Tests on Fine Aggregate:**
   Sieve Analysis of Fine aggregate-Specific gravity of Fine aggregate-Bulking of Fine aggregate
5. **Masonry:**
   Construction of masonry brick wall using English bond-Construction of masonry brick wall using Flemish bond
6. **Concrete Mix Design:** As Per IS Method
7. **Bar Bending and Reinforcement:**
   Bar bending of reinforcement skeleton for foundations, columns, beams.
8. **Painting**
   External wall painting-Internal wall painting
9. **House Wiring**
   16 A Line-6 A Line
10. **Shuttering And Scaffolding**

Shuttering for beams and slabs-Shuttering for columns and Walls-Steel scaffolding-Single and double scaffolding

Reference Books/Laboratory Manuals:

1. Civil Engineering Workshop Laboratory Manual, KSRMCE, Kadapa.
2. S. K. Duggal, Building Materials, New Age International Publishers, 4th Edition, 2010.
3. A. M. Neville, Properties of Concrete, John Wiley and Sons, New Delhi, 5th Edition, 2012.

IS Codes:

1. IS 1077 – 1992: Brunt Clay Building Brick.
2. IS 4031 - 1988: Chemical Analysis and Tests on Cement.
3. IS 383 - 1970: Coarse and Fine Aggregates.
4. IS 10264 - 2009: Mix Design of Concrete.
5. IS 1199 - 1959: Methods of Sampling and Analysis of Concrete.
6. IS 13311- 1992: Method of Non-destructive Testing of Concrete.
7. IS 7293 - 1974: Safety Code for Working with Construction Machinery.
8. IS 2212 - 1991: Code of Practice for Brick Work.
9. IS 2502 – 1993: Code of Practice for Bar Bending and Fixing of Bars.
10. IS 2395(1) - 1994: Code of Practice for Painting Concrete, Masonry.
11. IS 732 – 1989: Code of Practice for Electrical Wiring Installations.
12. IS 14678 - 1999: Guidelines for False work for Concrete Structures

B. Tech., IV Semester

Course Title	Universal Human values				B. Tech. IV Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2024410	Humanity Sciences (HSC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	0	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

Objective of this course is to make the students

- To understand the moral values that ought to guide the Management profession and resolve the moral issues in the profession,
- To justify the moral judgment concerning the profession.
- To develop a set of beliefs, attitudes, and habits that engineers should display concerning morality.
- To create an awareness on Management Ethics and Human Values.
- To inspire Moral and Social Values and Loyalty.
- To appreciate the rights of others.
- This course deals with professional ethics which includes moral issues and virtues, social responsibilities of an engineer, right qualities of moral leadership

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Develop appropriate technologies and management patterns to create harmony in professional and personal life
CO 2	Ensure students sustained happiness through identifying the essentials of human values and skills
CO 3	Get awareness of types of ethical challenges and dilemmas confronting members of a range of professions (business, media, police, law, medicines, research)
CO 4	Bring to bear ethical analysis and reasoning in the light of normative ethics frameworks on a selection of ethical challenges and dilemmas across the chosen range of professions
CO 5	Relate ethical concepts and materials to ethical problems in specific professions and professionalism

UNIT – I

Human Values: Morals, Values and Ethics - Integrity - Trustworthiness - Work Ethics - Service Learning - Civic Virtue - Respect for others - Living Peacefully - Caring - Sharing - Courage - Value Time - Co-operation - Commitment - Empathy - Self-confidence - Spirituality – Character

UNIT – II

Engineering Ethics: Senses of Engineering Ethics – Variety of Moral issues – Types of inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's Theory – Consensus and Controversy – Professions and Professionalism – Professional ideals and virtues.

UNIT – III

Engineer's Responsibility for Safety: Safety and Risk – Assessment of Safety and Risk – Risk benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk – Chernobyl Case and Bhopal Case studies

UNIT – IV

Value Education: Self- exploration- its content and process- natural acceptance- Happiness and Prosperity- Understanding Human relations

UNIT-V

Holistic Perception of Harmony: Understanding the Harmony in the society- -Universal order- critical appreciation of Human values- Justice, Trust

Text Books:

1. Mike martin and Roland Scherzinger. "Ethics in Engineering'', McGrow Hill, New York 2005.
2. Charles E Harris. Michael S Pritchard and Michael J Rabins. "Engineering Ethics – Concepts and Cases", Thompson Learning 2000.
3. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values andProfessional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1.

V Semester
Syllabus

B. Tech., V Semester

Course Title	Hydrology & Irrigation				B. Tech. V Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001501	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- The students acquire knowledge about hydrologic cycle, precipitation its measurement. To understand the precipitation forms, evaporation. types measurements.
- To study the Infiltration, surface runoff, floods and its importance and effects.
- Introduction to the types of irrigation systems and planning and design of irrigation systems.
- To Learn design principles of Diversion Head works.
- To Study the classification of dam their importance, applications.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand thoroughly theories and principles governing the hydrologic cycle.
CO 2	Estimate the flood discharge using different methods.
CO 3	Estimate consumptive usage of irrigation water for different crops and to design irrigation canals and canal network.
CO 4	Know the factors effecting the selection of site and design of dams and reservoirs.
CO 5	Analyse the stability of gravity and earthen dams.

UNIT-I

Introduction

Definition of hydrology – Hydrologic cycle; Precipitation: Types and forms of precipitation, Measurement – Recording and non-recording type of rain gauges– Average depth of precipitation – Double mass curve; Mean Precipitation: Arithmetic Mean, Thiessen Polygon and Isohyet Methods; Evaporation, Transpiration, Evapotranspiration – Factors affecting – Estimation and Measurement – Methods to Reduce evaporation.

UNIT – II

Infiltration

Factors affecting Infiltration, Measurement of Infiltration, Infiltration Curve and Infiltration Indices; Runoff: Components – Factors affecting – Features of hydrograph – Separation of base flow –Direct runoff hydrograph, Unit hydrograph; Flood Estimation: Introduction– Methods– Rational Method & Empirical formulae.

UNIT – III

Irrigation

Necessity and importance, principal crops and crop seasons – Types - Methods of application - Consumptive use - Estimation of consumptives use - Crop water requirement - Duty and delta - Factor affecting duty - Irrigation efficiencies - Water logging - Standard of quality for irrigation - Crop rotation.

Flow irrigation

Classification of canals - Design of Irrigation canals by Kennedy's and Lacey's theories.

UNIT – IV

Diversion head works - Weirs and barrages - Layout of diversion head works – Components - Causes and failure of hydraulic structures. Types of dams - Merits and demerits - Factors affecting selection of type of dam - Factors governing selecting site for dam - Types of reservoirs.

UNIT – V

Storage head works

Gravity dams: Forces acting on gravity dam - Causes of failure of a gravity dam - Elementary profile and practical profile of a gravity dam - Limiting height of a low gravity dam - Drainage galleries.

Types of Earth dams: Causes of failure of earth dam - Criteria for safe design of earth dam.

Text Books:

1. Mays, L.W. and K. Tung, "Hydro systems Engineering and Management", McGraw-Hill Inc., New York, 1992.
2. P. Jayarami Reddy, "A Text Book of Hydrology", Laxmi Publications, Third edition, 2016.
3. H.M. Raghunath, "Hydrology: Principles, Analysis, Design: Principles, Analysis and Design", New Age International Pvt Ltd, Third edition, 2015.
4. S.R. Sahasrabudhe, "A Textbook of Irrigation Engineering", S.K. Kataria & Sons, 2013

Reference Books:

1. Aswathanarayana U., "Water Resources Management and the Environment", A.A. Balkema Publishers, 2001
2. K.C.Parti, "Hydrology and Water Resources Engg", Narosa Publishers, 2001.
3. A.K.Biswas, "Water Resources-Environment Planning & development", Tata McGraw Hill, 1997.
4. G.L. Asawa, "Irrigation and Water Resources Engineering", new age publishers, 2005.

B. Tech., V Semester

Course Title	Foundation Engineering					B. Tech. V Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001502	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To emphasize the importance of soil investigations including destructive and non-destructive methods
- To explain how earth pressure theory is important in retaining structure design
- To explain the concept of bearing capacity and how to estimate the safe bearing capacity for various foundation systems including settlement consideration
- To explain in what circumstances pile is needed and how do analysis the pile and pile group under various soil conditions
- To study the types of slopes for different conditions

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Carry out soil investigation for any civil engineering construction
CO 2	Analyze earth retaining structures for any kind of soil medium
CO 3	Perceive knowledge to design shallow and deep foundations
CO 4	Determine bearing capacity and foundation settlement
CO 5	Understand various methods for computation of factor of safety for any type of slope condition

UNIT-I

Site Investigation & Sub-Soil Exploration

Site reconnaissance – Depth of exploration – Lateral extent of exploration – Test pits – Auger borings – Wash borings – Soil samplers – Penetration test – Standard penetration test (SPT) – Geophysical methods – Seismic refraction and electrical resistivity methods – Sub soil investigation reports - Plate load test – Pressure meter.

UNIT – II

Earth Pressure Theories and Retaining Walls

Active and passive earth pressures in cohesion less and cohesive soils (with and without surcharge, horizontal and inclined surfaces) - Rankine's theory of earth pressure – Earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's and Rebhann's graphical method. Types of retaining walls – Stability of gravity and cantilever retaining walls – Drainage in retaining walls.

UNIT – III

Bearing capacity of shallow foundations

Types of foundations – Depth of foundation – Terzaghi's bearing capacity equation – Bearing capacity of strip, square, circular, rectangular footings – Meyerhof's theory – Skempton's method – Brinch Hansen's method – Effect of ground water table on bearing capacity – Bearing capacity from building codes – Tolerable settlements – Settlement analysis.

UNIT – IV

Pile Foundations

Types of piles – Load carrying capacity of piles based on Static pile formulae – Dynamic pile formulae – Pile Load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups - Negative skin friction.

UNIT – V

Earth Slope Stability

Infinite and finite earth slopes – Types and causes of failures – Factor of safety of infinite slopes – Stability analysis by Swedish arc method, Standard method of slices, Bishop's simplified method – Taylor's stability number- Stability of slopes of earth dams under different conditions.

Text Books:

1. Professor John N. Cernica, P.E., Ph.D., "Geotechnical Engineering: Soil Mechanics", by John Wiley & Sons, Inc., New York.
2. B C Punmia, Ashok Kumar Jain & Arun Kumar Jain "Soil Mechanics & Foundation Engineering", Laxmi Publications, New Delhi.
3. Dr. K R Arora "Soil Mechanics & Foundation Engineering", Standard Publishers Distributers, New Delhi.
4. Braja M. Das, "Fundamentals of Geotechnical Engineering", Cengage Learning, USA.

Reference Books:

1. Joseph E. Bowles "Foundation analysis & Design", Tata McGraw-Hill Companies, Inc. New York.
2. R. Whitlow, "Basic Soil Mechanics", Addison Wesley Longman Limited, Edinburgh Gate, England.
3. C. Venkatramaiah "Geotechnical Engineering", New Age International (P) Limited, Publishers, New Delhi.
4. Michael Tomlinson and John Woodward, "Pile Design and Construction Practice", Taylor & Francis, London.

B. Tech., V Semester

Course Title	Concrete Technology				B. Tech. V Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001503	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To understand the different types of cements & admixtures available in construction industry and their properties.
- To understand the basic requirement so of aggregate used for concrete and properties of fresh concrete.
- To understand the durability properties of concrete.
- To understand the mechanical properties of concrete.
- To design a concrete mix for various grades of concrete

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Know the types of cements, admixtures available in market and their properties.
CO 2	Evaluate properties of aggregates and fresh concrete.
CO 3	Know about elasticity, shrinkage, creep and durability of concrete.
CO 4	Evaluate properties of hardened concrete.
CO 5	Design the concrete mix proportions by suing ACI and IS methods.

UNIT-I

Cements and Admixtures

Portland cement – Chemical composition – Hydration, Setting of cement – Types of cements - Tests on physical properties – Different grades of cement – Introduction to Mineral and chemical admixtures, their functions, uses and dosages.

UNIT – II

Aggregates & Fresh Concrete

Concrete aggregates: Classifications – Strength and other mechanical properties – Moisture content and its effects – Deleterious substances – Alkali-Aggregate reaction – Grading curves and grading requirements – Gap-graded aggregate.

Fresh concrete: Workability – Factors affecting workability – Measurements of workability – Effect of time and temperature – Segregation – Bleeding – Mixing of concrete – vibration of concrete – Pumped concrete, underwater concrete, pre-placed concrete, Ready mixed concrete– Pumped concrete.

UNIT – III

Properties of Concrete

Elasticity, Shrinkage and Creep: Modulus of elasticity – Dynamic modulus – Poisson's ratio– Shrinkage and its effects – Creep of concrete – Factors affecting creep

Durability: Introduction, types of durability tests – Chemical attack of Concrete – Efflorescence – Air entrained concrete – Thermal properties – Resistance of concrete to fire.

UNIT – IV

Hardened Concrete

Curing of concrete: Methods of curing – Maturity - Influence of temperature – Steam curing at atmospheric pressure – High pressure steam curing

Hardened concrete: Compression tests – Flexure test –Splitting test – Rebound Hammer test– Ultrasonic pulse velocity test, Digital Image Processing.

UNIT – V

Mix Design of Concrete

Concrete Mix Design and Quality Control: Basic consideration – Objectives - Principles of Mix Proportioning-Factors in the choice of properties– Procedure for ACI & IS methods of mix design - Simple example of mix design.

Text Books:

1. A M Neville, "Properties of Concrete", Pearson Education India, 5th edition, 2012.
2. P.K.Mehta and J.M.Monteiro, "Concrete: Micro Structure, Properties and Materials", McGraw Hill Publishers, 4th edition, 2013.
3. M S Shetty "Concrete Technology", S. Chand Publishers, New Delhi.
4. A R Santha Kumar "Concrete Technology", Oxford University Press, New Delhi.

Reference Books:

1. M L Gambhir "Concrete Technology", Tata McGraw-Hill Companies, Inc. New York.
2. P K Mehta and J M Monteiro "Concrete: Micro structure, Properties and Materials", Tata McGraw-Hill Companies, Inc. New York.
3. Krishna Raju "Design of Concrete Mix", CBS Publishers, New Delhi.
4. J Prasad and C G K Nair "Non-Destructive Test and Evaluation of Materials", Tata McGraw-Hill Companies, Inc. New York.

B. Tech., V Semester

Course Title	Optimization Techniques in Civil Engineering					B. Tech. V Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001504	Professional Elective (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- Understand the importance optimization to various practice problems and solve them simple mathematical techniques.
- The various optimization techniques for single variable optimization problem
- Direct search methods and Gradient methods for multi variable un constraint Optimization problems

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply the concept of basic mathematics for various optimization techniques.
CO 2	Know about one-dimensional optimization techniques civil engineering problems.
CO 3	Understand the constrained and unconstrained optimization techniques.
CO 4	Apply the dynamic programming techniques to solve problem in civil engineering.
CO 5	Appraise the integer programming techniques.

UNIT-I

Introduction to Optimization

Engineering applications, Statement of optimization, classification of optimization, Classical optimization: Single variable, multi variable with and without optimization. Mutli variable with inequality constraints Khun -Tucker conditions.

UNIT – II

One Dimensional Minimization

Uni-modal Function, Unrestricted search, Exhaustive search, Dichtomous search, Interval Halving method, Fibonici and golden bisection Method, Newton and Quasi Newton method.

UNIT – III

Non-Linear –Unconstrained optimization-I

Classification, scaling of design variables, Random search methods, Univeriate search, pattern Directions, Hook Jeeves, Powel method, Rosenbrock method.

UNIT – IV

Non-Linear –Unconstrained optimization-II

Characteristics, Random search methods, complex method, sequential linear programming, Zoutendijk's method, Penality method

UNIT – V

Dynamic programming

Multi stage decision processes, concept of sub optimization, few examples problems

Integer programming: Gomory's cutting plane method, branch and bound method.

Text Books:

1. David G. Luerbeggan, "Introduction to Linear and Non Linear Programming", Addison Wesley Publishing Co. 1973.
2. Hadley G. "Nonlinear and – dynamic programming" Addison Wesley Publishing Co. 1964.
3. HarndyA.Tahh. "operations Research, An Introduction", Macmillan Publishers Co. NewYork,1982.
4. J.K Sharma: Operations Research, S Chand ,9th edition, New Delhi

Reference Books:

1. Cordan C.C. Beveridge and Robert S. Schedther, "Optimization, Theory and Practice" McGraw Hill Co.1970.
2. SS. Rao, "Engineering Optimization theory and practice", New age international 3rd edition 2013.
3. Jasbir.S. Arora, "Introduction to Optimum Design" Mc Graw hill International edition, 4th edition Singapore.
4. M. C. Joshi, K. M. Moudgalya, "Optimization Techniques theory and practice", Narosa Publications

B. Tech., V Semester

Course Title	Advanced Structural Analysis				B. Tech. V Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2001505	Professional Elective (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To introduce stiffness method and flexibility method for analysis of statically indeterminate structures.
- To understand the basics of finite element method and application to structural analysis.
- Use and/or develop structural analysis software to analyze complicated structural systems.
- Interpret the output from computer-based analyses for the purpose of structural design

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Identify static and dynamic indeterminacy of structure and can apply matrix methods to analyse the structures.
CO 2	Analyse the continuous beams using stiffness and flexibility methods.
CO 3	Analyse two dimensional portable frames using stiffness and flexibility methods.
CO 4	Analyse two-dimensional pin-jointed trusses using stiffness and flexibility methods.
CO 5	Transform local coordinate system to global coordinate system in matrix methods.

UNIT-I

Introduction to Matrix methods

Introduction, coordinate systems, displacement and force transformation matrices, element and structure stiffness matrices, Element and structure flexibility matrices, equivalent joint loads, stiffness, and flexibility approaches.

UNIT – II

Matrix methods for beams

Analysis of continuous beams by flexibility method and stiffness method with and without settlement of supports.

UNIT – III

Matrix methods for Plane Frames

Analysis of 2-D frames by Flexibility matrix methods.

UNIT – IV

Matrix methods for Plane Frames

Analysis of 2-D frames by Stiffness matrix methods.

UNIT – V

Matrix methods for Plane truss problems

Analysis of 2-D trusses by flexibility method and stiffness method.

Text Books:

1. G. S. Pandit and S. P. Gupta, "Structural Analysis - A Matrix Approach", McGraw Hill Education; 2nd edition,2008.
2. M W Weaver and Gere, "Matrix Analysis of framed Structures", Springer, 1990.
3. S.S. Bhavikatti, "Matrix Methods of Structural Analysis", Dreamtech Press, 2019
4. S. Ramamrutham, R. Narayan, "Theory of Structures", 9th Edition, 2014.

Reference Books:

1. Devdas Menon, "Advanced Structural Analysis", Narosa Publishing House, 2015.
2. Asslam Kassimali, "Matrix Analysis of Structures", Cengage Learning, USA. 2012.
3. C.K Wang, "Analysis of Indeterminate Structures", Tata McGraw-Hill Companies, Inc. New York, 1992.
4. T.N.Gayl, "Matrix structural analysis", Tata Mc Graw Hill Company.

B. Tech., V Semester

Course Title	Remote Sensing & GIS				B. Tech. V Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001506	Professional Elective (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:
The purpose of this course is to provide an understanding of physical concepts and underlying various engineering and technological applications in remote sensing. In addition, the course is expected to understand the basic principles of remote sensing and its applications.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Perceive the basics of remote sensing
CO 2	Pick out the characteristics of the instruments used for remote sensing
CO 3	Analyze the need and standard techniques used for image processing
CO 4	Perceive the basics of GIS
CO 5	Study the areas of application of Remote Sensing and GIS

UNIT-I

Remote Sensing – 1

Introduction to Basic Concepts: Definition – Physics of Remote Sensing – Electro Magnetic Radiation (EMR) – Interaction of EMR with atmosphere, Earth surface features – Vegetation, soils, water – Spectral reflectance curves – Atmospheric windows

UNIT – II

Remote Sensing – 2

Remote Sensing Systems: Platforms: Introduction – Types – Satellites and orbits, - Spectral, radiometric and spatial resolutions, temporal resolution of satellites - Some remote sensing satellites and their features.

UNIT – III

Image Processing Techniques

Digital Image Processing: Image enhancement – Contrast stretch, Spatial filtering and edge enhancement; Classification – Supervised unsupervised classification – Visual image interpretation techniques.

UNIT – IV

Geographical Information Systems (GIS)

Basic Principles – Definition – Components – Data Structures – Raster and Vector formats – Functioning of GIS – Data Input – Data Manipulation – Data Retrieval – Spatial Data Analysis

– Computational Analysis Methods (CAM) – Visual Analysis Methods (VAM) - Data Display – Data Base Management Systems

UNIT – V

Remote Sensing Applications

Remote Sensing Applications: Water resources - Drought Assessment - Environmental Monitoring.

Text Books:

1. Thomas Lillesand, Ralph W Kiefer and Jonathan Chipman, "Remote Sensing and Image Interpretation", John Wiley & Sons, India.
2. M Anji Reddy, "Remote Sensing & GIS", B.S Publications, Hyderabad.
3. C P Lo and Albert K W Yeung, "Concepts and Techniques in Geographical Information Systems", Prentice Hall of India, New Delhi.
4. Tor Bernhardsen, "Geographic Information systems – An Introduction", Wiley India Publication, 3rd Edition, 2010.

Reference Books:

1. Floyd F Sabins Jr., "Remote Sensing Principles and Interpretation", Freeman and Co., San Francisco.
2. J R Jensen, "Remote Sensing of the Environment: An Earth Resource Perspective", Prentice Hall of India, New Delhi.
3. Michael N. Demers, "Fundamentals of Geographic Information systems", 4th Edition, Wiley Publishers, 2012.
4. Basudeb Bhatta, "Remote Sensing and GIS", Oxford University Press, 2nd Revised Edition, 2011

B. Tech., V Semester

Course Title	Disaster Management				B. Tech. V Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20OE101	Open Elective (OEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs			

Course Objectives:

To make the student to provide basic conceptual understanding of disasters and its relationships with planning management.

To make the student to gain an understanding of the scope and extent to which natural and manmade disasters influence vulnerability profile of India.

To make the student able to relate disasters impact on social, economic and political environment.

To make the students to understand approaches of Disaster Risk Reduction and the relationship between vulnerability, disasters, disaster prevention and risk reduction.

To make the student able to enhance awareness of Disaster Risk Management and build skills to respond at disasters.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Define and describe the terminology used within disaster planning and Management.
CO 2	Understand the scope, extent, and complexity of natural and man-made disasters.
CO 3	Justify the knowledge gained from disaster impacts on health, psycho-social issues and demographic aspects
CO 4	Discuss effective means to plan, mitigate, respond, and recover from disasters and emergencies, natural and man-made
CO 5	Understand the problems associated with government collaboration and assistance to state and local governments and non-governmental organizations.

UNIT-I

Introduction

Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT – II

Disasters

Disasters classification; natural disasters: floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.; manmade disasters: industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.; hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT – III

Disaster Impacts

Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT – IV

Disaster Risk Reduction (DRR)

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); sustainable and environmental friendly recovery; reconstruction and development methods.

UNIT – V

Environment and Development

Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. Pradeep Sahni and Madhavi Ariyabandu, "Disaster Risk Reduction in South Asia", PHI Learning Pvt. Ltd., Delhi.
2. B. K. Singh, "Handbook of Disaster Management: Techniques and Guidelines", Rajat Publications, Delhi.
3. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.
4. Inter-Agency Standing Committee (IASC) (Feb. 2007) IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Reference Books:

1. G. K. Ghosh, "Disaster Management", APH Publishing Corporation, New Delhi.
2. http://ndma.gov.in/ (Home page of National Disaster Management Authority.
3. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
4. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.

B. Tech., V Semester

Course Title	Basics of Civil Engineering				B. Tech. V Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20OE102	Open Elective (OEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To include the essentials of civil engineering field to the students of all branches of Engineering
- To provide the students an illustration of the significance of the civil engineering profession in satisfying social needs.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Illustrate the fundamental aspects of Civil Engineering.
CO 2	List the components of various types of buildings.
CO 3	Explain the concepts of planning and able to read a building plan.
CO 4	Illustrate the setting out of a building and acquire knowledge on building area items.
CO 5	Discuss about various building materials used for construction.

UNIT-I

General introduction to Civil Engineering

Various disciplines of civil engineering, Relevance of civil engineering in the overall infrastructural development of the country. Introduction to types of buildings as per NBC, selection of sites for buildings.

UNIT – II

Building Components

Components of residential buildings and their functions; Introduction to industrial buildings – office/factory/software development office/power house/electronic equipment service centre.

UNIT – III

Building planning

Introduction to planning of residential buildings- site plan, orientation of a building, open space requirement, position of doors and windows, size of rooms; preparation of a scaled sketch of the plan of a single storeyed residential building in a given site plan.

UNIT – IV

Building area items

Introduction to the various building area items – computation of plinth area / built up area, floor area / carpet area – for a single storeyed building; setting out of a building.

UNIT – V

Building construction

Foundations; Bearing capacity of soil (definition only) - Functions of foundations, Types - shallow and deep (sketches only)

Brick masonry – header and stretcher bond, English bonds – Elevation and Plan (one brick thick walls only)

Roofs – functions, types, roofing materials

Floors – functions, types; flooring materials

Paints and Painting – Purpose, types

Text Books:

1. Gopi, S., "Basic Civil Engineering", Pearson Publishers
2. S.S Bhavikatti, "Basics civil engineering", New international publishers
3. Rangwala, S.C and Dalal, K. B., "Building Construction", Charotar Publishing house
4. Rangwala, S.C., "Essentials of Civil Engineering", Charotar Publishing

Reference Books:

1. Mckay, W.B. and McKay, J. K., "Building Construction Volumes 1 to 4", Person India Education Services
2. Minu, S., "Basic Civil Engineering", Karunya Publication
3. Chudley, R., "Construction Technology, Vol. I to IV", Longman Group, England
4. Kandya, A. A., "Elements of Civil Engineering", Charotar Publishing house.

B. Tech., V Semester

Course Title	Building Materials				B. Tech. V Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20OE103	Open Elective (OEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- The importance and fundamental knowledge of building materials such as stones and aggregates its properties for better construction.
- The laboratory, field tests conducted on Bricks and Cement to identify better construction materials with strength & durability.
- The ability to understand the properties of Lime and Timber.
- Understand various Masonry works used in the construction field.
- To study the Modern Engineering materials used in construction.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Aware of natural and manufactured aggregates and the importance of physical properties of aggregates used for building construction.
CO 2	Identify various properties of bricks and steel used in construction of structures.
CO 3	Select appropriate timber and cement materials for different types of constructions.
CO 4	Choose suitable masonry works for modern construction to enhance the elegance and performance.
CO 5	Aware of different modern materials in construction.

UNIT-I

Stones and Aggregates

Properties of building stones – Classification of stones – Stone quarrying, precautions in blasting – Dressing of stone, Fine aggregate: Natural and manufactured – Sieve analysis – Different tests on fine aggregate, Coarse aggregate: Natural and manufactured – Importance of size, shape and texture.

UNIT – II

Bricks

Composition – Types of bricks – Manufacturing process of bricks – Test on bricks – Standard requirements and grades.

Steel

Types and grades of steel, tests on steel, applications.

UNIT – III

Cement

Introduction – Chemical Composition – Types of cement with their specific uses – Grade of cement as per BIS – Engineering properties of cement – Field and Laboratory test of cement as per BIS.

Timber

Types of timber – Uses and application of timber – Defects in timber and wood – Seasoning Wood – Wood products with specific uses

UNIT – IV

Masonry Works

Masonry - Stone Masonry - Rubble Masonry - Brick Masonry - Bond - Types of bonds - English and Flemish bonds - Composite masonry - Concrete Masonry - Reinforced masonry - Types of walls - Types of Partition walls.

UNIT – V

Modern Building Materials

Aluminum – Fiber Reinforced Polymers – Ferro cement – Composite materials – Light Weight Roofing Materials – GI Sheets – Ceramics – Other Modern Materials.

Text Books:

1. Rajput R.K. "Engineering Materials", S. Chand & Company Ltd. New Delhi, Third Edition2009.
2. P C Varghese, "Building Materials", PHI Learning Pvt. Ltd., Delhi.
3. G C Sahu, Joygopal Jena, "Building Materials and Construction", McGraw hill Pvt Ltd 2015.
4. Arthur Lyons De, "Materials for Architects and Builders", Montfort University, Leicester, UK.

Reference Books:

1. S C Rangwala, "Engineering Materials", Charotar Publishing House Pvt. Ltd., Anand, Gujarat.
2. S K Duggal, "Building Materials", New Age International (P) Limited, Publishers, New Delhi.
3. S. C. Rangwala, "Building Construction", Charotar Publishing House Pvt. Ltd., Anand, Gujarat.
4. R. Chubby, "Construction Technology – Vol – I & II", Longman UK

B.Tech V Semester

Course Title	Concrete Technology Lab				B. Tech. V Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001507	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives:

- To achieve the practical knowledge regarding concrete testing equipment and their operation.
- To familiarize the students with physical and mechanical properties of cement concrete constituents.
- To provide practical knowledge and understanding towards the materials used for concrete.
- To acquire practical skills in the area of cement, fresh & hardened concrete testing.

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

CO 1	Conversant with ideas and concept of various properties of cement, fine aggregates & coarse aggregates.
CO 2	Appreciate importance of quality control procedures of fresh & hardened concrete with regard to their suitability in construction jobs
CO 3	Relate the efficiency of test results with regard to acceptability of these materials to be used in concrete.
CO 4	Design & describe the preparation of mix proportion of concrete and testing.
CO 5	Enable to proportion the ingredients of concrete of a given strength so as to prepare concrete to needs at site.

List of Experiments:

1. Determination of fineness & Physical properties of cement (OPC & PPC)
2. Determination of normal consistency of standard cement paste
3. Determination of specific gravity of cement (OPC & PPC)
4. Determination of initial and final setting times of cement (OPC & PPC)
5. Determination of the compressive strength of cement for OPC & PPC
6. Determination of fineness modulus of coarse and fine aggregate
7. Specific Gravity of coarse and fine aggregate
8. Determination of bulking of fine aggregate
9. Determination of workability of concrete by slump cone test & compaction factor test
10. Determination of hardened properties of concrete by compressive strength.

Augmented Experiments:

1. Flexural Strength Test of Concrete (Beam)
2. Split Tensile Strength Test of Concrete (Cylinder)

Text Books:

1. M S Shetty "Concrete Technology – Theory and Practice", S Chand & Company Limited, New Delhi.

Reference Books:

1. Hemant Sood, L N Mittal and P D Kulkarni "Laboratory Manual on Concrete Technology", C B S Publishers and Distributors, New Delhi.

B. Tech., V Semester

Course Title	Structural Analysis and Design Lab (STAAD Pro)				B. Tech. V Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001508	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---					End Exam Duration: 3 Hrs		

Course Objectives:

- Learn how to achieve user specified design parameters to customize design
- Know how to perform code check, member selection and optimized member selection consisting of analysis or design cycles
- Apply the fundaments of reinforced concrete to design structures like beams, slabs, columns, retaining walls, water tanks, and other structures.

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

CO 1	Apply the core, multidisciplinary knowledge for understanding the problems in structural engineering and allied fields.
CO 2	Identify and analyse the impact of structural engineering in development projects and find a suitable solution from number of alternatives
CO 3	Demonstrate in-depth knowledge of Structural Engineering and build capability toapply that knowledge to real problems.

Exercises:

1. Analysis and design of Beam
2. Analysis and design of Column
3. Analysis and design of 2-D portal frame
4. Analysis and design of 3-D portal frame
5. Analysis and design of Two-Way Slab.
6. Analysis and design of Retaining Wall
7. Analysis and design of Water Tank
8. Analysis and design of steel tabular truss
9. Analysis and design of transmission tower
10. Earthquake load & wind load application to RC structures along with the design for different load combinations.

Text Books /Reference Books:

1. Dr.M.N. Sesha Prakash And Dr.C.S.Suresh,"Computer Aided Design Lab Manual" Laxmi Publications.
2. T.S. SARMA,"STAAD.PRO V8i for Beginners with indian Examples".
3. Prof.SHAM TICKOO,"Leaning Bentley STAAD.PRO V8i for Structural Analysis", Publisher : Dreamtech Press, USA.

B. Tech., V Semester

Course Title	SketchUp-3D modeling				B. Tech. V Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20015S3	Skill (SC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		1	0	2	2	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To know the basic drawing tool to draw the building plans
- To create 3D models of building components and to prove customised outputs.

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

CO 1	Use the SkechUp Layout and SkechUp for civil engineering drawing.
CO 2	Create 2D and 3D models of build components
CO 3	Use V-ray for beatification of SketchUp outputs

Exercises:

1. Introduction to sketchup Layout.
2. Drawing building plan using sketchup Layout.
3. Introduction to Sketchup 2D and 3D.
4. Drawing building components: doors, windows, etc.
5. Creating 3D model of a singly story building from given plan.
6. Developing interior design for a singly story building.
7. Drawing sanitary connections.
8. Basic rendering tools for V-ray.
9. Creating high-definition 2D pictures using sketchup.
10. Creating 3D motion videos using sketch.

Text Books:

1. Bill Fane, Mark Harrison, Josh Reilly, "SketchUp for Dummies", For Dummies, 1st edition, 2020.
2. Michael Brightman, "The SketchUp Workflow for Architecture: Modeling Buildings, Visualizing Design, and Creating Construction Documents with SketchUp Pro and LayOut", Wiley, 2nd edition, 2018.
3. N. Sreenivasulu, S. Rama Rao, "Civil Engineering Drawing-I", Radiant PublishingHouse.
4. N. Sreenivasulu, "Civil Engineering Drawing-II", Radiant Publishing House.

B. Tech., V Semester

Course Title	Community Service Project				B. Tech. V Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2001509	PROJ	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	3	100	---	100
Mid Exam Duration: ----						End Exam Duration: ----		

Course Objectives:

- 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

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Positive impact on students' academic learning in view of the classroom to field and vice versa experience
CO 2	Improves students' ability to apply what they have learned in "the real world"
CO 3	Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
CO 4	Improved ability to understand complexity and ambiguity
CO 5	Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

A student may complete the Community Service Project before the beginning of 5th semester and the evaluation and credits will be awarded in 5th semester through internal assessment process only. The award of credits will be based the performance in Viva-Voce and report submitted. The duration and time frame of the Community Service Project are given below:

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. Preliminary Survey (One Week)

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.

- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. Community Awareness Campaigns (Two Weeks)
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.
3. Community Immersion Programme (Four Weeks)
   - **Along with the Community Awareness Programmes**, the student batch will work along with any one of the below listed governmental agencies and do service in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics while serving the people. Programmes could be in consonance with the Govt. Departments.
4. Community Exit Report (One Week)
   - During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which shall be countersigned by the governmental agency representative and the
teacher-mentor, who is required to periodically visit the students and guide them.

VI Semester
Syllabus

B. Tech., VI Semester

Course Title	Environmental Engineering				B. Tech. VI Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001601	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To get the knowledge of water sources, standards, treatment of water for distribution to the domestic purpose.
- To estimate sewage and storm water from towns and to design the sewage
- To understand the design and operation of wastewater treatment units.
- To illustrate solid waste, air and noise pollutions.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Know the various sources, quality standards of water.
CO 2	Acquire knowledge on different treatment methods of water.
CO 3	Plan efficient water distribution network to supply as per demand.
CO 4	Estimate the waste water quantity; collection and testing of various properties of sewage.
CO 5	Understand the various biological treatment methods of waste water treatment.

UNIT-I

Introduction, Sources & Impurities

Introduction - Water supply - Objectives of water supply systems - Water supply scheme - Quantity of water - Design period – Per Capita Consumption - Fluctuations in demand pattern - population forecast – Arithmetic, Incremental, Geometric methods.

Sources of water – Surface and Sub Surface – Quality of water - Physical, chemical and biological aspects - Impurities in water - Waterborne diseases – Drinking water quality standards.

UNIT – II

Treatment

Flowchart of water treatment plant - Treatment methods (Theory and Design) – Sedimentation - Coagulation – Filtration – slow sand, rapid sand - Disinfection – Aeration - Softening of Water – Defluoridation.

UNIT – III

Water Distributions: Requirements - Layout of Water distribution systems – Design by Hardy Cross method - Laying of pipe lines – Waste detection and prevention.

Waste water & Estimation: Definition of Terms – Sewage, Sullage, Storm Water and Sludge, Estimation of Sewage – Dry weather Flow and Wet weather flow – Average, Peak and Minimum Sewage Flows - problems.

UNIT – IV

Collection of Sewage: Separate and Combined Sewers with their Merits and Demerits – Hydraulic Design of Sewers for Full and Partial Flow System – Self Cleansing Velocity of Sewers – Sewer Appurtenances and their Location.

Characterization of Sewage: Chemical Composition of Sewage – Solids, BOD and COD, Nutrients and Biological Impurities – Numerical Problems on BOD Equation – Population Equivalent.

UNIT – V

Biological Treatment: Preliminary – Design of Screen, Grit Chamber - Primary Sedimentation Tank - Secondary – Design of Suspended and Attached Growth of Biological System – Oxidation Ponds - Tertiary treatment – Removal of Nitrogen, Phosphorus - Standards for Disposal of Treated Sewage into Inland Surface Waters, Marine Disposal and on Land for Irrigation - Design of Septic Tank and Soak Pits.

Text Books:

1. B C Punmia, Ashok Kumar Jain & Arun Kumar Jain "Wastewater Engineering", Lakshmi Publications, New Delhi.
2. G.S. Birdie and J. S. Birdie, "Water Supply and Sanitary Engineering", 8th Edition, Dhanpat Rai and Sons Publishers, New Delhi, 2010.
3. K.N. Duggal, "Elements of Environmental Engineering", 1st Edition, S.Chand Publishers, New Delhi, 2010
4. S.K. Garg, "Environmental Engineering (Vol. I): Water Supply Engineering", 20th Revised Edition, Khanna Publishers, New Delhi, 2011.

Reference Books:

1. K.N. Duggal, "Elements of environmental engineering", S. Chand Publishers
2. H S Peavy and D R Rowe, "Environmental Engineering" Tata McGraw-Hill Companies, Inc. New York.
3. Met Calf & Eddy, "Wastewater Engineering – Treatment and Reuse", Tata McGraw-Hill Companies, Inc. New York.
4. G.S. Birdi, Dhanpat, "Water supply and sanitary Engineering", Rai & Sons Publishers.

B. Tech., VI Semester

Course Title	Water Resources Engineering					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001602	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To study the different measures to prevent damages of Floods and their remedial measures.
- To study the various factors considering for construction of different head works
- To study the different components and their applications
- To study the various design procedures and their engineering significances
- To study the different tools required for knowing performance of water resources projects

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand different energy dissipation methods in spillways.
CO 2	Know the concepts and design principles of various types of falls in canals.
CO 3	Know the design principals of canal regulatory works.
CO 4	Identify suitable site location for various cross drainage works and their design principles.
CO 5	Know different water resources development projects across the nations and its strategies.

UNIT-I

Spillways

Types of Spillways – Necessity and Components of Spillways – Applications of Spillways – Design Principles of Ogee Spillways – Types of Spillway Gates – Energy Dissipation Methods.

UNIT – II

Canal Structures – 1

Types of Falls and Their Location – Design Principles of Sarda type Fall – Trapezoidal Notch Fall and Straight Glacis Fall.

UNIT – III

Canal Structures – 2

Canal Regulation Works – Principles of Design, Distribution, Head Regulator – Canal Outlets – Types of Canal Modules – Proportionality, Sensitivity and Flexibility.

UNIT – IV

Cross Drainage Works

Types of Selection of Site – Design Principles of Aqueduct – Siphon Aqueduct and Super Passage.

UNIT – V

Water Resources Planning

Introduction to Indian Water Resources – Scenario of Water Use – Purpose of Water Resource Development – Classification of Water Resources – Development Projects – Project Evaluation – Strategies for Future – Planning Strategies – Management Strategies.

Text Books:

1. G L Asawa "Irrigation and Water Resources Engineering", New Age International (P) Limited, Publishers, New Delhi.
2. R S Varshney, S C Gupta and R L Gupta "Theory and Design of Irrigation Structures", Nem Chand & Bros Publishers, Roorkee, Uttarakhand.
3. Loucks D.P. and van Beek E., "Water Resources Systems Planning and Management", UNESCO Publishing, The Netherlands.

Reference Books:

1. Satya Narayana Murty Challa "Water Resources Engineering – Principles and Practice", New Age International (P) Limited, Publishers, New Delhi.
2. B C Punmia, Pande B B Lal, Ashok Kumar Jain & Arun Kumar Jain "Irrigation and Water Power Engineering", Lakshmi Publications, New Delhi.
3. David A. Chin, "Water-Resources Engineering", SI Edition, Third Edition, Pearson Education, 2019.
4. Larry W. Mays, "Water Resources Engineering", Wiley, 2nd edition, 2010.

B. Tech., VI Semester

Course Title	Design of Reinforced Concrete Structures					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001603	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To define and introduce the different design philosophies of Reinforced Cement Concrete.
- To implement the Limit State Method for design of rectangular section beams.
- To design two way slabs and dog-legged staircase
- To design the short and long columns for axial load, uniaxial and by-axial bending conditions
- To Design the isolated and combined footings.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Know the various design philosophies and analyse the rectangular beam section using Limit State Method.
CO 2	Design the beam for flexural, shear and torsional loading conditions.
CO 3	Design the RCC slabs with different support conditions and staircases.
CO 4	Design the RCC columns for different loading conditions.
CO 5	Design isolated and combined footing for given SBC.

UNIT-I

Introduction

Introduction to working stress and limit state methods-characteristic values & partial safety factors, Stress-strain curves for concrete & steel. Limit State Method: Stress Block Parameters as per IS 456 -2000, Under reinforced-over reinforced-balanced sections, analysis of rectangular section beams using limit state methods.

UNIT – II

Limit State Design for Flexure, Shear, Torsion and Bond

Design of singly & double reinforced rectangular beams for flexure. Design of rectangular sections for shear and torsion. Design for Bond –Anchorage and Development length of bars

UNIT – III

Design of Slabs and Staircase

Design of two way slabs with different end conditions (IS Code Method). Design of dog-legged staircase.

UNIT – IV

Design of Compression Members

Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - IS Code provisions

UNIT – V

Design of Foundation

Different types of footings –Design of flat isolated square, rectangular, circular footings and combined footings for two columns.

Text Books:

1. B C Punmia, Ashok Kumar Jain & Arun Kumar Jain "Comprehensive RCC Design", Laxmi Publications, New Delhi.
2. N. Subramanian, "Design of Reinforced Concrete Structures", Oxford University Press
3. S. Unnikrishna Pillai & Devdas Menon, Reinforced Concrete Design, TMH, New Delhi. 3rd Edition 2009
4. M.L. Gambhir, "Fundamentals of Reinforced concrete design", PHI, New Delhi.2nd Edition 2010

Reference Books:

1. Ashok. K Jain "Reinforced Concrete: Limit State Design", Nem Chand & Bros, Roorkee.
2. N Krishna Raju and R N Pranesh "Reinforced Concrete Design: IS: 456-2000 Principles and Practice", New Age International (P) Limited, Publishers, New Delhi.
3. P.C. Varghese, "Limit state designed of reinforced concrete", PHI Learning Pvt. Ltd.
4. N.C. Sinha and S.K Roy, "Fundamentals of Reinforced Concrete", 4th Edition, S. Chand publishers, 2004.

B. Tech., VI Semester

Course Title	Pre-Stressed Concrete				B. Tech. VI Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001604	Professional Elective (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:
To give idea on methods available on pre-stressed concrete and analysis of pre-stressed members and design of members.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Classify and differentiate the design principles of pre-stressed concrete over reinforced concrete and its advantages and limitations.
CO 2	Identify the losses in pre-stressed members due to short and long term deformations.
CO 3	Design the pre-stressed concrete beams for flexure as per codal recommendations.
CO 4	Design the pre-stressed concrete beams for shear as per codal recommendations.
CO 5	Identify the factors influencing deflections and design of pre-stressed beams under deflection criteria.

UNIT-I

Introduction: General Principles of Pre-Stressed Concrete Members – Advantages and Limitations of Pre-Stressed Concrete – Comparison of Pre-Stressed Concrete Beams with Reinforced Concrete Beams.

Systems of Pre-Stressing: Classification of Pre-Stressed Concrete Members, System of Pre-Stressing, Pre-Tensioned System, Stability of the System. Hoyer System, Magnel Blaton System, Freyssinet System, Gifford Udall System, P.S.C Mono Wire System, C.C.L Standard System, LEE-MCCALL System.

UNIT – II

Losses of Pre-Stresses: Loss of Pre-Stress in Pre-Tensioned and Post-Tensioned due to Various Causes Like Elastic Shortening of Concrete, Shrinkage of Concrete, Creep of Concrete, Relaxation of Stress in Steel, Slip in Anchorage Bending of Member and Wobble Frictional Losses.

UNIT – III

Analysis and design of sections for flexure: Assumptions, Analysis by Stress Concept – Elastic Analysis of Concrete Beams Pre-Stressed with Straight, Concentric, Eccentric, Bent and Parabolic Tendons – Design of Pre-Stressed Concrete Beams – I.S Recommendations as per IS 1343 Code Book – Design of Rectangular and an I-Section of a Beam – Lever Arm Concept – Kern Distance.

UNIT – IV

Shear Design of PSC Beam: Design of Shear based on IS 1343 Code Book – Design of Beam.

UNIT – V

Deflections of Pre-Stressed Concrete Beams: Importance of Control of Deflections – Factors Influencing Deflections – Short Term Deflections of Uncracked Members Prediction of Long Term Deflections.

Text Books:

1. S Ramamrutham, "Pre-Stressed Concrete", Dhanpat Rai Publishing Company (P) Limited, New Delhi.
2. N Krishna Raju, "Pre-Stressed Concrete", Tata McGraw-Hill Companies, Inc. New York.
3. N Rajagopalan, "Pre-Stressed Concrete", Narosa Publishing House, New Delhi.
4. M.K.Hurst, "Prestressed Concrete Structures", Tata Mc.Graw Hill Publications, 2nd Edition,2009.

Reference Books:

1. IS 1343-2012 "Indian Standard Code of Practice for Prestressed Concrete", Bureau of Indian Standards, New Delhi.
2. P.Dayaratnam, "Pre-stressed Concrete Structures", Oxford &IBH Publishers, Fourth Edition.
3. K. U. Muthu, Agmil Ibrahim, Maganti Janardhana, M. Vijayanand, "Pre-stressed Concrete", PHI Publishers, 2016
4. T.Y. Lin & N.H. Burns, "Design of Pre-Stressed Concrete Structures", John Wiley & Sons, 3rd Edition, 2005.

B. Tech., VI Semester

Course Title	Bridge Engineering					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001605	Professional Elective (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To acquire knowledge about bridges and its components, different types of loading s and IRC classification of loading and its importance.
- To understand about analysis and design about square box culvert.
- To make the students able to analyze deck slab bridges and its importance.
- To give knowledge about analysis and design of T-beam bridges and various types of class 'AA' loadings acting on T-beam bridges.
- To understand about piers, abutments, various forces acting on piers & abutments. And also design principles of various bridge bearings.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Know the site selection parameters and various loads on bridge structures.
CO 2	Analyse & Design of box culvert under classified loads.
CO 3	Analyse and Design deck slab bridge according to IRC codes
CO 4	Analyse & Design of T-beam bridge subjected to class 'AA' tracked vehicles loading conditions.
CO 5	Understand the design principles and learn stability aspects of piers, abutments and bridge bearings

UNIT-I

Introduction

Importance of Site Investigation in Bridge Design – Highway Bridge Loading Standards – Impact Factor – Railway Bridge Loading Standards (B.G & M G Bridges) – Various Loads in Bridges.

UNIT – II

Design of Box Culvert

General Aspects – Design Loads – Design of Box Culvert Subjected to R C Class AA Tracked Vehicles only.

UNIT – III

Design of Deck Slab Bridge

General Features – Effective Width Method of Analysis; Design of Deck Slab Bridge (Simply Supported) subjected to Class AA Tracked Vehicles only.

UNIT – IV

Design of T-Beam Bridge

General Features – Design of Interior Panel of Slab – Pigeaud's Method – Design of a T- Beam Bridge Subjected to Class AA Tracked Vehicles only.

UNIT – V

Piers, Abutments and Bridge Bearings

General Features – Bed Block – Material Piers & Abutments – Types of Piers – Forces Acting on the Piers – Stability Analysis of Piers – General Features of Abutments – Forces Acting on Abutments – Stability Analysis of Abutments – Types of Wing Walls – Approaches – Types of Bridge Foundations (Excluding Design)

Bridge Bearings

General Features – Types of Bearings – Design Principles of Rocker & Roller Bearings – Design of Steel Rocker Bearings – Design of Elastomeric Pad Bearings

Text Books:

1. S Ponnuswamy, "Bridge Engineering", Tata McGraw-Hill Companies, Inc. New York.
2. N Krishna Raju, "Design of Bridges", Oxford & IBH Publishing Company (P) Limited, New Delhi.
3. V.N. Vazirani and M.M. Ratwani M.G. Aswani, "Design of Concrete Bridges", Khanna Publishers, 1995.
4. B.C. Pumai, Jain & Jain, "Design of RC Structures", Lakshmi Publications.

Reference Books:

1. IS 800-2007 "Indian Standard Code of Practice for General Construction in Steel", Bureau of Indian Standards, New Delhi.
2. IS 456-2000 "Indian Standard Plain and Reinforced Concrete – Code of Practice", Bureau of Indian Standards, New Delhi.
3. IRC 6-2000 "Standard Specifications and Code of Practice for Different Types of Loadings Acting on the Bridge Structure", The Indian Roads Congress, New Delhi.
4. IRC 22-2000 "Standard Specifications and Code of Practice for Road Bridges and Different Materials used in Bridge Structures and Reinforcement Details", The Indian Road Congress, New Delhi.
5. IRC 24-2000 "Standard Specifications and Code of Practice for Permissible Bending Stresses in Steel and its Properties", The Indian Road Congress, New Delhi.
6. IRC 83-2000 "Standard Specifications and Code of Practice for Different Types of Bridge Bearings used in the Bridges and its Detailed Specifications", The Indian Road Congress, New Delhi.

B. Tech., VI Semester

Course Title	Traffic Engineering					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001606	Professional Elective (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives: To set a solid and firm foundation in

- Traffic engineering management.
- Traffic regulation means and measures.
- Concept of highway capacity.
- Road safety
- Concepts of traffic flow theory

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Justify the need for traffic management
CO 2	Implement different traffic regulations
CO 3	Apply highway capacity concept for designing and evaluating various traffic management means and measures
CO 4	Design and implement various road safety enhancement measures.
CO 5	Interpret, analyse data for simple situations to predict the main characteristics of traffic flow

UNIT-I

Traffic Management

Traffic management – scope of traffic management measures – restrictions to turning movements – one-way streets – tidal flow operations-Traffic segregation –Traffic calming-Exclusive bus lanes, Introduction to ITS

UNIT – II

Traffic Regulation

Regulation of traffic – Need and scope of traffic regulations- Motor Vehicle Act – Speed limit at different locations- regulation of the vehicle – regulations concerning the driver rules of the road enforcement

UNIT – III

Highway Capacity

Highway capacity: Its importance in transportation studies – basic, possible and practical capacity – determination of theoretical maximum capacity -passenger car units – level of service – concept in HC manual – factors affecting level of service.

UNIT – IV

Traffic Safety

Road Accidents-Causes and Prevention-Road and its effect on accidents-The Vehicle-The Driver-Weather and its effect on accidents-Speed in Relation of Safety-Collection of accident data-Condition Diagram and Collision Diagram-Traffic Management Measures and their Influence on Accident Prevention.

UNIT – V

Traffic Flow

Theory of traffic flow – scope – definition and basic diagrams of traffic flow- basic concepts of light hill – Whitham's theory – Introduction to Car 'following theory and queuing'.

Text Books:

1. Khanna, S.K. and C.E.G. Justo, C.E.G., "Highway Engineering", Khanna Publishers, Roorkee, 2001.
2. Kadiyali, L.R., "Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi
3. Donald Drew, Traffic Flow Theory Chapter 14 in Differential Equation Models, Springer,1983
4. Papa Costas C.S., "Fundamentals of Transportation Engineering", Prentice Hall, India

Reference Books:

1. Martin Whol & Brian V Martin, "Traffic system Analysis for Engineers and Planners", McGraw Hill, NY, 1967.
2. Highway Capacity Manual: HCM 2010 (3 volume set), TRB Publications, 2010
3. Jotin Khisty, C. and Kent Lall, B., "Transportation Engineering – An Introduction", Prentice- Hall.
4. Salter, R.J. and Hovnsell, N.B., "Highway Traffic Analysis and Design", 3rd Edition, Macmillan Press Ltd, 1996.

B. Tech., VI Semester

Course Title	Solid Waste Management					B. Tech. VI Semester		
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
20OE104	Open Elective (OEC II)	3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To know the necessity of solid waste management
- To study various strategies for the collection of solid waste
- To understand various solid waste disposal methods
- To understand how to categorize the Hazardous Wastes

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand and identify the physical and chemical composition of solid waste.
CO 2	Understand the optimum route planning for transport of solid waste.
CO 3	Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
CO 4	Understand the design of waste disposal systems.
CO 5	Understand the sources and how to manage the different categories of Hazardous Wastes.

UNIT - I

Introduction to Solid Waste

Definition - Types of solid waste - sources of solid waste - Characteristics - properties of solid wastes - Sampling of Solid wastes - Elements of solid waste management

UNIT - II

Solid Waste Management

Solid waste generation - onsite handling - storage and processing - collection of solid wastes - Stationary container system and Hauled container systems - Route planning - transfer and transport.

UNIT - III

Resource and Energy Recovery

Processing techniques - materials recovery systems - Composting - types of composting - Problems with composing – Pyrolisis – Gasification - RDF - recovery of energy from conversion products - materials and energy recovery systems.

UNIT - IV

Landfills

Types and Construction of landfills - Design considerations - Life of landfills - Landfill Problems - Lining of landfills - Leachate pollution and control - Landfills reclamation.

UNIT - V

Hazardous Waste Management

Sources and characteristics - Effects on environment - Risk assessment - Disposal of hazardous wastes - Secured landfills, incineration - Biomedical waste disposal - E-waste management

Text Books:

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.

Reference Books:

1. CPHEEO Manual on Municipal Solid Waste Management - 2000
2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.
3. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985.

B. Tech., VI Semester

Course Title	Estimation and Costing				B. Tech. VI Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20OE105	Open Elective (OEC II)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To attain basic knowledge on types of quantity estimation of structures different types of structures and estimate quantities of load bearing wall structures
- To interpret the rates of different items of works involved in a construction activity.
- To understand various types & conditions of contracts and related documentation
- To know about various techniques of valuation of land and building properties
- To get basic knowledge on various types of costing along with cost control and reduction techniques.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Estimate quantities of various types of load bearing wall structures.
CO 2	Calculate the rates of different items of works involved in a construction activity.
CO 3	Know different types of contract documents as per requirements of a project.
CO 4	Do valuation of land and building properties.
CO 5	Do costing of a product using various techniques.

UNIT-I

Introduction to the Estimation of Structures

Introduction, Different Item of Works – Units of Item of works– Types of Estimates – Methods of Estimates.

Quantity Estimation of Buildings

Estimation of Quantities in Buildings: Load Bearing Wall Structure of Single Room and Multi Room

UNIT – II

Rate Analysis

Rate Analysis of Different Item of Works: Earthwork Excavation – Mortars of Various Proportions(Cement and Lime)–Concrete with Various Proportions (Lime and Cement) – Brick Masonry – Stone Masonry – Pointing – Painting – Plastering

UNIT – III

Contracts

Types of Contracts, Contract Document, Conditions of Contracts, Contract Procedure,

Termination of Contracts, Specifications, Important Conditions of Contract, Arbitration and Tenders.

UNIT – IV

Valuation

Introduction, Technique of Valuation, Elements of Valuation and Factors Affecting Valuation, Methods of Valuation to the Land Property and Building Property, Mortgage.

UNIT – V

Costing

Fixed and variable cost, Product and Process Costing, Standard Costing, Cost estimation, Relevant Cost for decision making, Cost estimation, Cost control and Cost reduction techniques.

Text Books:

1. B N Dutta "Estimating and Costing in Civil Engineering", U B S Publishers Distributers Pvt. Limited, Noida.
2. "Standard Data Book – Vol.2", Andhra Pradesh Department of Standard Specifications,Amaravati.
3. Contracts and estimations by B.S.Patil, Universities.Press, Hyderabad
4. G.S. Birdie, Estimating and Costing, Danpatrai Publications, New Delhi, 2009
5. Riggs, J.L., Dedworth, Bedworth, D.B, Randhawa, S.U. Engineering Economics, McGraw Hill International Edition, 1996

Reference Books:

1. Dr. Roshan H Namavati "Professional Practice", The Lakhani Book Depot, Mumbai.
2. S C Rangwala "Estimating Costing and Valuation", Charotar Publishing House Pvt.Limited, Anand.
3. IS 1200 (Parts I to XXV–1974/ Method of Measurement of Building and Civil EngineeringWorks – B.I.S.)
4. M. Chakraborthi, Estimating Costing Specification and Valuation in Civil Engineering,23rd Edition, Laxmi Publications, New Delhi, 2010.

B. Tech., VI Semester

Course Title	Water Management				B. Tech. VI Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20OE106	Open Elective (OEC II)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To understand different watershed behavior
- To be able to interpret runoff data and quantify erosion by using various modelling methods.
- To understand land use classification and impact of land use changes on hydrological cycle parameters.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Know concept and need for watershed management.
CO 2	Aware on various causes of soil erosion and mitigation methods.
CO 3	Implement basic rain water harvesting methods.
CO 4	Understand artificial groundwater recharge methods.
CO 5	Understand the soil reclamation methods.

UNIT – I

Introduction

Concept of watershed, need for watershed management, concept of sustainable development, hydrology of small watersheds.

UNIT – II

Soil Erosion

Principles of soil erosion- causes of soil erosion, types of soil erosion, estimation of soil erosion from small watersheds, Control of soil erosion, methods of soil conservation – structural and non-structural measures.

UNIT – III

Water Harvesting

Principles of water harvesting, methods of rainwater harvesting, design of rainwater harvesting structures.

UNIT – IV

Ground Water Recharge

Artificial recharge of groundwater in small watersheds-, methods of artificial recharge.

UNIT – V

Reclamation of saline soils

Micro farming - biomass management on the farm.

Text Books:

1. Murthy, V.V.N. and M.K. Jha Land and Water Management, Kalyani Publishers, 2015
2. Watershed Management by Madan Mohan Das and M.D. Saikia, Prentice Hall of India, 2013.
3. Watershed Management Muthy, J. V. S., New Age International Publishers, 1998.

References:

1. Watershed Hydrology by P E Black, Prentice Hall Englewood Cliffs, 1991.
2. Watershed Hydrology by R Suresh, Standard Publishers and Distributors, Delhi, 2020

B. Tech., VI Semester

Course Title	Environmental Engineering Lab				B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2001607	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives:

- To analyze the Waste water sources and waste water characteristics.
- To Compare the results on estimating various parameters like pH, Chlorides, and different solids in water.
- Status of Industrial effluents will also be taught in the laboratory by estimating BOD and COD of effluent.

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

CO 1	Describe the knowledge of physical, chemical and biological parameters of water and their importance.
CO 2	Understand and use the domestic water sampling procedures and sample preservations.
CO 3	Apply the laboratorial results to problem identification, quantification, and basic environmental design and technical solutions.
CO 4	Understand and use wastewater sampling procedures and sample preservations.
CO 5	Understand and apply ethical issues associated with decision making and professional conduct in the laboratory and field environment.

List of Experiments:

1. Determination of various forms of Acidity
2. Determination of various forms of Alkalinity
3. Determination of pH in water
4. Determination of Chlorides content
5. Determination of Residual Chlorine
6. Determination of Turbidity in water
7. Determination of various forms of Solids
8. Determination of Hardness in water
9. Determination of Dissolved oxygen
10. Determination of Optimum Dosage of Coagulant

Augmented Experiments:

1. Determination of total iron in the water
2. Determination of fluoride in water

Text Books:

1. Dr. G Kotaiah and Dr. N Kumara Swamy "Environmental Engineering Lab Manual",Charotar Publishing House, Anand, Gujrat.
2. S.K. Garg, "Environmental Engineering (Vol.I): Water Supply Engineering", 20thRevisedEdition, Khanna Publishers, New Delhi, 2011.

Reference Books:

1. Clair N Sawyer, Perry L Mccarty and Gene F Parkin "Chemistry for EnvironmentalEngineering and Science", Tata McGraw-Hill Edition, New Delhi.
2. CPHEEO, Ministry of Urban Development (1996), Manual on water supply and Treatment, New Delhi.

B. Tech., VI Semester

Course Title	Computer-Aided Design and Drafting Lab					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001608	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives:

- To know how to apply engineering drawing using computers
- To make the student to understand about the scope of Auto CAD software
- To teach detailing of different reinforced cement concrete components.

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

CO 1	Understand the process of detailing different building components.
CO 2	Apply AutoCAD tool for drawing and detail of civil engineering components.
CO 3	Provide proper detailing drawing to customer.

Exercises:

1. Detailing of Reinforced Cement Concrete determinate beams.
2. Detailing of Continuous and indeterminate Reinforced Cement Concrete beams.
3. Detailing of circular and rectangular Columns.
4. Details of one-way and two-way slabs.
5. Detailing of Reinforced Concrete wall.
6. Detailing of Earth retaining structures
7. Detailing of rectangular and circular footing.
8. Detailing of different combined footings.
9. Detailing of different deep foundations.
10. Detailing of Over Head Water Tank.

Text Books:

1. N. Sreenivasulu, S. Rama Rao, "Civil Engineering Drawing-I", Radiant Publishing House.
2. N. Sreenivasulu, "Civil Engineering Drawing-II", Radiant Publishing House.
3. G C Sahu, Joy Gopal Jena, "Building Materials and Construction", McGraw hill Pvt Ltd 2015
4. Duggal, "Building Materials", New Age International

Reference Books:

1. P. J. Sha, "Engineering Graphics", S. Chand & Co.
2. S. Mahaboob Basha, "Civil Engineering Drawing-I", Falcon Publishers
3. M. G. Shah,"Building drawing", Tata McGraw-Hill Education.
4. R. Chubby,"Construction Technology – Vol – I & II", Longman UK

B. Tech., VI Semester

Course Title	Advanced Concrete Technology Lab					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001609	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
Mid Exam Duration: ---						End Exam Duration: 3 Hrs		

Course Objectives:

- To conduct laboratory tests to find the suitability of the design of concrete mixes

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

CO 1	The behavior of fresh concrete with advanced methods
CO 2	Find out the crushing strength of hardened concrete and its crack pattern during the testing
CO 3	The behavior of concrete against severe exposure conditions
CO 4	Understand the effect of Chemicals on the properties of concrete

List of Experiments:

1. Determination of workability of concrete by Vee-bee Consistometer test.
2. Determination workability of concrete by Flow table test.
3. Determine Young's Modulus of concrete and draw the graph.
4. Determine Compressive strength of the concrete using Non-Destructive testing by Rebound Hammer.
5. Determination of Rapid chloride permeability Number by using RCPT as a durability parameter.
6. Determine Compressive strength of concrete in Acid Curing and Compare its strength with Conventional concrete
7. Determine of Compressive strength of concrete in Sulphate solution curing and compare its strength with Conventional concrete.
8. Determination of carbonation depth of concrete.
9. Determine the behaviour of beams under shear.

Text Books:

1. M S Shetty "Concrete Technology – Theory and Practice", S Chand & Company Limited, New Delhi.

Reference Books:

1. Hemant Sood, L N Mittal and P D Kulkarni "Laboratory Manual on Concrete Technology", C B S Publishers and Distributors, New Delhi.

VII Semester
Syllabus

B. Tech., VII Semester

Course Title	Ground Improvement Techniques				B. Tech. VII Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2001701	Professional Elective (PEC III)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To learn and understand various ground improvement technique.
- To learn various method of compaction for ground improvement in its strength.
- To learn various physical and chemical modification for ground improvement
- To learn the method to choose the foundation and or treatment method based on the site condition

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Select the ground improvement technique which is suitable and economical for soil strengthening.
CO 2	Select different techniques based on the various types of soils in-situ
CO 3	Design reinforced earth structures
CO 4	Exposed to the knowledge on use of geosynthetic material
CO5	Understand the behavior of expansive soils and design foundations in expansive soils

UNIT-I

Introduction

Need for engineered ground improvement, classification of ground modification techniques; suitability, feasibility and desirability of ground improvement technique; objectives of improving soil.

Stabilisation

Methods of stabilization-mechanical-cement- lime bituminous- chemical stabilization with calcium chloride, sodium silicate and gypsum.

UNIT-II

Densification Methods in Granular Soils

In – situ densification methods in granular Soils – Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.

Densification Methods in Cohesive Soils

In-situ densification methods in cohesive soils – preloading or dewatering, vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.

UNIT-III

Dewatering

Methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points- Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis.

Grouting

Objectives of grouting- grouts and their properties-grouting methods- ascending, descending and stage grouting- hydraulic fracturing in soils and rocks- post grout test.

UNIT-IV

Reinforced Earth

Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

UNIT-V

Expansive Soils

Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles

Text Books:

1. Dr. P. Purushothama Raj., "Ground Improvement Techniques", Lakshmi Publications Pvt. Ltd.
2. Jones, J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1985.
3. Koerner, R.M. and Welsh, J.P., Construction and Geotechnical Engineering using Synthetic Fabrics, John Wiley, 1990.
4. Koerner, R.M., Designing with Geosynthetics (Third Edition), Prentice Hall, 1997.

Reference Books:

1. Moseley, M.D., Ground Treatment, Blackie Academic and Professional, 1998.
2. Hehn, R.W., Practical Guide to Grouting of Underground Structures, ASCE, 1996.
3. Das, B.M., Principles of Foundation Engineering, (Fourth Edition). PWS Publishing, 1999
4. Foundation Analysis and Design by Joseph E. Bowles; McGraw – Hill International Book Company 2

B. Tech., VII Semester

Course Title	Quantity Estimation of Structures					B. Tech. VII Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001702	Professional Elective (PEC III)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To impart basic knowledge on Estimation of structures and understand how to Estimate the quantities of engineering projects
- To know the importance of specifications in final cost of the structure.
- To understand how to prepare the rate of the different item of works with SSR and Data book
- To understand the contractual system in public works and know the importance of Valuation
- To gain basic knowledge on quantity estimation of other Civil Engg Structures

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Acquire knowledge on specifications of different items of work related to build construction.
CO 2	Estimated different items of works and prepare bar bending schedule.
CO 3	Do rate analysis of varies items of works as per Standard Schedule of Rates.
CO 4	Understand the different types of contracts and valuation methods.
CO 5	Estimate various items of works related to irrigation and road structures.

UNIT-I

Introduction to The Estimation

Importance of Estimation for Structures, units and items of works in structures, Methods of Estimation, Quantity Estimation of Single Room, Double Room and Multiple Rooms with Long wall and Short wall methods and Framed Structures

Estimation of Bar Bending Schedule

Beams, columns, Slabs, Staircases, Sun shade, Lintels.

UNIT – II

Specifications of Different Item of Works

Specification of different items of works: Earth work for foundations, mortars, Plain cement concrete, Reinforced concrete roofing, Brick work, Stone masonry, RCC roof and AC roof and GI sheet roof structures, plastering, Painting, pointing and wood works.

UNIT – III

Rate Analysis

Rate Analysis of different item of works: Earthwork Excavation, Mortars of various proportions (cement and lime) – Concrete with various proportions (lime and Cement) – Brick Masonry, Stone Masonry, Pointing, Painting, Plastering, cement concrete flooring with 1:2:4 mix, Ceramic

and Vitrified Tile flooring.

UNIT – IV

Contracts and Valuation

Contracts: Types of contracts, contract document, conditions of contracts, contract procedure, termination of contracts, arbitration and tenders.

Valuation: Introduction, Technique of valuation, elements of valuation and factors affecting valuation, methods of valuation.

UNIT – V

Estimation of Irrigation and Road Structures

Estimate of bituminous and cement concrete roads, estimate of retaining walls, Estimation of Canals Dam structures

Text Books:

1. B N Dutta "Estimating and Costing in Civil Engineering", U B S Publishers Distributers Pvt. Limited, Noida.
2. "Standard Data Book – Vol.2", Andhra Pradesh Department of Standard Specifications, Amaravati.
3. Contracts and estimations by B.S.Patil, Universities.Press, Hyderabad
4. G.S. Birdie, Estimating and Costing, Danpatrai Publications, New Delhi, 2009

Reference Books:

1. S C Rangwala "Estimating Costing and Valuation", Charotar Publishing House Pvt. Limited, Anand.
2. M. Chakraborthi, Estimating Costing Specification and Valuation in CivilEngineering,23rd Edition, Laxmi Publications, New Delhi, 2010.

B. Tech., VII Semester

Course Title	Finite Element Method					B. Tech. VII Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001703	Professional Elective (PEC III)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:
To understand the concepts of Finite element methods to analyze critical stress conditions in structures.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the fundamentals of the Finite Element Methods.
CO 2	Derive Finite Element Formulation for one dimensional beam and bar elements.
CO 3	Apply two dimensional elements for analysis of structures.
CO 4	Understand isoperimetric elements and its applications in Finite Element Methods.
CO 5	Analyse various structures for static loading conditions using Finite Element Methods.

UNIT - I

Introduction to Finite Element Method

Basic Concepts of FEM, Limitations, Finite Element Modelling and Discretization, Types of Elements, Nodes and Degrees of Freedom, Interpolation and ShapeFunctions

UNIT– II

One Dimensional

Local and Global coordinate systems - Finite element modelling - Stiffness matrix for Bar element, Flexure element - Element load vector - Equivalent nodal loads.

TRUSSES: Plane Trusses - Local and Global Coordinate Systems - Direction Cosines - ElementStiffness Matrix - Assembly of Global Stiffness Matrix - Stress Calculation.

UNIT – III

Two-Dimensional Elements

Two Dimensional Elements- Different types of elements for plane stress and plane strain analysis – Displacement models– generalized coordinates – shape functions – convergent and compatibility requirements –Geometric invariance – Natural coordinate system – area and volume coordinates.

UNIT - IV

Iso-Parametric Elements and Finite Element Modelling

Mesh Requirements - Material Properties - Loads and Reactions - Boundary Conditions - Checking the Model - Analysis andDesign Software (For Practice Purpose Only)

UNIT - V

Solution Techniques

Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

Applications of FEM

Plate bending problems - Finite elements in Fluid mechanics – Finite elements to elastic stability

Text Books:

1. Daryl L Logan "A First Course in the Finite Element Method", Cengage Learning India Private Limited, New Delhi.
2. S S Bhavikatti "Finite Element Analysis", New Age International (P) Limited, Publishers, New Delhi.
3. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers
4. Finite element analysis by S.S. Bhavakatti-New age international publishers

Reference books:

1. Robert D Cook, David S Malkus and Michael E Plesha "Concepts and Applications of Finite Element Analysis", Wiley India Pvt. Limited, New Delhi.
2. George R Buchanan "Theory and Problems of Finite Element Analysis", Tata McGraw-Hill Companies, Inc. New York.
3. Finite element analysis and procedures in engineering by H.V.Lakshminaryana, 3rd edition, universities press, Hyderabad.
4. Finite Element Analysis for Engineering and Technology, Tirupathi R Chandraputla, Universities Press Pvt Ltd, Hyderabad. 2003.

B. Tech., VII Semester

<table>
<tr><td>Course Title</td><td colspan="5">Design of Steel Structures</td><td colspan="3">B. Tech. VII Semester</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2001704</td><td rowspan="2">Professional Elective (PEC IV)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1.5 Hrs</td><td colspan="3">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
The student acquires knowledge about elastic & plastic methods to analyze the structural elements.
To understand about different types of tension & compression membersand to analyze easily by limit state design.
To make the student able to analyze various beams like laterally supported & laterally unsupported beams.
To make the students to understand the beam to beam & beam to columnconnections.
To understand the design of slab base and gusseted based and subjected
to moments.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Aware of standard loads and load combinations considered for design of steel structures; basic knowledge on plastic analysis.</td></tr>
<tr><td>CO 2</td><td colspan="8">Analyse and design welded connections subjected to axial loads and moments.</td></tr>
<tr><td>CO 3</td><td colspan="8">Deign tension and compression members with different cross-sections.</td></tr>
<tr><td>CO 4</td><td colspan="8">Design simple and compound beams and beam connections.</td></tr>
<tr><td>CO 5</td><td colspan="8">Design beam column connections and column base.</td></tr>
</table>

UNIT – I

Introduction

Loads & Load combinations: Appraisal of loading standards such as I.S, I.R.C Effect of wind and earthquake on structure.

Plastic Analysis

Introduction – Idealized Stress – Strain Diagram – Shape Factors for VariousSections – Moment Curvature Relationship – Ultimate Moment – Plastic Hinge – Lower and Upper Bound Theorems – Ultimate Strength Fixed and Continuous Beams – Frames.

UNIT – II

Welded Connections

Introduction – Advantages and Disadvantages of Welding – Strength ofWelds – Butt and Fillet Welds – Permissible Stresses – IS Code Requirements – Design of Welds Subjected to Moment Acting in the Plane and at Right Angles to the Plane of the Joints – Beamto Beam and Beam to Column Connections.

UNIT – III

Design of Tension Members

Types of Sections – Net Effective Section for Angles and Ties in Tensions - Lug Angles – Tension Splices

Design of Compression Members

Plain and Built-Up Compression Members – Assumptions Regarding End Conditions – Design of Built-Up Columns with Battens and Lacings – Splicing of Column.

UNIT – IV

Design of Beams

Allowable Stresses – Design Requirements as per IS Code – Design of Simple and Compound Beams- Curtailment of Flange Plates – Beam to Beam Connections – Check for Deflections –Shear – Buckling – Check for Bearing – Laterally Unsupported Beams.

UNIT – V

Design of Beam to Column Connections

Introduction – Design of Beam to Column Connections – Framed, Stiffened, Un-Stiffened and Seated Bracket Connections. Design of Column Bases: Design of Slab Base and Gusseted Bases – Column Bases subjected to Moment.

Text books:

1. S K Duggal "Limit State Design of Steel Structures", Tata McGraw-Hill Companies, Inc. NewYork.
2. S S Bhavikatti "Design of Steel Structures", I K International Publishing House Pvt. Limited, New Delhi.
3. Design of steel structures by M Raghupathi Tata MC Graw –Hill
4. Steel structures by Subramanian N, Oxford Higher Education, New Delhi

Reference Books / Is Codes / Tables:

1. IS 800 – 2007 "Indian Standard Code of Practice for General Construction in Steel", Bureau of Indian Standards, New Delhi.
2. IS 875 – Part – 3 "Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Building and Structures – Wind Loads", Bureau of Indian Standards, NewDelhi.
3. K L V Ramu and Subhash Chander "Steel Tables – SI Units", Jain Brothers, New Delhi.
4. Limit state Design of steel structures by S.K. Duggal Tata MCgraw Hill, New Delhi

B. Tech., VII Semester

Course Title	Water Supply Engineering					B. Tech. VII Semester		
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
2001705	Professional Elective (PEC IV)	3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hr						End Exam Duration: 3 Hrs		

Course Objectives:

- To import knowledge in water quantity and quality parameters and future demand and forecasts on water
- To study the sources, quality, and standards of water
- To understand various water treatments methods
- To understand the water distribution system from source to destination

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Estimate per capita consumption of water for future demands using different methods.
CO 2	Know various sources of water and quality standards of drinking water.
CO 3	Understand the stages involved in drinking water treatment process.
CO 4	Follow advanced water treatment methods adopted by industry and sustainable water management methods.
CO 5	Plan efficient water distribution network to supply as per demand.

UNIT - I

Introduction

Role of Environmental Engineer - Development of public water supply - Need for protected water supply - Objectives of water supply systems - Per Capita Consumption - Water quantity estimation - population forecast - Arithmetic, Incremental, Geometric methods.

UNIT - II

Sources of Water

Sources of water - Surface and ground water sources – Infiltration galleries - Infiltration wells.

Quality of Water

Quality of water - Physical, chemical, and biological aspects - Drinking water quality standards - Water borne diseases.

UNIT - III

Treatment of Water

Flow chart of water treatment plant – Treatment - Sedimentation - Coagulation - Filtration

- Disinfection methods - Softening of Water – Defluoridation.

UNIT - IV

Advanced Water Treatments

Objectives and types of Aeration - Iron and manganese removal - Demineralization - Desalination - Membrane Systems.

Water Management

Sustainable Development - Rainwater harvesting methods - Water Pollution - Causes and effects

UNIT - V

Water Distributions

Distribution systems - Requirements, Layout of Water distribution systems - Design procedures - Hardy Cross methods - Laying of pipelines - waste detection and prevention - Different types of valves Joints, and fire hydrants.

Text Books:

1. S K Garg, "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi.
2. B C Punmia, Ashok Kumar Jain & Arun Kumar Jain "Water Supply Engineering", LakshmiPublications, New Delhi.
3. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers
4. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, AshokJain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi

Reference Books:

1. H S Peavy, D R Rowe and G Tehobanoglous "Environmental Engineering" Tata McGraw-Hill Companies, Inc. New York.
2. S K Hussain "Water Supply and Sanitary Engineering", Oxford & IBH, New Delhi.
3. K.N. Duggal, Elements of Environmental Engineering, 1st Edition, S.Chand Publishers,New Delhi, 2010.
4. G.S. Birdie and J. S. Birdie, Water Supply and Sanitary Engineering, 8th Edition, DhanpatRai and Sons Publishers, New Delhi, 2010.

B. Tech., VII Semester

Course Title	Advanced Concrete Structures					B. Tech. VII Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001706	Professional Elective (PEC-IV)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

To expose students to the design and analysis methodology for designing combined footings, retaining walls, overhead tanks, bridge deck slabs as per standard IS and IRC codal provisions.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Design combined footings as per limit state design method of IS 456-2000 codal provisions
CO 2	Design & detailing of cantilever and counterfort retaining walls as per IS Codal Provisions
CO 3	Design RCC circular ground level and over-head tanks as per IS code
CO 4	Design RCC flat slabs as per IS code
CO 5	Design RCC bridge deck slab as per IRC codal provisions

UNIT – I

Combined Footings

Limit state design & detailing of combined- rectangular and trapezoidal footings as per IS: 456-2000 Codal Provisions.

UNIT – II

Design & detailing of cantilever and counter-fort Retaining wall as per IS Codal Provisions.

UNIT – III

Elastic Design & Detailing for RCC circular and Rectangular ground level and over-head tanks- Design of staging, Design of Intze tanks as per IS Codal Provisions.

UNIT – IV

Design of Flat slab (Interior panel only)

UNIT – V

Elastic design and detailing of RC bridge deck slab using effective width method and Pigeaud's method as per IRC Codal Provisions**.**

Text Books:

1. S. Ramanatham, Design of Reinforced Concrete Structures, Dhanpat Rai &Sons, 2002.
2. D.S. Prakash Rao; Design Principles and Detailing of Concrete Structures, Tata McGraw-Hill Publishing Co. Ltd., 1995.
3. Johnson Victor, D., "Essentials of Bridge Engineering", Oxford & IBH Publishing Co., New Delhi, Fourth Edition, 1991
4. Krishna Raju. N., "Advanced Reinforced Concrete Design", CBS Publishers and distributors, 2007
5. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata McGraw HillPublishers Company Ltd., New Delhi, 2006.

Reference Books:

1. Park & Paulay , "Reinforced Concrete", Robert Publisher,1975.
2. Ashok.K. Jain, Nem Chand & Bors. "Reinforced Concrete", Tata McGraw-Hill PublishingCompany Limited, New. Delhi, 2003.
3. Sinha. N. C. and Roy S. K., "Fundamentals of Reinforced Concrete", S. Chand andcompany Limited, New Delhi, 2003.
4. Bungey, Millard, Grantham, "Testing of Concrete in Structures", Taylor and Francis,United Kingdom.
5. IS 456:2000 Plain and Reinforced Concrete - Code of Practice.

B. Tech., VII Semester

Course Title	Design and Drawing of Irrigation Structures				B. Tech. VII Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2001707	Professional Elective (PEC V)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs			

Course Objectives:

- To study the preliminary and secondary investigations required for hydraulic structures.
- To study the different methods for estimating of peak flow.
- To study in detail design procedures and their site-specific criteria.
- To study the different safety measures required for during operations of irrigation structures.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Gain knowledge and use or apply theory / design principles of surplus weir works.
CO 2	Understand the importance and easily recognize the structure in broadest context of canal drop works.
CO 3	Apply engineering fundamentals to study stability and design aspects of tower head.
CO 4	Identify components of canal regulator and design aspects of Vent way.
CO 5	Design canal drop structures based for different filed conditions.

UNIT-I

Design of surplus Weir

Introduction – Estimation of Flood Discharge – Selection of type of Work – Length of Surplus Weir – Crest Width Base Width – Abutments – Wings Returns – Aprons.

UNIT – II

Canal Drop (Notch Type)

Trapezoidal Notch Length of Drop Wall Between Abutments – Profile of Drop Wall – Notch Pier – Protective Works.

UNIT – III

Tank Sluice with Tower Head

Vent Way Design – Sluice Barrel Tower Head – R.C Slab – Earth Pressure – Stability Analysis – Tower Head Design – Cistern.

UNIT – IV

Canal Regulator

Vent Way Design – Drowning Ratio Method – Roadway – Piers Shutters, Abutments – Wing Walls – Return Walls –Solid Apron for Regulator.

UNIT – V

Glacis Type of Canal Drop

Design of throat – Fluming Ratio – Crest Level – Length of weir crest – U/S & D/S side Glacis – Baffle platform – Canal approach – Protective works.

Text Books:

1. C Satyanarayana Murty "Water Resources Engineering – Principles and Practice", New Age International (P) Limited, Publishers, New Delhi.
2. Irrigation engineering and Hydraulic structures by S.K.Garg, Standard Book House.

Reference Books:

1. Santosh Kumar Garg "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi.
2. N Balasubramanya "Hydraulic Structures and Irrigation Design Drawing", Sapna Book House and Publishers, Bangalore

B. Tech., VII Semester

Course Title	Construction Practice and Management					B. Tech. VII Semester		
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
2001708	Professional Elective (PEC-V)	3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To equip students with the understanding of the importance of construction management, resource management and various stages of construction project
- To give students, the understanding of various concepts involved in construction planning and the ability to schedule the construction activities using various scheduling techniques
- To understand various types of equipment in construction and the effect of mechanization on productivity
- Understand importance and procedure of inspection, Quality control and ethical audit.
- To know the importance of safety measures in construction activity and principles of organization for effective communication

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the importance of construction management, resource management along with various stages of construction project
CO 2	Schedule construction activities using various scheduling techniques
CO 3	Understand various types of equipment in construction and the effect of mechanization on productivity.
CO 4	Inspect the construction activities and perform quality control of various construction activities.
CO 5	Know the importance of safety measures in construction activity and principles of organization for effective communication

UNIT – I

Introduction

Significance of Construction Management – Objectives and Functions of Construction Management – Types of Construction – Resources for Construction Industry – Stages of Construction – Construction Team and Engineering Drawings.

UNIT – II

Construction Planning

Work-breakdown structure, methodology of WBS, planning techniques—terminologies used, event and activity, dummy activity, network, precedence, network logic, duration of an activity, forward and backward pass, float or slack time. Path and critical path, bar charts, reparation of network diagram, Programme Evaluation and Review Technique (PERT), Critical Path Method

(CPM), the Line-Of-Balance (LOB), network techniques advantages, disadvantages.

UNIT – III

Construction Equipment and Management

Equipment Requirements in Construction Industry, Heavy Earth Moving Equipment – Bulldozers, Scrapers, Loaders Shovels and Cranes Compaction Equipment, Grading Equipment, Aggregate Production Equipment, Asphalt Mixing Plant and Asphalt Laying Plant, Hauling Equipment, Concrete Mixing Equipment, Material Handling Devices, Pneumatic Equipment, Bridge Construction Equipment, Drilling and Blasting Equipment, Pumping and Dewatering Equipment.

UNIT – IV

Inspection and Quality Control, Ethical Audit

Need for Inspection and Quality Control, Principles of Inspection – Enforcement of Specifications – Stages of Inspection an Quality Control. Introduction – Aspects of Project Realization – Ethical Audit Procedures – The Decision Makers – Variety of Interest – Formulation of Briefs – The Audit Statement and Reviews.

UNIT – V

Safety and Risk, Organization of Construction

Introduction on Safety and Risk – Concept and Importance of Safety – Types of Risks – Safety and Engineers – Safety Measures in Construction Work – Design for Safety – Risk Benefit Analysis – Accidents. Principles of Organization – Communication – Leadership and Human Relations – Types of Organizations Organization for Construction – Temporary Services and Job Layout.

Text Books:

1. P S Gahlot and B M Dhir "Engineering Construction Planning and Management", New Age International (P) Limited, Publishers, New Delhi.
2. S C Sharma "Construction Equipment and Its Management", Khanna Publishers, New Delhi.
3. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Building Construction, 10th Edition, Laxmi Publications (P) Ltd., New Delhi, 2010
4. KN Jha, Construction Project Management,1stEdition, Pearson Publications, New Delhi, 2011

Reference Books:

1. M Govindarajan, S Natarajan and V S Senthilkumar "Engineering Ethics", Prentice-Hall of India (P) Limited, New Delhi.
2. Dr. S Seetharaman "Construction Engineering and Management", Umesh Publications, New Delhi.
3. Horpal Singh "Construction Management and Accounts", Tata McGraw-Hill Companies, Inc. New York.
4. P.K. Joy, Total Project Management: The Indian Context, 1st Edition, Mac Millan Publishers India Limited, 199

B. Tech., VII Semester

Course Title	Urban Transportation Planning					B. Tech. VII Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2001709	Professional Elective (PEC V)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To study the need of urban transportation planning system.
- To understand different types of transportation surveys.
- To study the process of trip generation and distribution.
- To understand model split and factors affecting it.
- To study the transportation plan preparation for different transit systems

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Justify the need for urban transportation planning.
CO 2	Undertake different traffic surveys required for design of transport system.
CO 3	Plan the process of trip generation and distribution.
CO 4	Understand and evaluate current scenarios of land use.
CO 5	Prepare the transportation plans for urban mass rapid transit systems.

UNIT – I

Introduction to Urban Transportation System Planning

Role of transportation in urban development – Transportation problems in urban areas - Purpose of transportation planning - Transportation planning process and factors affecting it - Travel demand and factors affecting it - Urban transport forecasting

UNIT – II

Transportation Surveys

Study area and zoning - Survey Types: Home interview surveys - Commercial vehicle surveys - Taxi surveys - Road side interview surveys - Post card questionnaire surveys - Registration number surveys - Tag surveys - Public transport surveys - Telephone surveys - Inventory of existing transport facilities.

UNIT – III

Trip Generation and Distribution

Trip generation: Trip purpose, Problems of trip generation -Factors governing trip generation and attraction rates - Trip distribution, Methods of trip distribution: Uniform factor - Average factor – Detroit – Fratar - Furness and Time factor method - Problems based on trip distribution-Modal Split-Modal split in the transport planning process-Problems-Factors affecting modal split.

UNIT – IV

Land-Use-Transport Models

Introduction-Selection of Land -Use-Transport Models-Lowry Derivative Models-Garin-Lowry Model-Applications in India

UNIT – V

Transportation Plan Preparation

Definitions: corridor, corridor traffic forecasting, corridor traffic study, count, segment, point, segment capacity, screen line - Corridor identification - Mass transit system - Urban mass rapid transit system - Rail based transit – Metro, Light rail transit system (LRT), Monorail, Sky rail - Road based transit – Bus rapid transit system (BRTS), Electric trolley bus, commuter Bus / City Bus.

Text Books:

1. Kadiyali. L. R. "Traffic Engineering and Transportation Planning", Khanna Publishers, New Delhi.
2. Hutchinson, B. G "Introduction to Urban System Planning", McGraw Hill.
3. Papa Costas C.S.; Fundamentals of Transportation Engineering, Prentice Hall, India

Reference Books:

1. John W. Dickey, Metropolitan Transportation Planning, Tata McGraw Hill Pub. Co
2. Vukan R. Vuchic, Urban Public Transportation System & Technology, Prentice Hall, Inc.
3. Jotin Khisty, C. and Kent Lall, B., Transportation Engineering – An Introduction, Prentice- Hall
4. Salter, R J., Highway Traffic Analysis and Design, ELBS.

B. Tech., VII Semester

Course Title	Repair & Rehabilitation of Structures				B. Tech. VII Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
20OE107	Open Elective (OEC III)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs					End Exam Duration: 3 Hrs		

Course Objectives:

- To impart knowledge on the distress in structures.
- To Understand the basic concepts of deterioration of structures.
- To Understand the serviceability and durability aspect of structures.
- Learning the materials used for retrofitting technique.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the cause of deterioration of concrete structures.
CO 2	Able to assess the damage for different type of structures.
CO 3	Summarize the principles of repair and rehabilitation of structures.
CO 4	Recognize ideal material for different repair and retrofitting technique.
CO 5	Know the artificial polymers and rust eliminators used for retrofitting works.

UNIT – I

Introduction

Definition for Repair, Retrofitting, Strengthening and rehabilitation.Physical and Chemical Causes of deterioration of concrete structures.

UNIT – II

Damage Assessment

Purpose of assessment, Rapid assessment, Investigation of damage, Chemical and Physical damages, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non- destructive, and semi destructive testing systems.

UNIT – III

Influence of Various Elements on Serviceability and Durability

Effects due to climate, temperature, moisture, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking.

UNIT – IV

Materials for Repair and Retrofitting

Artificial fiber reinforced polymer like CFRP, GFRP,AFRP and natural fiber like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes andmortars, concrete chemicals, special elements for accelerated strength gain,

UNIT – V

Maintenance and Retrofitting Techniques

Importance of Maintenance. Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, externally bonding (ERB) technique,

Text Books:

1. Sidney, M. Johnson, "Deterioration, Maintenance and Repair of Structures"
2. Denison Campbell, Allen & Harold Roper, "Concrete Structures – Materials, Maintenanceand Repair"- Longman Scientific and Technical.
3. Repair and protection of concrete structures by Noel P.Mailvaganam, CRC Press,1991
4. Concrete repair and maintenance Illustrated by Peter.H.Emmons, Galgotia publicationsPvt. Ltd., 2001.

Reference Books:

1. R. T. Allen and S.C. Edwards, "Repair of Concrete Structures"-Blakie and Sons Raiker R.N., "Learning for failure from Deficiencies in Design, Construction and Service"-R&DCenter (SDCPL).
2. M. S. Shetty, Concrete Technology – Theory and Practice, S. Chand & Co. Ltd., NewDelhi.
3. Failures and repair of concrete structures by S.Champion, John Wiley and Sons, 1961
4. Handbook on seismic retrofit of buildings, A. Chakrabarti et.al., Narosa Publishing House,2010.

B. Tech., VII Semester

Course Title	Geo-Environmental Engineering					B. Tech. VII Semester		
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
20OE108	Open Elective (OEC III)	3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To make the students to learn the concepts of geo-environmental engineering, planning and design of waste in landfills, ash ponds and tailing ponds.
- To make the students to understand the effects of pollutants on soil properties
- To give awareness about the adverse effects of soil and ground water contaminants
- To analyze and apply various techniques for remediation of the contaminants
- To make the student to understand the reuse of waste materials in geotechnical constructions.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the different types of contaminants and their effects on subsurface soils
CO 2	Understand the waste contaminants and design the landfill
CO 3	Understand the environmental impacts due to the contaminants of slurry waste
CO 4	Adopt the type of barriers to protect the earth from different contaminants
CO 5	Understand the engineering properties of the waste material and reuse in the construction

UNIT – I

Introduction

Industrialization and Urbanization, Pollution, Control, and remediation.

Contamination

Surface contamination, Contamination transport, Soil-a Geotechnical trap, Effect of subsurface contamination, Detection of polluted zone

UNIT – II

Contaminants of Solid Waste in Landfills

Waste contaminants, landfills, types, shape, and size of landfills. Liner and liner system, Cover and cover system, Stability of landfills.

UNIT – III

Contaminants of Slurry Wastes

Slurry transported wastes, slurry ponds, operation, Embankment construction and raising, Environmental Impact, and control.

UNIT – IV

Vertical Barriers for Contaminant

Contaminated sites, Types of barriers, Soil-Bentonite slurry trench walls, Cement-Bentonite slurry trench walls and construction material

UNIT – V

Geotechnical Reuse of Waste Materials

Waste reduction, use in geotechnical construction, waste characteristics, transportation consideration, Waste material in Embankment and Fills.

Text Books:

1. Lakshmi N. Reddi and Hilary I. Inyang, "Geoenvironmental Engineering: Principles and Applications", CRC Press, United States.
2. Hari D. Sharma and Krishna R. Reddy, "Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies", John Wiley and Sons, Inc., United States.
3. G.S. Birdie and J. S. Birdie, Water Supply and Sanitary Engineering, 8th Edition, Dhanpat Rai and Sons Publishers, New Delhi, 2010
4. H.S. Peavy and D.R.Rowe, Environmental Engineering, 1st Edition, McGrawHill Publishing Company, New York, 1984.

Reference Books:

1. David E. Daniel, "Geotechnical Practice for Waste Disposal", Chapman & Hall, Springer Publishers, Germany.
2. Rowe R. Kerry, "Geotechnical and Geoenvironmental Engineering Handbook", Springer Publishers, Germany.
3. Proceedings of the International symposium of Environmental Geotechnology (Vol. I and II), Environmental Publishing Company, 1986 and 1989.
4. ASTM Special Technical Publication 874, Hydraulic Barrier in Soil and Rock, 1985.

B. Tech., VII Semester

Course Title	Environmental Impact Assessment					B. Tech. VII Semester		
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
20OE109	Open Elective (OEC III)	3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- Deals with the various impacts of infrastructure projects on the components of environment and method of assessing the impact and mitigating the same.
- The student is able to know about the various impacts of development projects on environment and the mitigating measures.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Perform a critical quality review of an EIA and EIS.
CO 2	Structure the EIA working process considering the need for interdisciplinary.
CO 3	Perform the screening and scoping of an EIA, based on existing Requirements, evaluate the impacts and draw meaningful conclusions from the results of the EIA.
CO 4	Clarify the concept of EIA and its application in an international context to those involved in or affected by the EIA process.
CO 5	Interpretation an EIA, present its conclusions and translate its conclusions into actions.

UNIT – I

Basic Concepts of EIA

Introduction -Initial Environmental Examination – Elements of EIA – Factors Affecting E-I-A – Impact Evaluation and Analysis – Preparation of Environmental Base Map – Classification of Environmental Parameters.

UNIT – II

EIA Methodologies

Introduction – Criteria for the Selection of EIA Methodology – E I A Methods – Ad-Hoc Methods – Matrix Methods – Network Method – Environmental Media Quality Index Method – Overlay Methods and Cost/Benefit Analysis.

UNIT – III

Environmental Management Plan

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

UNIT – IV

Assessment of Impact on Vegetation and Wildlife

Introduction – Assessment of Impact of Development Activities on Vegetation and Wildlife.

Environmental Audit

Introduction - Environmental Audit & Environmental Legislation – Objectives of Environmental Audit – Types of Environmental Audit – Audit Protocol – Stages of Environmental Audit – Evaluation of Audit Data and Preparation of Audit Report.

UNIT – V

Environmental Acts (Protection and Prevention)

Post Audit Activities-The Air, water, Wild Life and Environmental Protection (Prevention Control Acts).

Case Studies

Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Highway project, Sewage treatment plant,

Text Books:

1. Y Anjaneyulu and Valli Manickam "Environmental Impact Assessment Methodologies", B S Publications, Sultan Bazar, Hyderabad.
2. J Glynn Henry and Gary W Heinke "Environmental Science and Engineering", Prentice-Hall of India (P) Limited, New Delhi.

Reference Books:

1. Dr. Suresh K Dhameja "Environmental Science and Engineering", S K Kataria & Sons Publishers, New Delhi.
2. H S Bhatia "Textbook on Environmental Pollution and Control", Galgotia Publications Pvt. Limited, New Delhi.
3. Rau and Wooten "Environmental Impact Analysis Handbook", Tata McGraw-Hill Companies, Inc. New York.

B. Tech., VII Semester

Course Title	Industrial Safety Engineering					B. Tech. VII Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20OE110	Open Elective (OEC-IV)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- The course is intended to give knowledge of various safety management principles, various safety systems, various machine guarding devices, hazard identification techniques, energy sources, systems & applications and the need in the present context. Learners will be able to compare different hazard identification tools and choose the most appropriate based on the nature of industry

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe the theories of accident causation and preventive measures of industrial accidents
CO 2	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping
CO 3	Explain different safety issues in construction industries.
CO 4	Describe various hazards associated with different machines and mechanical material handling.
CO 5	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.

UNIT – I

Safety Introduction

Need for safety. Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. Theories of accident causation. Safety organization- objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee-need, types, advantages.

UNIT – II

Personal Protection in Work Environment

Personal protection in the work environment, Types of PPEs, Personal protective equipment respiratory and non-respiratory equipment. Standards related to PPEs. Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate. Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. Work permit system- objectives, hot work and cold work permits. Typical industrial models and methodology. Entry into confined spaces.

UNIT – III

Safety Issues in Construction

Introduction to construction industry and safety issues in construction Safety in various construction operations – Excavation and filling – Under-water works – Under-pinning & Shoring – Ladders & Scaffolds – Tunneling – Blasting – Demolition – Confined space – Temporary Structures. Familiarization with relevant Indian Standards and the National Building Code provisions on construction safety. Relevance of ergonomics in construction safety. Ergonomics Hazards - Musculoskeletal Disorders and Cumulative Trauma Disorders.

UNIT – IV

Safety Hazards in Machines

Machinery safeguard-Point-of-Operation, Principle of machine guarding -types of guards and devices. Safety in turning, and grinding. Welding and Cutting-Safety Precautions of Gas welding and Arc Welding. Material Handling-Classification-safety consideration- manual and mechanical handling. Handling assessments and techniques- lifting, carrying, pulling, pushing, palletizing and stocking. Material Handling equipment-operation & maintenance. Maintenance of common elements-wire rope, chains slings, hooks, clamps. Hearing Conservation Program in Production industries.

UNIT – V

Hazard and Risk

Types of hazards –Classification of Fire, Types of Fire extinguishers, fire explosion and toxic gas release, Structure of hazard identification and risk assessment.

Text Books:

1. R.K Jain (2000) Industrial Safety, Health and Environment management systems, Khanna Publications.
2. Paul S V (2000), Safety management System and Documentation training Programme handbook, CBS Publication.
3. Krishnan, N.V. (1997). Safety management in Industry. Jaico Publishing House, New Delhi.
4. John V. Grimaldi and Rollin H.Simonds. (1989) Safety management. All IndiaTraveller Book Seller, Delhi

Reference Books:

1. Ronald P. Blake. (1973). Industrial safety. Prentice Hall, NewDelhi.
2. Alan Waring. (1996). Safety management system. Chapman & Hall, England.
3. Vaid, K.N., (1988). Construction safety management. National Institute of Construction Management and Research, Mumbai.
4. AIChE/CCPS. (1992). Guidelines for Hazard Evaluation Procedures. (second edition). Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York.

B. Tech., VII Semester

Course Title	Surveying					B. Tech. VII Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20OE111	Open Elective (OEC IV)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3		0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- Be familiar with Chain and Compass in measuring the horizontal and vertical distances, calculating simple areas, and correcting different errors.
- Identify the level instruments; record the levels in field book and determine thereduced levels of objects by different methods.
- Determine the areas and volumes on the field by different rules and methods.
- Using totalstation instrument for measuring the distances, angles, and areas.
- Understand the concepts of photogrammetry and remote sensing which can be used in higher surveying.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Compute linear and areal measurements by using chain and compass.
CO 2	Gain the knowledge on levelling and contouring techniques and its applications.
CO 3	Apply the modern surveying techniques for various field problems
CO 4	Know the uses of total station instrument for different field applications
CO 5	Know the concepts of Phostogrammetry and Remote sensing

UNIT-I

Introduction to Surveying

Definition; Classification; Principles of surveying; Errors in surveying: Types of errors; Ranging, Principles of chain surveying; Basic definitions.

Compass Surveying

Prismatic compass, Surveyor's compass, Whole Circle and Quadrant Bearing, Included angles, and errors.

UNIT – II

Levelling

Different methods of levelling, Different types of level instruments, Levelling staff, Level field book, Reciprocal Levelling, Evaluation of Reduced Levels byRise and Fall Method, and Height of Instrument Method

Areas

Introduction; Simpson's rule; Boundaries with offsets at irregular intervals; coordinate method; level section; two level section; trapezoidal and prismoid rule

UNIT – III

Modern Field Survey Systems

Principle of Electronic Distance measurement; types of EDM instruments, total station, parts, accessories – advantages and applications, field procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments.

UNIT – IV

PHOTOGRAMMETRIC SURVEYING: Introduction, Basic concepts, perspective geometry of aerial photograph, relief, and tilt displacements, and terrestrial photogrammetric

UNIT – V

REMOTE SENSING: Definition, Energy Principles, radiation principles, principles, and Use of EMR spectrum, Energy interactions in atmosphere- Scattering, Absorption, Energy interactions with h surface features and concepts of spectral reflectance curve.

Text Books:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Surveying – Vol. I, II and III, Laxmi Publications (P) Ltd., 17th Edition, 2016.
2. R. Subramanian, Surveying and Levelling, Oxford University Press, 2nd Edition, 2012.
3. Chandra, A.M, Plane Surveying, 2nd Edition, New Age International Publishers, NewDelhi, 2010.
4. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi.

Reference Books:

1. S. K. Duggal, Surveying – Vol. I and II, Tata McGraw–Hill Publishing Co. Ltd., 4th Edition,2013.
2. Arthur R. Benton and Philip J. Taetz, Elements of Plane Surveying, McGraw-Hill, 3rdEdition,2010.
3. Arora, K. R., Surveying – Vol. I and II, Standard Book House, 14th Edition, 2011.
4. T. P. Kanetkar and S. V. Kulkarrni, Surveying and Levelling, Pune Vidyarthi GrihaPrakashan, Pune, 24th Edition, 2013.

B. Tech., VII Semester

Course Title	Traffic Engineering					B. Tech. VII Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20OE112	Open Elective (OEC IV)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- The objective of this course is to impart knowledge about various components and characteristics of traffic to understand concepts like Highway capacity and level of service concepts. To know various traffic control devices and principles of highway safety.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Conduct different engineering surveys required for highway planning and design
CO 2	Analyze the traffic flow patterns and delay patterns
CO 3	Understand the role and importance of various traffic control devices
CO 4	Know the impact of traffic on environmental pollution and standard pollution limits
CO 5	Understand the concepts of level of service of highways along with various highway systems required for traffic surveillance

UNIT – I

Components of the Traffic System

Human-Vehicle–Environment System; characteristics of Road users, Vehicles, Highways and their classification; Traffic Studies: Inventories; Volume studies; Speed, Accident studies.

UNIT – II

Traffic Characteristics

Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial and model flow patterns; Interrupted and Un interrupted traffic. Travel time and delay studies, Car-following theories.

UNIT – III

Traffic Control Devices & Highway Safety

Traffic signs & Markings; Signal Warrants; Signal phasing and Development of phase plans; Fixed and Vehicle activated signals; Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit.

UNIT – IV

Environmental Considerations

Air pollution: Kinds of pollutants; Air pollution standards; Measures of air quality; modelling and control. Noise pollution: Measurement of sound levels; Acceptable limits, Prediction of noise levels, Traffic noise control.

UNIT – V

Highway Capacity and Level of Service

Capacity and level of service; Factors affecting Capacity and LOS; Capacity of Rural Highways, Capacity of Urban Roads;

Highway Systems: Traffic surveillance and monitoring; Intelligent vehicle highway system. IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS.

Text Books:

1. L R Kadiyali "Principles and Practice of Highway Engineering", Khanna Publishers, NewDelhi.
2. S K Khanna, C E G Justo and A Veeraragavan "Highway Engineering", Nemchand Publications, New Delhi.
3. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, ThirdEdition, Third Impression; Pearson Education, 2018.
4. Highway Engineering, Paul H. Wright and Karen K Dixon, Wiley Student Edition, WileyIndia (P) Ltd., New Delhi

Reference Books:

1. G V Rao "Principles of Transportation and Highway Engineering", Tata McGraw-HillCompanies, Inc. NewYork.
2. Partha Chakroborthy, Animesh Das, "Principles of Transportation Engineering", PrenticeHall of India, New Delhi.
3. S P Bindra "Highway Engineering", Dhanpath Rai & Sons, New Delhi.
4. Traffic & Highway Engineering by Nicholas J. Garber, Lester A. Hoel, Fifth Edition, published in 2015, CENGAGE Learning, New Delhi.

B. Tech., VII Semester

Course Title	Practices in Geo-Technical Engineering					B. Tech. VII Semester		
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
20015S5	Skill Oriented Course (SOC V)	1	0	2	2	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

- To introduce traditional program consisting mostly of practical courses related to geotechnical engineering.
- To apply the knowledge of science, mathematics and engineering with the context of applications in geotechnical engineering.
- To design and conduct experiments, analyze and interpret data related to the various laboratory tests studied in geotechnical engineering.
- To classify the soils based on the field identification (coarse and fine)
- To estimate the bearing capacity and design the various types of foundations

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Do various soil identification and classification tests
CO 2	Select suitable boring methods to collect the soils
CO 3	Use the modern equipment to find the shear and settlement properties of the soils
CO 4	Select the testing facilitates to cater the requirement of selection of proper soil type as per the requirement
CO 5	Use the techniques, skills, and modern tools necessary for engineering practice.

UNIT – I

Field Identification of Soils

Identifying soils for various types of constructions, Preparation of Report

UNIT – II

Soil Sample Collection Methods

Types of samples and samplers - Types of Augers, Boring methods

UNIT – III

Advanced Testing Methods

Field CBR Method, Triaxial Shear Test (Digitized), Consolidation Test (Digitized)

UNIT – IV

Penetration Methods

Standard Penetration Test, Cone Penetration Test

UNIT – V

Designs of SBC and types of foundations using software tools

Bearing capacity by Terzaghi, Mayerhoff, Vesic methods – Design of footings for multistory structure, silos, transmission tower, and machines.

Text Books:

1. S Mittal and J P Shukla "Soil Testing for Engineers", Khanna Publishers, New Delhi.
2. T G Sitharam and T N Ramamurthy "Geotechnical Engineering", S Chand Publishing, New Delhi
3. Analysis and Design of Foundation - J. E. Bowles
4. Engineering Properties of Soil and Their Measurements- Bowles J.E. (1988), - McGraw Hill Book Co. New York

Reference Books:

1. Foundation Engineering - M.J. Tomlinson
2. Analysis and Design of Substructures - Swami Saran
3. Foundation Design – Coduto
4. SP 36 Compendium of Soil Mechanics (Part – 1 & 2)
5. IS: 2911 (All Parts)

Software:

1. ABC
2. Plaxis
3. Apile
4. GeoStudio
5. Staad Foundation
6. MS Office (Excel)

B. Tech., VII Semester

<table>
<tr><td>Course Title</td><td colspan="5">Industrial/Research Internship</td><td colspan="3">B. Tech. VII Semester</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2001710</td><td rowspan="2">PR</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>6</td><td>6</td><td>100</td><td>---</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: ----</td><td colspan="3">End Exam Duration: ----</td></tr>
<tr><td colspan="9">Course Objectives:
To apply the concepts and theories learned in classroom to real world civil engineering problems.
To develop proficiency in using industry specific software, tools and equipment used in civil engineering projects.
To enhance ability to work effectively in multidisciplinary team environment and industry professionals.
To develop critical thinking and problem solving skills by tackling real life engineering challenges and proposing viable solutions.
To inculcate the report writing and effective communication skills of the work done.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand how engineering principles and concepts are implemented in practical problems.</td></tr>
<tr><td>CO 2</td><td colspan="8">Gain hands on experience and exposer to real world civil engineering projects enabling to apply theoretical knowledge to practical situations.</td></tr>
<tr><td>CO 3</td><td colspan="8">Contribute to the planning, design, construction or maintains of civil engineering projects.</td></tr>
<tr><td>CO 4</td><td colspan="8">Apply analytical and critical thinking skills to identify and solve engineering challenges encountered during internship.</td></tr>
<tr><td>CO 5</td><td colspan="8">Prepare professional documentation for the work carried out</td></tr>
</table>

A student may complete the training before the beginning of 7th semester and the evaluation and credits will be awarded in 7th semester through internal assessment process only. The duration of the internship or practical training will be for a minimum of 4 weeks. Internship must be undertaken in physical mode/online mode in industry/R&D organisations/Premier educational institutes. Internship must focus on Civil Engineering domain/allied areas. The award of credits for internship will be based the performance in Viva-Voce and report submitted.

VIII Semester

Syllabus

B. Tech., VIII Semester

<table>
<tr><td>Course Title</td><td colspan="5">Project Work/Internship</td><td colspan="3">B. Tech. VIII Semester</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2001801</td><td rowspan="2">PROJ</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>30</td><td>12</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: ----</td><td colspan="3">End Exam Duration: ----</td></tr>
<tr><td colspan="9">Course Objectives:
To apply the theoretical knowledge and practical skills they have acquired throughout their coursework to a real-world project.
To identify and define a problem or research question, analyze it critically, and propose effective solutions or outcomes.
To develop their research skills, including literature review, data collection methods, data analysis, and interpretation
To plan, organize, and manage their project activities effectively
To communicate their project findings, methodologies, and outcomes effectively</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Use engineering knowledge to choose an appropriate topic for study</td></tr>
<tr><td>CO 2</td><td colspan="8">Identify the needs and requirements of a specific civil engineering task</td></tr>
<tr><td>CO 3</td><td colspan="8">Plan and design the task at hand with the help of appropriate conventional and modern methods/tools</td></tr>
<tr><td>CO 4</td><td colspan="8">Build professional competence and confidence in students to take up civil engineering assignments</td></tr>
<tr><td>CO 5</td><td colspan="8">Prepare professional documentation for the work carried out</td></tr>
</table>

The project work can be a design project/experimental project/field surveying/computer oriented on any of the topics of civil engineering/allied domain. The internal assessment will be done through three progress seminars during eight semester reviewed by internal committee members. A consolidated six to ten pages of typed report based on the progress work done have to be submitted by the batch of students to the assessing committee during each review process. The external assessment of the project will be done at the end of the semester by a committee consisting of both internal and external faculty members specialized in various fields of Civil Engineering. The students will present their project work before the committee. Each group will submit the copies of the completed project report signed by the guide to the department. The head of the department will certify the copies and return the reports to the students. Students have to submit the three hard copies, one copy to the respective guide, one copy to the departmental library and another copy to the college library.