AR20

ACADEMICREGULATIONS,

PROGRAM STRUCTURE

AND

DETAILED SYLLABUS

CIVIL ENGINEERING

For

CHOICE BASED CREDIT SYSTEM (CBCS) BASED

B.TECH FOUR YEAR DEGREE PROGRAM

(Applicable for the batches admitted from AY 2020-21)

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Cheeryal (V), Keesara (M), Medchal Dist., Telangana State, Pin Code: 501 301

(Affiliated to JNTU, Hyderabad/ AICTE Approved / UGC Autonomous/ NAAC 'A' Grade)

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)
(**Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NAAC with 'A')**
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*** Activity oriented non laboratory courses**

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ACADEMIC REGULATIONS 2020

For CBCS Based B.Tech PROGRAMMES

(Effective for the students admitted into FIRST year from theAcademic Year **2020-2021**

1. Under-Graduate Degree Programme (B.Tech) in Engineering

Geethanjali College of Engineering and Technology (GCET) offers **four (**4) Year(**eight** (8) Semesters) **Bachelor of Technology** (B.Tech) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2020-2021, in the following Branches of Engineering

S. No.	***Branch***
1.	Civil Engineering
2.	Computer Science and Engineering
3.	Computer Science and Engineering (Artificial Intelligence and Machine Learning)
4.	Computer Science and Engineering (Cyber Security)
5.	Computer Science and Engineering (Data Science)
6.	Computer Science and Engineering (Internet of Things)
7.	Electrical and Electronics Engineering
8.	Electronics and Communication Engineering
9.	Information Technology
10.	Mechanical Engineering

2. Eligibility for Admission

2.1 Admission to the B.Tech Programme shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (EAMCET), or the JNTUH, or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government of Telangana from time to time.

2.2 The medium of instruction for all the B.Tech programmes shall be ENGLISH only.

3. B.Tech Programme Structure

3.1 A student after securing admission shall complete the B.Tech programme in a minimum period of **four (4)** academic years (**eight** (8) semesters), and a maximum period of **eight (8)** academic years (**sixteen**(16) semesters) starting from the date of commencement of first year first semester, failing which the student shall forfeit his seat in B.Tech program. The student shall secure 160 credits (with CGPA $\geq$ 5) required for the completion of the undergraduate programme and award of the B.Tech degree.

3.2 UGC/AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.2.1 **Semester Scheme:**

Each B.Tech program is of **four** (4) academic years (**eight** (8)semesters**)**, with each academic year being divided into two semesters of **20 weeks (minimum of 90 working days)** each. Each semester has - '**Continuous Internal Evaluation (CIE)**' and '**Semester End Examination (SEE)**'. **Choice Based Credit System (CBCS)** as denoted by UGC and curriculum / programme structure as suggested by AICTE are followed.

3.2.2 **Credit Courses:**

All courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each course in a L: T: P/D: C (Lecture periods: Tutorial periods: Practicals / Drawing periods: Credits) Structure, based on the following general pattern...

- One credit - for one hour/ week/ semester for Theory/ Lecture (L)/Tutorial(T) courses;
- One-half (½) of a credit – for one hour/ week/ semester for Laboratory/Practical (P) or Drawing (D)courses.
- No Credits for mandatory courses.

3.2.3**Course Classification:**

The College follows almost all the guidelines issued by AICTE/ UGC. All subjects/ courses offered for the B.Tech. Degreeprogrammes are broadly classified as follows.

S. No	Broad Course Classification	CourseGroup/Category	CourseDescription
1	Foundation Courses(FnC)	BSC-Basic Science Courses	Includes Mathematics, Physics and Chemistry courses
2		ESC-Engineering Science Courses	Includes Fundamental Engineering Courses
3		HSMC-Humanitiesand Social sciences including Management Courses	Includes courses related to Humanities, Social Sciences andManagement
4	Core Courses (CoC)	PCC-Professional Core Courses	Includes core courses related to parent discipline/department/ branch of Engineering
5	Elective Courses (EℓC)	PEC-Professional Elective Courses	Includes elective coursesrelated to parent discipline / related department / branch of Engineering
6		OEC-Open Elective Courses	Elective Courses which include interdisciplinary courses or courses in an area outside the parent discipline/department /branch of engineering
7	Core Courses	PROJ - Project Work	Project/ Internship/Mini- Project/Design Thinking/ Project Seminar/TechnicalSeminar
8	Mandatory Courses (MC)		Mandatory courses (Non Credit)

4. Course Registration

4.1 A 'Faculty Advisor or Counselor' shall be assigned to a group of 20 students, who shall advise the students about the B.Tech programme, its structure along with curriculum, choice/option for course(s), based on their competence, progress, pre-requisites and interest.

4.2 The Academic Departments of the college invite 'Registration Forms' from students before the beginning of the semester. Registration requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

4.3 A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum extra/ additional course(s) limited to 4 credits, based on progress and SGPA/ CGPA, and completion of the 'pre- requisites' as indicated for various subjects/ courses, in the department course structure and syllabus content.

4.4 If anytheory course(s) has an associated laboratory / practical course, while registering for such course(s), the student shall register for laboratory / practical course(s)along with the corresponding theory course(s) in the same semester**.**

4.5 Student's choice for 'extra/additional course(s)'must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/ Counselor**.**

4.6 A student can apply for registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL'from hisfaculty advisor, which should be submitted to the College Academic Committee through Head of the Department concerned (a copy of the same being retained with Head of the Department, Faculty Advisor and the student).

4.7 If the student submits ambiguous choices or multiple options or erroneous entries - during registration for thecourse(s) under a given/ specified course(s) Group/ Category, as listed in the programme structure, Faculty Advisor will rectify such errors and advise the student accordingly.

4.8 Course(s) options exercised by the student and approved by Faculty Advisor are final and CANNOT be changed, or inter-changed.Further, alternate choices shall also not be considered. However, if thecourse(s) that has (have)already been listed for registration (by the department) in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice: either for new course(s) (subject to offering of such course(s)), or for another existing course(s) offered, which may be considered. Such alternate arrangements shall be made by the department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of class-work for that semester.

4.9 Dropping of course(s) may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.

4.10 Open electives: The student has to choose open electives from the list of open electives given. However, the student cannot opt for an open elective course(s) offered by his own (parent) department.

4.11 Professional electives: The student has to choose the required professional electives from the list given.

5. Courses to be offered

5.1 A typical section (or class) strength for each semester shall be 60.

5.2 A Course may be offered to the students, ONLY IF a Minimum of 20 students (1/3 of the Section Strength) opt for the same.The maximum strength of a section is limited to 80(60 + 1/3 of the section strength).

5.3 More than one Instructor may offer the same course(s) (laboratory / practical may be included with the corresponding theory course(s) in the same semester) in any semester. However, selection of choice for students shall be based on - 'first come first serve basis and CGPA criterion'.(i.e. the first focus shall be on early on-line registrationfrom the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student)

5.4 If more entries for registration of a course come into picture then the Head of the Department concerned shall decide whether or not to offer such a course for two or more sections.

5.5 In case of options coming from students of other departments /branches / disciplines (not considering OPEN ELECTIVES), PRIORITY shall be given to the student of the 'Parent Department'.

6 Attendance Requirements

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% attendance in aggregate of all the courses (including attendance in mandatory course like Environmental Science, Indian Constitution, Induction Program, Sports/NCC/NSS etc.,) for that semester

6.1.1 Shortage of attendance in aggregate up to 10% in each semester may be condoned by the college academic committee on genuine medical grounds, based on the student's representation with supporting evidence.

6.2 A stipulated fee shall be payable towards condoning of shortage of attendance.

6.3 Shortage of attendance below 65% in aggregate shall in "**NO"** case be condoned.

6.4 Students, whose shortage of attendance is not condoned in any semester, are not eligible to take their Semester End Examinations. They get detained and their registration for that semester shall stand cancelled. They shall not be promoted to the next semester. They may seek re-registration for all those course(s) registered in the semester in which they were detained, by seeking re-admission into that semester as and when offered. In the case of elective course(s), namely, professional elective(s) and / or open elective(s), the same may also be re-registered, if offered. However, if those elective(s) are not offered in later semesters, then alternate elective(s) may be chosen from the SAME set of elective course(s) offered under that specific category.

6.5 A student fulfilling the attendance requirements in the present semester shall not be eligible for readmission into the same class.

7 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirement mentioned in section 6.

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 35% marks (e.g. 25 out of 70 marks in theory/laboratory/practical/drawing course(s))in the Semester End Examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal

Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing Pass (C) Grade or above in that course.

7.2 Academic requirements in respect of Internship, Mini-Project, Technical Seminar, Project Seminar, Project, Activity Oriented (Non-Laboratory) courses such as Design Thinking, Logical reasoning and English Language courses (English for effective communication, English for career development, English for professional success) are as follows:

Name of the Course	Academic Requirements
Internship	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Internship if the student: i. Secures not less than 40% of the total marks allocated for the course in the evaluation by Departmental Evaluation Committee. ii. Makes a presentation of the Internship carried out before the Departmental Evaluation Committee as per schedule iii. Submits a report on his Internship.
Mini-Project	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Mini-Project if the student: i. Secures not less than 40% of the total marks allocated for the course in the evaluation by Departmental Evaluation Committee. ii. Makes a presentation of the Mini-Project carried out before the Departmental Evaluation Committee as per schedule. iii. Submits a report on his Mini-Project.
Project Seminar	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Project Seminar if the student: i. Secures not less than 40% of the total marks allocated for the course in the evaluation by Departmental Evaluation Committee. ii. Makes a presentation of the Project Seminar carried out before the Departmental Evaluation Committee as per schedule. iii. Submits a report on his Project Seminar.
Technical Seminar	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Technical Seminar if the student: i. Secures not less than 40% of the total marks allocated for the course in the evaluation by Departmental Evaluation Committee. ii. Makes a presentation of the Technical Seminar carried out before the Departmental Evaluation Committee as per schedule. iii. Submits a report on his Technical Seminar.
Project	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Project if the student: i. Secures not less than 40% of the total marks allocated for the course, in the project evaluation. ii. Makes a presentation of the Project carried out before the Internal Project Review Committee as per schedule. iii. Submits a report on his Project.
Activity Oriented(Non – Laboratory) courses a. Design Thinking b. Logical reasoning c. English for effective communication d. English for career development e. English for professional success.	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted if the student: i. Submits all assignments in time. ii. Secures not less than 40% of the total marks allocated for the course in continuous Internal Evaluation.

Note: A student who has not satisfied the above requirementsin any of the courses mentioned in the above table, is deemed to have failed; he may reappear once for each of the evaluation in the failed courseswhen they are scheduled again.If he fails in such "one reappearance" evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 **Promotion Rules**

S. No.	Promotion	Conditions to be fulfilled
1	First year First semester to First year Second semester	Regular course of study of First year First semester.
2	First year Second semester toSecond year First semester	i. Regular course of study of First year Second semester. ii. Must have secured at least 50% of the credits specified in the program structure of first year (up to and including first year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year First semester toSecond year Second semester	Regular course of study of Second year First semester.
4	Second year Second semester toThird year First semester	i. Regular course of study of Second year Second semester. ii. Must have secured at least 60% of the credits specified in the program structure of second year (up to and including second year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not
5	Third year first semester to Third year second semester	Regular course of study of Third year First semester.
6	Third year second semester toFourth year first semester	i. Regular course of study of Third year Second semester. ii. Must have secured at least 60% of the credits specified in the program structure of third year (up to and including third year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not
7	Fourth year First semester toFourth year Second semester	Regular course of study of Fourth year First semester.

7.4 A Student shall register for all course(s) covering 160 credits as specified and listed in the Programme Structure, fulfills the Attendance and Academic requirements for 160 Credits securing a minimum of "C Grade" (Pass Grade) or above in each course(s), and 'earns ALL 160 Credits securing an SGPA ≥ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) ≥ 5.0, in addition to fulfilling the academic requirements of mandatory course(s), to successfully complete the B.Tech Programme. The performance of the student in

these 160 credits shall be taken into account for the calculation of "the final CGPA" (at the end of undergraduate programme), and shall be indicated in the grade card issued at the end of IV-year II semester.

7.5 A student eligible to appear in the Semester End Examination in any course(s), but absent for it or failed (thereby failing to secure '**C**' Grade or above), may reappear for that course(s) at the supplementary examination as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that course(s) shall be carried over, and added to the marks he obtains in the supplementary examination, for evaluating his performance in that course(s).

7.6 A student detained in a semester due to shortage of attendance may be readmittedin the same semester in the next academic year for fulfillment of academicrequirements. The academic regulations under which a student has been readmitted shall be applicable. However, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

7.7 A student detained due to lack of credits, shall be promoted to the next academic year onlyafter acquiring the required credits as per the regulations last studied under. Upon readmission the academic regulations under which the student has beenreadmitted shall be applicable to him.

8 Evaluation - Distribution and Weightage of Marks

8.1 The performance of a student in each semester shall be evaluated course-wise (irrespective of credits assigned) with a maximum of 100 marks for all types of course(s), namely, theory, drawing, practicals,Internship, Mini-Project, Project Seminar, Project, Technical seminar, Activity Oriented (Non-Laboratory) courses etc., and their evaluation is as follows:

8.1.1 Theory, practical, drawing and Project course(s) shall be evaluated based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination)

8.1.2 Internship/Mini-project/ Project Seminar/ Technical seminar/ Activity Oriented (Non-Laboratory)coursesshall be evaluated internally by the Department Evaluation Committee.

Note: A letter grade corresponding to the % marks obtained shall be given for all course(s) as mentioned in section 9.2.

8.2 For theory course(s), during the semester, there shall be TWO (2) mid-term examinations for 25 marks each. Each mid-term examination consists of one objective paper for TEN (10) marks, plus one subjective paper for FIFTEEN (15) marks, with duration of 120 minutes (20 minutes for objective and 100 minutes for subjective papers). Further, there shall be an allocation of five (5) marks for assignment.The objective paper is set with multiple choice questions, and/or True/ False, and/or fill-in the blanks, and/or matching type questions. Subjective paper shall contain 3 questions, one from each unit or part thereof, with internal choice, each for 5 marks. All three questions are to be answered.

8.2.1 The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

8.2.2 The first set of assignments should be submitted before the conduct of the first mid-term examinations, and the second set of assignments should be submitted before the conduct of the second mid-term examinations. The assignments shall be as specified by the course instructor concerned.

8.2.3 The first mid-term examination marks and average of the marks of the first set of assignment shall make one set of CIE marks, and the second mid-term examination marks and the average of the marks of the second set of assignment shall make second set of CIE

Marks; and the average of these two sets of marks shall be taken as the final marks secured by the student in the Continuous Internal Evaluation in that course.

8.2.4 The details of the question paper pattern for Semester End Examination (SEE) shall be as follows:

- The examination shall be conducted for 70 marks. The question paper consists of two parts:
- Part – A for 20 marks (Compulsory);
- Part – B for 50 marks (Questions with Internal Choice);
- Part – A: Part A shall consist of ten questions, two from each unit of the prescribed syllabus of the course. Each question carries 2 marks. All questions are compulsory.
- Part – B: Part B shall consist of five questions, one each from the five units of the prescribed syllabus of the course. Each question carries 10 marks and may contain sub-questions. For each question, there shall be an internal choice (it means, there shall be two questions from each unit, and the student shall answer either of the questions). The student shall answer all the five questions.

8.2.5. For laboratory / practicals / drawing course(s), there shall be a Continuous Internal Evaluation (CIE) during the semester for 30 marks, and Semester End Examination (SEE) for 70 marks. Out of the 30 marks for CIE, day-to-day work in the laboratory / practical shall be evaluated for 15 marks; and for the remaining 15 marks - two internal practical tests (each of 15 marks) shall be conducted by the concerned laboratory instructor, one at the end of 8 weeks and the other in the last week of the semester. The average of these two tests is taken into account. The SEE for practicals shall be conducted at the end of the semester by two examiners, namely, an external examiner and laboratory faculty as internal examiner.

8.2.6. **Makeup test in theory/ laboratory internal examination(s):**

For the benefit of students who are absent or desirous of improvement in mid-term examination(s) in any course(s) concerned, one Makeup test shall be conducted (15 marks for laboratory course and 25 marks for theory) covering all units/experiments (as applicable)in that course at the end of the semester.

- In the case of the student seeking to improve performance and had appeared for both Mid-I and Mid-II examinations, the lower of the marks obtained in the two mid term examinations shall be annulled and replaced with the marks secured in the makeup test.
- In the case of students who are absent in both mid-term examinations for any course(s), marks secured in the makeup test shall be halved and awarded against the said mid-term examinations for that course.
- A prescribed fee shall be payable by the student for appearing in the above mentioned Makeup test.

8.2.6.1. **Internship, Mini-Project, Technical Seminar,Project seminar,Projectand Activity Oriented courses.**

There shall be an internship, which the student shall carryout immediately after Second year second semester examinations and pursue it during summer vacation for a duration ofaboutfour weeks. The Work carried out duringInternship shall be submitted intheformof a report, and a presentation of the same shall be made before a committee, which evaluates

it for 100 marks.The committee shall consist of Head of the Department or his nominee, the supervisor allocated for the internship, and two Professors /Assoc-Professors of the department. There shall be only CIE for 100 marks for internship and shall be evaluated during third year first semester.There shall be no SEE for Internship.

8.2.6.2. There shall be a Mini Project, which the student shall carryout immediately after Third year second semester examinations and pursue it during summer vacation. Mini Project shall be submitted in the form of a report, duly approved by the departmental internal evaluation committee, and presented before the examination committee in Fourth year first semester. It shall be evaluated for 100 marks as SEE. The examination committee consists of Head of the Department or his nominee, supervisor of the mini project and a senior faculty member of the department. There shall be no internal marks (CIE) for Mini Project.

8.2.6.3. There shall be a technical seminar presentation in Fourth year second semester, for which, the student shall collect the information on a specialized topic, prepare a technical report, submit it and present the same before a departmental committee. It shall be evaluated by the departmental committee, consisting of Head of the Department or his nominee, seminar supervisor and a senior faculty member. The technical seminar report shall be evaluated for 100 marks as CIE. There shall be no SEE for the technical seminar.

8.2.6.4. There shall be a Project seminar presentation in Fourth year First semester, for which, the student shall collect the information on theProject topic, prepare a report, submit it and present the same before a departmental committee. It shall be evaluated by the departmental committee, consisting of Head of the Department or his nominee, seminar supervisor and a senior faculty member. The Project seminar report shall be evaluated for 100 marks as CIE. There shall be no SEE for the Project seminar.

8.2.6.5. The student shall carryout the Project in final year secondsemester. There shall be three reviews, one at the end of the fourth week, another at the end of the ninth week and third at the end of the fourteenth week. The reviews shall be conducted and evaluated by an internal project review committee. The committee shall consist of Head of the Department or his nominee, the supervisor allocated for the Project, and two Professors /Assoc-Professors of the department. Each review shall be evaluated for thirty (30) marks and average of all three reviews shall constitute CIE of thirty (30) marks. Project carried out shall be submitted in a dissertation form, and a presentation of the same shall be made before a final examination committee consisting of Head of the Department or his nominee, the supervisor and an external examiner, appointed by the chief superintendent of examinations, selected from a panel of examiners suggested by the chairperson, BoS, which evaluates it for seventy (70) marks.

8.2.6.6. Activity Oriented(Non-laboratory) courses shall be evaluated internally (CIE)for 100 marks; there shall be no SEE.

8.2.7. For mandatory / non-credit course(s), a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the course(s)

8.2.7.1. No marks / letter grades shall be allotted for mandatory/non-credit course(s). Only Pass / Fail shall be indicated in Grade Card.

9. Grading procedure

9.1 Grades shall be awarded to indicate the performance of students in each theory course, laboratory / practicals / Engineering Graphics / Drawing, Technical Seminar, Internship, Mini-Project, Project, Activity Oriented courses based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in section 8 above, a corresponding letter grade shall be given.

9.2. As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% ofMarks Secured in a Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A^+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B^+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

9.3. A student who has obtained an '**F**' grade in any course(s) shall be deemed to have '**failed**' and is required to reappear as a 'supplementary candidate' in the semester end examination, as and when conducted. However, the internal marks in those course(s) shall remain the same as obtained earlier.

9.4. A student, who has not appeared for an examination in any course(s), shall be awarded '**Ab**' grade in that course(s), and shall be deemed to have '**failed**' in that course(s). Such a student shall be required to reappear as a 'supplementary candidate' in the semester end examination, as and when conducted. However, the internal marks in those course(s) shall remain the same as obtained earlier.

9.5. A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6. A student earns a grade point (GP) in each course, on the basis of the letter grade secured in that course. The corresponding 'Credit Points (CP)' for a course are computed by multiplying the grade point with credits for that particular course.

Credit points (CP) = grade point (GP) x credits …. For a course

9.7. A student passes a course, only when the student secures a **GP ≥ 5 ('C' grade orabove)** in that course.

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9.8. The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all course(s) registered for in a semester, by the total number of credits registered for in that semester. SGPA is rounded off to **two decimal places**. SGPA is thus computed as

$$SGPA = \{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \} \ldots. \text{ For each Semester,}$$

where 'i' is the course indicator index (takes into account all course(s) in a semester), 'N' is the number of courses '**registered'** for in that semester (as specifically required and listed under the program structure of the parent department), C is the number of credits allotted to the i^{th} course, and G represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} course.

9.9. The Cumulative Grade Point Average (CGPA) is a measure of the cumulative performance of a student in all the courses registered from all the semesters. The CGPA is the ratio of the total credit points secured by a student in **all the** registered courses in **all** the semesters, and the total number of credits registered for in **all** the semesters. CGPA is rounded off to **twodecimal places**. CGPA is thus computed from the First year second semester onwards at the end of each semester as per the formula

$$CGPA = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \ldots \text{ for all S Semesters registered (ie., upto and inclusive of S Semesters, } S \geq 2 \text{)},$$

where '**M'** is the **total** number of courses(as specifically required and listed under the program structure of the parent department) the student has '**registered'** for i.e. from the first semester onwards up to and inclusive of the eighth semester, 'j' is the course indicator index (takes into account, all course(s) from first semester to eighth semester), C is the number of credits allotted to the j^{th} course, and G represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} course. After registration and completion of First year first semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course	Credits	Letter Grade	Grade Point	Credit Points
Course1	4	A	8	4 x 8=32
Course 2	4	O	10	4 x 10=40
Course 3	4	C	5	4 x 5=20
Course 4	3	B	6	3 x 6=18
Course 5	3	A+	9	3 x 9=27
Course 6	3	C	5	3 x 5=15
Total	**21**	**Total Credit Points**		**152**

SGPA = 152/21 = 7.24

Illustration of calculation of CGPA up to 3rd semester:

Semester	Course Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point	Credit Points(CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
Total Credits		**69**	**Total Credit Points**		518

CGPA = 518/69 = 7.51

The above illustrated calculation process of CGPA shall be followed for each subsequent semester until eighth semester. The CGPA obtained at the end of eighth semester will become the final CGPA secured for entire B.Tech Programme.

9.10. For merit ranking or comparison purposes or any other listing, **only** the '**rounded off**' values of the CGPAs shall be used.

9.11. SGPA and CGPA of a semester shall be mentioned in the semester Memorandum of Grades if all courses of that semester are passed in the first attempt. Otherwise, the SGPA and CGPA shall be mentioned only on the Memorandum of Grades generated after the student has passed his last examination in that semester. However, mandatory course(s) will not be taken into consideration.

10. Passing Standards:

10.1 A student shall be declared **'SUCCESSFUL'** or **'PASSED'** in a semester, only when he gets a SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared **'SUCCESSFUL'** or **'PASSED'** in the entire B.Tech programme, only when he gets a

CGPA ≥ 5.00, subject to the condition that he secures a GP ≥ 5 (C Grade or above) in every registeredcourse(s)in each semester (during the entire B.Tech Programme) for award of the degree.

10.2 After the completion of each semester, a Grade Card or Grade Sheet (Memorandum of Grades) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It shall show the details of the course(s) registered (course(s) code, title, number of credits, grade earned etc.), credits earned, SGPA and CGPA.

11. Declaration of Results

11.1 Computation of SGPA and CGPA are done using the procedure listed in sections 9.6 through 9.9.

11.2 For final % of marks equivalent to the computed final CGPA, the following formula shall be used:

% of Marks = (final CGPA – 0.5) x 10

12. Award of Degree

12.1 A student who registers for all the specified course(s) as listed in the programme structure, satisfies all the programme requirements, and passes all the examinations prescribed in the entire B.Tech programme, and secures the required number of 160 credits (with CGPA ≥ 5.0), within eight (8) academic years from the date of commencement of the first academic year, shall be declared to have **'QUALIFIED'** for the award of the B.Tech degree in branch of Engineering studied.

12.2 A student who qualifies for the award of the degree as listed in section 12.1, shall be placed in the following classes based on evaluation as per section 7.4:

12.2.1 Students with final CGPA (at the end of the B. Tech Programme) ≥ 8.00 and fulfilling the following conditions shall be placed in 'FIRST CLASS with DISTINCTION' -

i. should have passed all the courses in 'FIRST APPEARANCE' within the first four (4) academic years (or eight (8) sequential semesters) from the date of commencement of his first academic year,
ii. should have secured a CGPA≥ 8.00,at the end of each of the eight (8) sequential semesters, starting from the FIRST year FIRST semester onwards,
iii. should not have been detained or prevented from writing the Semester End Examinations in any semester due to shortage of attendance or any other reason.

12.2.2 Students having final CGPA (at the end of B.TechProgramme) ≥ 8.00, but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

12.2.3 Students with final CGPA (at the end of the B.TECHProgramme) ≥ 6.50 but < 8.00, shall be placed in 'FIRST CLASS'.

12.2.4 Students with final CGPA (at the end of the B.TECHProgramme) ≥5.50 but < 6.50, shall be placed in 'SECOND CLASS'.

12.2.5 All other Students who qualify for the award of the degree (as per Section 12.1), with final CGPA (at the end of the B.TechProgramme) ≥5.00 but < 5.50, shall be placed in 'PASS CLASS'.

12.3 A student with final CGPA (at the end of the B.TechProgramme) < 5.00 shall not be eligible for the award of the degree.

12.4 Students fulfilling the conditions listed under section (iii) of 12.2.1 alone shall be eligible for the award of 'college rank' and / or 'gold / silver / bronze medal'.

13. Withholding of Results

If the student has not paidfees to College at any stage, orhas pending dues against his name due to any reason whatsoever, orif any case of indiscipline is pending against him, the result of the student shall be withheld,and he shall not be allowed to go into the next higher semester.The award or issue of the degree shall also be withheld in such cases.

14. Transitory Regulations

14.1 The student readmitted under changed regulations, shall pass all the courses in the curriculum prescribed for the batch of students which the readmitted student joins subsequently. To fulfill this requirement, the student may have to pass additional courses. The student shall apply to Dean Academics, through HoD, at the beginning of the semester of readmission, for allotment of additional courses to be studied, if any. The BoS of the department will thereupon:

i. examine and establish the equivalence of courses studied in the previous curriculum and the courses prescribed in the curriculum in force
ii. verify the equivalent courses already passed by the student in the previous semesters, and the credits secured thereby, as per the new curriculum
iii. determine and prescribe the additional courses, if any, the student has to pass to fulfill the academic requirements under the new curriculum.

The student must register for additional course(s) at the beginning of the semester during which he desires to study with the approval of the faculty advisor.

14.1.1. The college shall conduct one internal Test in each of the additional courses, at the end of the semester, covering the entire syllabus, for a maximum of 30 marks. The marks obtained in the test shall be considered as the internal marks for the course.

14.1.2. If a student readmitted into AR20 Regulations has any course(s) to be studied in the semester of his re-admission or succeeding semesters with about 80% of the syllabus in common as certified by the BoS with course(s) he has studied under his previous regulations, that particular course(s) shall be substituted for by another course(s) from the list of additional courses the student is required to pass as mentioned in 14.1(iii).

15. Student Transfers

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

15.2 The student seeking transfer to this college from other University/institutions should obtain NoC from the college and apply to Department of Technical Education, Government of Telangana, Telangana State. The student, on transfer, shall pass additional courses, from the courses prescribed in the curriculum of AR20, up to the class/semester preceding the class/semester into which the student is admitted,if he had not studied those courses or their equivalents,or failed in those courses at the previous institution.

The rules governing the registration of the additional courses, and award of internal marks, shall be the same as specified in section 14.1

16. Scope

1. Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".
2. The Academic Regulations should be read as a whole, for the purpose of any interpretation.
3. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.
4. The college may change or amend the Academic Regulations, Program Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the College Authorities.
5. B.Tech (Regular) program is B.Tech 4 year degree program to which students are admitted to FIRST year.
6. B.Tech LE Scheme refers to the system under which students are admitted to SECOND year of the B.Tech FOUR (4) year degree program.
7. The terms "mid-term" and "internal" are used interchangeably.

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GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)
(**Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NAAC with 'A')**
Cheeryal (V), Keesara (M), Medchal Dist., Telangana - 501 301

17. PUNISHMENT FOR MALPRACTICE

	Nature of Malpractices	Punishment
	If the candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cellphones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the

		academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he shall be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the Chief Superintendent/ Assistant –Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them.

7	Leaves the exam hall taking away answer script or tears of the script or any part thereof inside or outside the examination hall with the mala fide intention of destroying any evidence of use of unfair means.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester / year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College shall be handed over to police and, a police case shall be registered against them.

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18. ACADEMIC REGULATIONS FOR B.TECH **(LATERAL ENTRY SCHEME)** FROM THE AY 2020-2021

18.1. **Eligibility for award of B. Tech. Degree (LES)**

1. The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.
1. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from SECOND year through FOURTH year B.Tech programme (LES) for the award of B.Tech degree.
2. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech
3. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech (LES).

18.2 **Promotion rule**

S. No.	Promotion	Conditions to be fulfilled
1.	Second year first semester toSecond year second semester	Regular course of study of Second year first semester.
2.	Second year second semester toThird year first semester	(i) Regular course of study of Second year second semester. (ii) Must have secured at least 50% of the credits specified in the program structure of second year (up to and including second year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Third year first semester to Third year second semester	Regular course of study of Third year first semester.
4.	Third year second semester to Fourth year first semester	(i) Regular course of study of Third year second semester. (ii) Must have secured at least 60% of the credits specified in the program structure of third year (up to and including third year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5.	Fourth year first semester toFourth year second semester	Regular course of study of Fourth year first semester.

6. All the other regulations as applicable to B. Tech. FOUR (4) - year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

18.3**Punishment for Malpractice**

	Nature of Malpractices	**Punishment**
	If the candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with

		forfeiture of seat. If the impostor is an outsider, he shall be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the Chief Superintendent / Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them.

7	Leaves the exam hall taking away answer script or tears of the script or any part thereof inside or outside the examination hall with the mala fide intention of destroying any evidence of use of unfair means.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is course to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College shall be handed over to police and, a police case shall be registered against them.

Vision of the Institute

Geethanjali visualizes dissemination of knowledge and skills to students, who would eventually contribute to well-being of the people of the nation and global community.

Mission of the Institute

1) To impart adequate fundamental knowledge in all basic sciences and engineering, technical and Inter-personal skills to students.
2) To bring out creativity in students that would promote innovation, research and entrepreneurship.
3) To preserve and promote cultural heritage, humanistic and spiritual values promoting peace and harmony in society.

Vision of the Department

The Civil Engineering Department is committed to excellence, quality, and sustained growth while offering our students an outstanding and rigorous education in an environment that supports intellectual growth while meeting 21st century demands.

Mission of the Department

1. To provide high-quality educational experience for students in the field of Civil Engineering with strong emphasis on professional ethics, social and environmental responsibilities.
2. To provide infrastructure and facilities to meet the latest technological requirements.
3. To provide research opportunities for faculty and students.
4. To have a continuous interaction with Industry with an emphasis on R and D.
5. To produce engineers capable of critical thinking, devoted to lifelong learning, and highly sought after by employers.

Program Educational Objectives (PEOs):

Program Educational Objectives (PEOs) are broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve within three to five years of graduation. The PEOs for Civil Engineering program are:

PEO 1: Graduates will be technically adept in mathematical, scientific, and engineering fundamentals to pursue their chosen profession or pursue advanced studies with a commitment to lifelong learning for professional development.

PEO 2: Graduates will be able to apply problem-solving skills to various engineering problems that involve management of medium-sized projects to large-scale projects using modern equipment or systems, and work on multidisciplinary projects in multicultural environment demonstrating interpersonal skills.

PEO 3: Graduates will exhibit creativity, innovation, and professional ethics with leadership qualities towards societal development.

Program Outcomes (POs):

Program Outcomes (POs) describe what students are expected to know and be able to do by the time of graduation to accomplish Program Educational Objectives (PEOs). The Program Outcomes for Civil Engineering students are:

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

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

PO 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.

PO 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.

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

PO 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.

PO 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.

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

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

PO 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.

PO 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.

PO 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.

Program Specific Outcomes (PSOs):

PSO 1: Apply knowledge in core areas of Civil Engineering such as Structural, Geotechnical, Water Resources, Transportation and Environmental Engineering to Civil Engineering practice.

PSO 2: Utilize Civil Engineering principles that are appropriate to produce detailed drawings, design reports, quantity and cost estimates, specifications, contracts and other documents appropriate for the design, construction, operations and maintenance of Civil Engineering projects.

PSO 3: Shall interact and collaborate with stakeholders; execute quality construction works applying Civil Engineering tools namely, Total Station, Global Positioning System (GPS), ArcGIS, AutoCAD, STAAD and other necessary tools.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301

B.Tech. CIVIL ENGINEERING

AR 20 STRUCTURE FOR UNDERGRADUATE PROGRAM

S. No.	Category	Credits as per AR20	Credits as per AICTE Model Curriculum
1	**Humanities and Social Sciences including Management Courses**	**11**	12
2	**Basic Sciences Courses**	**25**	26
3	**Engineering Sciences Courses** including workshop, drawing, basics of electrical/mechanical/computer etc.	**25**	29
4	**Professional Core Courses**	**57**	47
5	**Professional Elective Courses** relevant to chosen specialization/branch	**15**	23
6	**Open Elective Subjects**: Electives from other technical and/or emerging subjects	**9**	11
7	**Project work, seminar and internship** in industry or appropriate work place / academic and research institutions in India /abroad	**18**	12
8	**Mandatory Courses** (Environmental Science, Professional Ethics, Introduction to Artificial Intelligence, Introduction to Cyber Security)	**4- Slots**	(non-credit)
	Total	**160**	**160**

Course code and definition

S.No.	Category Abbreviation	Description
1.	HSMC	Humanities and Social Sciences including Management courses
2.	BSC	Basic Science Courses
3.	ESC	Engineering Science Courses
4.	PCC	Professional Core Courses
5.	PEC	Professional Elective Courses
6.	OEC	Open Elective Courses
7.	MC	Mandatory Courses
8.	PROJ	Project, Internship, Mini project and Technical Seminar

Definition of Credit

S.No.	Abbreviation	Credits	Description
1.	L	1	1 Hr. Lecture (L) per week
2.	T	1	1 Hr. Tutorial (T) per week
3.	P	0.5 1	1 Hr. Practical (P) per week 2 Hours Practical (Lab)/week

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SCHEME OF INSTRUCTION AND EXAMINATION

B.TECH. CIVIL ENGINEERING (CE)

AR 20 CURRICULUM WITH EFFECTIVE FROM A.Y. 2020-21

PROGRAM STRUCTURE

FIRST YEAR I - SEMESTER

S. No	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	20PH11002	Engineering Physics	BSC	3	1	--	30	70	100	4
2	20MA11001	Basic Engineering Mathematics	BSC	3	1	--	30	70	100	4
3	20CS11001	Programming for Problem Solving –I	ESC	2	--	--	30	70	100	2
4	20ME11002	Engineering Graphics	ESC	2	--	2	30	70	100	3
5	20CE11001	Engineering Mechanics : Statics and Dynamics	ESC	3	1	--	30	70	100	4
6	20PH11L02	Engineering Physics Lab	BSC	--	--	2	30	70	100	1
7	20CS11L01	Programming for Problem Solving – I Lab	ESC	--	--	2	30	70	100	1
8		Induction Program	MC	-	-	-	-	-	-	-
Total				**13**	**3**	**6**	**210**	**490**	**700**	**19**
Total Periods Per Week				**22**						

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FIRST YEAR II – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	20EN12001	English	HSMC	3	-	-	30	70	100	3
2	20MA12001	Multi Variable Calculus	BSC	3	1	-	30	70	100	4
3	20CS12001	Programming for Problem Solving– II	ESC	2	-	-	30	70	100	2
4	20CH12001	Engineering Chemistry	BSC	3	-	-	30	70	100	3
5	20CE12001	Engineering Geology	ESC	2	-	-	30	70	100	2
6	20EN12L01	English Language Communication Skills Lab (ELCS)	HSMC	-	-	2	30	70	100	1
7	20CS12L01	Programming for Problem Solving - II Lab	ESC	-	-	2	30	70	100	1
8	20CH12L01	Engineering Chemistry Lab	BSC	-	-	2	30	70	100	1
9	20CE12L01	Engineering Geology Lab	ESC	-	-	2	30	70	100	1
10	20ME12L01	Engineering Workshop	ESC	--	--	2	30	70	100	1
11	20CE12P01	Design Thinking*	PROJ	-	-	4	100	-	100	2
Total				**13**	**1**	**14**	**400**	**700**	**1100**	**21**
Total Periods Per Week				**28**						

*** ACTIVITY ORIENTED NON-LAB COURSE (NO LABORATORY REQUIRED)**

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Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301

SECOND YEAR I – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	20CE21001	Surveying and Geomatics	PCC	3	-	-	30	70	100	3
2	20CE21002	Mechanics of Materials	PCC	3	-	-	30	70	100	3
3	20CE21003	Fluid Mechanics	PCC	3	-	-	30	70	100	3
4	20CE21004	Building Materials, Construction and Planning	PCC	2	-	-	30	70	100	2
5	20MB21004	Engineering Economics and Accounting	HS MC	3	-	-	30	70	100	3
6	20EE21001	Basic Electrical Engineering	ESC	3	-	-	30	70	100	3
7	20CE21L01	Surveying and Geomatics Lab	PCC	-	-	2	30	70	100	1
8	20CE21L02	Mechanics of Materials Lab	PCC	-	-	2	30	70	100	1
9	20EE21L01	Basic Electrical Engineering Lab	ESC	-	-	2	30	70	100	1
10	20EN21P01	English for Effective Communication*	HS MC	-		2	100	-	100	1
11	20CH21M01	Environmental Science	MC	3	-	-	-	-	-	-
Total				**20**	**-**	**8**	**370**	**630**	**1000**	**21**
Total Periods Per Week				**28**						

*** ACTIVITY ORIENTED NON-LAB COURSE (NO LABORATORY REQUIRED)**

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301

SECOND YEAR II – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/ D	CIE	SEE	Total	C
1	20MA22001	Computational Mathematics	BSC	3	-	-	30	70	100	3
2	20CE22001	Structural Analysis	PCC	3	-	-	30	70	100	3
3	20CE22002	Hydraulics and Hydraulic Machinery	PCC	3	-	-	30	70	100	3
4	20CE22003	Concrete Technology	PCC	3	-	-	30	70	100	3
5	**Open Elective-I**		OEC	3	-	-	30	70	100	3
	20EE22062	Industrial Safety and Hazards								
	20ME22063	Nano Materials and Technology								
	20EC22064	Electronic Measuring Instruments								
	20CS22065	Web Programming								
	20MB22066	Intellectual Property Rights								
6	20MA22L01	Computational Mathematics Lab	BSC	-	-	2	30	70	100	1
7	20CE22L01	Computer Aided Drafting of Buildings lab	PCC	-	-	2	30	70	100	1
8	20CE22L02	Fluid Mechanics and Hydraulic Machinery Lab	PCC	-	-	2	30	70	100	1
9	20EN22P01	English for Career Development*	HSMC	-	-	2	100	-	100	1
10	20MB22M04	Professional Ethics	MC	3	-	-	-	-	-	-
			Total	**18**	**-**	**8**	**340**	**560**	**900**	**19**
			Total Periods Per Week	**26**						

*** ACTIVITY ORIENTED NON-LAB COURSE (NO LABORATORY REQUIRED)**

Note: Students have to undergo internship program during the summer vacation which shall be evaluated internally during Third year First semester. There is no Semester End Examination for this internship.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301

THIRD YEAR I – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/ D	CIE	SEE	Total	C
1	20CE31001	Design of Reinforced Concrete Structures	PCC	3	-	-	30	70	100	3
2	20CE31002	Transportation Engineering	PCC	3		-	30	70	100	3
3	20CE31003	Geotechnical Engineering	PCC	3	-	-	30	70	100	3
4	20MA31002	Statistical Applications in Civil Engineering	ESC	3	-	-	30	70	100	3
5	20CE31L01	Geotechnical Engineering Lab	PCC	-	-	2	30	70	100	1
6	20CE31L02	Highway Engineering and Concrete Technology Lab	PCC	-	-	2	30	70	100	1
7	20MA31L02	Statistical Applications in Civil Engineering Lab	ESC	-	-	2	30	70	100	1
8	20MA31P01	Logical Reasoning – I*	BSC	-	-	4	100	-	100	2
9	20EN31P01	English for Professional Success*	HSMC	-	-	2	100	-	100	1
10	20CE31004	Internship	PROJ	-	-	4	100	-	100	2
11	20CS31M02	Introduction to Artificial Intelligence	MC	3	-	-	-	-	-	-
Total				**15**	**-**	**16**	**510**	**490**	**1000**	**20**
Total Periods Per Week				**31**						

*** ACTIVITY ORIENTED NON-LAB COURSE (NO LABORATORY REQUIRED)**

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301

THIRD YEAR II – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1.	20CE32001	Hydrology and Water Resources Engineering	PCC	3	-	-	30	70	100	3
2.	20CE32002	Environmental Engineering	PCC	3	-	-	30	70	100	3
3.	20CE32003	Design of Steel Structures	PCC	3	-	-	30	70	100	3
4.	**Professional Elective – I**		PEC	3	-	-	30	70	100	3
	20CE32004	Advanced Structural Analysis								
	20CE32005	Foundation Engineering								
	20CE32006	Intelligent Transportation Systems								
	20CE32007	Disaster Mitigation and Management								
	20CE32008	Modern Construction Materials								
5.	**Professional Elective – II**		PEC	3	-	-	30	70	100	3
	20CE32009	Prefabricated Structures								
	20CE32010	Ground Improvement Techniques								
	20CE32011	Traffic Engineering and Management								
	20CE32012	Advanced Surveying								
	20CE32013	Green Building Systems								
6.	20EN32L01	Professional Communication Skills Lab (PCS Lab)	HSMC	-	-	2	30	70	100	1
7.	20CE32L01	Environmental Engineering Lab	PCC	-	-	2	30	70	100	1
8.	20CE32L02	Structural Drafting Lab	PCC	-	-	2	30	70	100	1
9.	20MA32P01	Logical Reasoning – II*	BSC	-	-	4	100	-	100	2
10	20CS32M03	Introduction to Cyber Security	MC	3	-	-	-	-	-	-
		Total		**18**	**-**	**10**	**340**	**560**	**900**	**20**
		Total Periods Per Week		**28**						

*** ACTIVITY ORIENTED NON-LAB COURSE (NO LABORATORY REQUIRED)**

Note: Students have to undertake a Mini-Project during the summer vacation which shall be evaluated externally during Fourth year First semester.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301

FOURTH YEAR I – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods per Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	20CE41001	Estimation and Costing	PCC	3	-	-	30	70	100	3
2	20CE41002	Pavement Analysis and Design	PCC	3	-	-	30	70	100	3
3.	**Professional Elective – III**		PEC	3	-	-	30	70	100	3
	20CE41003	Prestressed Concrete Structures								
	20CE41004	Soil Dynamics and Machine Foundation								
	20CE41005	Railway Engineering								
	20CE41006	Irrigation Engineering and Hydraulic structures								
	20CE41007	Solid Waste Management								
4.	**Professional Elective – IV**		PEC	3	-	-	30	70	100	3
	20CE41008	Health Monitoring and Retrofitting of structures								
	20CE41009	Earth Retaining Structures								
	20CE41010	Smart Cities Planning and Development								
	20CE41011	Environmental Impact Assessment								
	20CE41012	GIS and Remote Sensing								
5.	**Open Elective – II**		OEC	3	-	-	30	70	100	3
	20EE41072	Energy Conservation and Management								
	20ME41073	Digital Fabrication								
	20EC41074	Principles of Communication Systems								
	20CS41075	Knowledge Management								
	20MB41076	Supply Chain Management								
6.	20CE41L01	STAAD Lab	PCC	-	-	2	30	70	100	1
7.	20CE41L02	Pavement Analysis and Design Lab	PCC	-	-	2	30	70	100	1
8.	20CE41013	Project Seminar	PROJ	-	-	2	100	-	100	1
9.	20CE41014	Mini-Project	PROJ	-	-	4	-	100	100	2
			Total	**15**	**-**	**10**	**310**	**590**	**900**	**20**
			Total Periods Per Week	**25**						

FOURTH YEAR II – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1.	20CE42001	Construction Technology and Project Management	PCC	3	-	-	30	70	100	3
2.	**Professional Elective – V**									
	20CE42002	Elements of Earthquake Engineering	PEC	3	-	-	30	70	100	3
	20CE42003	Soil Reinforcement and Geosynthetics								
	20CE42004	Pavement Maintenance and Management System								
	20CE42005	Climate Change and Adaptation								
	20CE42006	Hydropower Engineering								
3.	**Open Elective – III**		OEC	3	-	-	30	70	100	3
	20EE42082	Micro-Electro-Mechanical Systems								
	20ME42083	Principles of Automobile Engineering								
	20EC42084	Biomedical Instrumentation								
	20CS42085	Database Systems								
	20MB42086	Entrepreneurship								
4.	20CE42007	Technical Seminar	PROJ	-	-	2	100	--	100	1
5.	20CE42008	Project	PROJ	-	-	20	30	70	100	10
		Total		**9**	**-**	**22**	**220**	**280**	**500**	**20**
		Total Periods Per Week		**31**						

OPEN ELECTIVES

OPEN ELECTIVES offered by a Department SHOULD NOT be taken by the students of the same department

Open Elective I

S. No.	Course Title	Course Code
61	Building Technology	20CE22061/ 20CE31061/ 20CE32061
22	Industrial Safety and Hazards	20EE22062/ 20EE31062/ 20EE32062
63	Nano Materials and Technology	20ME22063/ 20ME31063/ 20ME32063
64	Electronic Measuring Instruments	20EC22064/ 20EC31064/ 20EC32064
65	Web Programming	20CS22065/ 20CS31065/ 20CS32065
66	Intellectual Property Rights	20MB22066/ 20MB31066/ 20MB32066

Open Elective II

S. No.	Course Title	Course Code
71	Green Buildings	20CE31071/ 20CE32071/ 20CE41071
72	Energy Conservation and Management	20EE31072/ 20EE32072/ 20EE41072
73	Digital Fabrication	20ME31073/ 20ME32073/ 20ME41073
74	Principles of Communication Systems	20EC31074/ 20EC32074/ 20EC41074
75	Knowledge Management	20CS31075/ 20CS32075/ 20CS41075
76	Supply Chain Management	20MB31076/ 20MB32076/ 20MB41076

Open Elective III

S. No.	Course Title	Course Code
81	Disaster Management	20CE42081
82	Micro-Electro-Mechanical Systems	20EE42082
83	Principles of Automobile Engineering	20ME42083
84	Biomedical Instrumentation	20EC42084
85	Database Systems	20CS42085
86	Entrepreneurship	20MB4286

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20PH11002 – Engineering Physics

B. Tech. CE I Year, I Sem

L	T	P/D	C
3	1	-/-	4

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand the concepts of simple harmonic, damped and forced oscillations and their characteristics in different conditions with analogous to electrical oscillations.
2. Understand the propagation of transverse and longitudinal waves in one dimensional media, standing waves and their frequencies, concept of impedance matching, acoustic wave and minimizing errors in acoustic wave velocity.
3. Understand division of amplitude and wave front using Newton's rings, Michelson's interferometer, anti-reflection coatings and Young's double slit experiment, and the concept of diffraction using single slit, double slit and diffraction grating.
4. Understand the interaction of radiation with matter, working of different types of lasers and their applications. Understand the total internal reflection of light, numerical aperture, types of optical fibers based on refractive index, materials, and the causes for light attenuation, and the applications of optical fibers.
5. Understand the principle of reverberation and absorption coefficient of materials, noise control in machines and automobiles using quieting. Understand the principle, construction and working of magnetostriction, piezoelectric method for the production of Ultrasonic waves, properties, detection of ultrasonics and its applications.

Course Outcomes: At the end of the course, student would be able to

CO 1. Distinguish simple harmonic, damped harmonic, forced oscillations and their characteristics, and compare electrical oscillator based on mechanical oscillators.

CO 2. Explain the propagation of transverse, longitudinal waves in one dimensional media, Standing waves and their frequencies. Explain the concept of impedance matching, acoustic wave and minimizing errors in acoustic wave velocity.

CO 3. Use different methods to explain and demonstrate the optical phenomena of interference and diffraction.

CO 4. Explain the basic principles, construction, working and applications of various lasers and optical fibers, and causes for attenuation in optical fibers.

CO 5. Analyze the quality of acoustically good hall and sound absorbing materials. Explain the production of ultrasonic waves using different methods, properties, detection and their applications.

UNIT-I: Harmonic Oscillations (12 Hrs)

Introduction to harmonic oscillations, Simple harmonic oscillators, Damped harmonic oscillator: over, critical and under damping, energy, power dissipation and quality factor of damped harmonic oscillator, steady state motion of Forced Oscillator, Mechanical and Electrical oscillators, Electrical analogy for a simple oscillator, mechanical and electrical Impedance.

UNIT II: Waves in one dimension (12 Hrs)

Transverse wave on a string , The wave equation on a string , Harmonic waves, Reflection and transmission of waves at a boundary, Impedance matching , Standing waves and their Eigen frequencies , Longitudinal waves and the wave equations for them. Acoustic waves and speed of sound, Standing sound waves.

UNIT-III: Wave Optics (10 Hrs)

Huygens's principle, superposition of waves and interference of light by wavefront division and amplitude division, Young's double slit experiment, Newton's rings, Michelson's interferometer, anti-reflection coatings; introduction to diffraction, diffraction due to single slit, double slit and diffraction grating.

UNIT-IV: Lasers and Fiber Optics (12 Hrs)

Laser: Interaction of radiation with matter: Absorption, Spontaneous emission and Stimulated emission, Characteristics of Laser, Resonating cavity, active medium, Pumping methods and mechanisms, population inversion, Construction and working of Lasers: Nd:YAG Laser, He-Ne Laser, Carbon dioxide (CO_2) Laser, Applications of Lasers.

Fiber Optics: Introduction, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index optical fibers, Losses associated with optical fibers, Applications of optical fibers.

UNIT V: Acoustics of buildings and Ultrasonics (10 Hrs)

Acoustics of buildings: Reverberation time, Sabine's formula, measurement of absorption coefficient of material, factors affecting the architectural acoustics and their remedies, acoustic quieting. Noise control in machines and auto mobiles- mufflers.

Ultrasonics: Introduction to ultrasonics, production of ultrasonic waves: magnetostriction method and piezoelectric method (principle, construction and working), properties of ultrasonics, detection of ultrasonics, applications of ultrasonics.

TEXT BOOKS:

1. Engineering Mechanics- Manoj K. Harbola, Cengage Learning, 2013.
2. Vibrations and waves in physics - I.G. Main, 3rdEdn, Cambridge University Press, 2018.

REFERENCE BOOKS:

1. Elements of properties of matter - D.S. Mathur, S. Chand publications, 2010.
2. Optics – Ajoy Ghatak -McGraw Hill Education, 2012.
3. The physics of vibrations and waves - H.J. Pain, Wiley, 2006.
4. Principles of Lasers - O. Svelto, 1998.
5. Introduction to Mechanics – Mahendra K.Verma, Universities Press, 2016.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20MA11001 – Basic Engineering Mathematics

B. Tech. CE I Year, I Sem

L	T	P/D	C
3	1	-/-	4

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand various types of matrices, properties and rank of the matrix to find the solution for system of equations, if it exists.
2. Apply the knowledge of eigenvalues and eigenvectors of a matrix from quadratic form into a canonical form through linear transformation.
3. Solve first and higher order differential equations of various types.
4. Analyze properties of Laplace Transform, Inverse Laplace Transform and to understand how the product of the Transforms of two functions relates to their convolution
5. Identify the methods of solving the differential equations of first and higher order applications namely, Newton's law of cooling, Natural growth and decay, Electrical circuits, Simple harmonic motion and Bending of Beams.

Course Outcomes: At the end of course, student would be able to

CO1. Write the matrix representation of a set of linear equations and analyze solution of a system of equations using rank of a matrix.

CO2. Deduce eigenvalues and eigenvectors of a matrix and apply the same to reduce quadratic form into a canonical form through linear transformation.

CO3. Identify the type of differential equation and use the appropriate method to solve the same.

CO4. Evaluate various problems using Laplace Transform, Inverse Laplace Transform and apply the convolution theorem to obtain inverse Laplace transforms.

CO5. Apply first and higher order differential equations to solve problems like Newton's law of cooling, Natural growth and decay, Electrical circuits, Simple harmonic motion and Bending of Beams.

UNIT-I: Matrices

Matrices: Types of Matrices, Symmetric, Hermitian, Skew-symmetric, Skew-Hermitian, Orthogonal matrices, Unitary Matrices, rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by *Gauss-Jordan method

System of linear equations: solving system of Homogeneous and Non-Homogeneous equations**,** *Gauss elimination method.

UNIT-II: Eigenvalues and Eigenvectors

Linear Transformation and Orthogonal Transformation: *Eigenvalues and *Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), *finding inverse and power of a matrix by Cayley-Hamilton Theorem, *Quadratic forms and Nature of the Quadratic forms, Reduction of Quadratic form to canonical form.

UNIT-III: Ordinary Differential Equations

First Order Ordinary Differential Equations: *Exact Differential Equations, *Linear Differential Equations and Bernoulli's Equations.

Second and Higher Order Linear Differential Equations with Constant Coefficients: Non homogeneous of the type e^{ax}, sin ax, cos ax, x^n, $e^{ax}V(x)$ and $xV(x)$**,** Method of variation of parameters, Equations reducible to linear Ordinary Differential Equations with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-IV: Laplace Transforms

Definition of Laplace transform, Existence of Laplace transforms, Laplace transform of standard functions, first shifting theorem, Laplace transform of functions when they are multiplied or divided by "t", Laplace transforms of derivatives and integrals of functions, Unit step function, second shifting theorem, Dirac's delta function, Periodic function, Evaluation of integrals using Laplace Transforms, Inverse Laplace transform by Partial fractions (Heaviside method), Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace transforms of derivatives and integrals of functions, Convolution theorem.

UNIT-V: Applications of Ordinary Differential Equations

Applications of First order Ordinary Differential Equations: *Newton's law of cooling, *Law of Natural growth and decay, Electrical circuits.

Applications of Higher order Ordinary Differential Equations: Electrical circuits, Simple harmonic motion, Bending of Beams.

*Enlightenment with flowchart and algorithmic approach.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th Edition, 2011.

REFERENCE BOOKS:

1. A Text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, 10th Edition, 2015.
2. Advanced Engineering Mathematics, H.K. Das, S. Chand and Company Ltd, 21st Edition, 2013.
3. Advanced Engineering Mathematics, Jaggi and Mathur, Khanna Publishers, 6th Edition, 2019.
4. Advanced Engineering Mathematics, R.K. Jain and S.R.K. Iyengar, Alpha Science International Limited, 4th Edition, 2013.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CS11001 – Programming for Problem Solving - I

B. Tech. CE I Year, I Sem

L	T	P/D	C
2	-	-/-	2

Prerequisite(s): None

Course objectives: Develop ability to

1. Developing flowcharts for given problem.
2. Understand the concepts of variables, constants, basic data types and input and output statements in C programming language.
3. Understand the use of sequential, selection and repetitive statements in algorithms implemented using C programming language.
4. Understand structured design by implementing programs with functions to solve complex problems.
5. Understand the concepts related to arrays and pointers along with dynamic memory allocation using C programming language.

Course Outcomes: At the end of the course, student would be able to

CO1. Demonstrate problem solving skills by developing algorithms to solve problems. Incorporate the concept of variables, constants, basic data types and input and output statement in a C language program.

CO2. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.

CO3. Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.

CO4. Write C programs using 1D and 2D arrays.

CO5. Write C programs using pointers and also with dynamic memory allocation.

UNIT – I

Basics of Computers- Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers.

Logic Building: Flow chart, Algorithm, Pseudo code.

Introduction to Programming – Computer Languages, Creating and running programs, Program Development.

Introduction to the C Language – Background, C Programs, Identifiers, Data Types, Variables, Constants, Input/output functions.

Operators - Arithmetic, relational, logical, bitwise, conditional, increment/decrement, assignment, C program examples. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions.

UNIT - II

Statements- Selection Statements (decision making) – if and switch statements with C program examples.

Repetition statements (loops) - while, for, do-while statements with C Program examples

Statements related to looping – break, continue, goto, Simple C Program examples.

UNIT - III

Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Scope and Lifetime of variables, Storage classes-auto, register, static, extern, type qualifiers, C program examples.

Recursion- recursive functions, Limitations of recursion, example C programs

UNIT -IV

Arrays – Concepts, using arrays in C, arrays and functions, Bubble Sort, Linear Search, two – dimensional arrays-matrix addition and matrix multiplication, Declaration of Multidimensional arrays, Pre-processor Directives, C program examples.

UNIT - V

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, void pointer, null pointer.

Pointer Applications - Arrays and Pointers, Pointer Arithmetic and arrays, passing an array to a function.

Memory allocation functions – malloc(), calloc(), realloc(), free().

Array of pointers, pointers to functions, C program examples.

TEXT BOOKS:

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

REFERENCE BOOKS:

1. Raptor-A flow charting Tool http://raptor.martincarlisle.com
2. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
3. Programming in C. P. Dey and M Ghosh , Oxford University Press.
4. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
5. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20ME11002 – Engineering Graphics

B. Tech. CE I Year, I Sem

L	T	P/D	C
2	-	2	3

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand basic concepts in engineering drawing.
2. Understand the principle of orthographic projection and isometric projection for planes and solids.
3. Draw sectional views of various solids.
4. Draw isometric views and pictorial views of solids.
5. Learn basic concepts and commands in AutoCAD.

Course Outcomes: At the end of the course, student would be able to

CO1: Understand the basic principles of graphics and draw various curves in engineering drawing practice.

CO2: Draw the engineering scales and orthographic projections of points.

CO3: Draw orthographic projections of lines and planes.

CO4: Draw projections of solids and its sectional views.

CO5: Draw the Isometric views and orthographic views of various solids and basic AutoCAD commands for engineering drawings.

UNIT - I:

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid, Hypocycloid.

UNIT - II:

Engineering Scales – Plain, Diagonal.

Orthographic Projections: Principles of orthographic Projections Conventions-Projections of Points.

UNIT - III:

Projections of Lines- Projections of Plane regular geometric figures.

UNIT - IV:

Projections of Regular Solids inclined to one plane, Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone, Sphere.

UNIT -V:

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple Solids – Isometric Projection of objects having non- isometric lines.

Conversion of Isometric views to Orthographic Views and vice versa.

Introduction to CAD: (For Internal Evaluation only): Introduction to CAD Software Package Commands. - Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhatt / Charotar, 53rd Edition 2016.
2. Engineering Drawing, Basant Agrawal and C M Agrawal, McGrawHill, 2nd Edition 2013.

REFERENCE BOOKS:

1. Engineering Drawing , N. S. Parthasarathy and Vela Murali, Oxford, 1st Edition 2015.
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson, 2nd Edition 2013.
3. Computer Aided Engineering Drawing – K Balaveera Reddy, CBS Publishers. 2nd Edition 2015.
4. Engineering Graphics with AutoCAD, Dr.D.M. Kulkarni and A. Sarkar., Prentice Hall India, New Delhi, 2009

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE11001 – Engineering Mechanics: Statics and Dynamics

B. Tech. CE I Year, I Sem

L	T	P/D	C
3	1	-/-	4

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand basic terms, represent and analysis of forces to simplify any force system using free body diagram.
2. Understand the concept of free body diagrams under equilibrium condition and apply equilibrium equations to solve problems comprising frictional forces.
3. Determine centroid, centre of gravity and moment of inertia for standard sections and composite bodies.
4. Understand the principles of dynamics to engineering problems.
5. Understand connection of forces in trusses and in general frame structures.

Course Outcomes: At the end of the course, student would be able to

CO1. Describe position, forces, and moments in terms of vector notation in two and three dimensions.

CO2. Draw free body diagrams accurately and write appropriate equilibrium equations from the free body diagram, including support reactions and also apply concepts of equilibrium to analyze systems that include frictional forces.

CO3. Calculate centroid, centre of gravity and moment of inertia for standard sections and composite bodies.

CO4. Apply the principles of kinematics, kinetics and work energy to find the solutions of various problems in straight and curvilinear motions.

CO5. Calculate and analyze the forces in members and structures by the method of joints and method of sections.

UNIT–I:

Introduction of Engineering Mechanics:

Basic Concepts: Scope of mechanics, preview in statics and dynamics, fundamental concepts, scalar and vector quantities, Newton laws. Resultants of force system: Introduction, Parallelogram Law, force and components, Resultant of coplanar concurrent forces, Moment of

force and principles of moments, Varignon's theorem, couple and moment of couple, Resultant of any force system, Components of forces in space, Spatial forces and its applications.

UNIT–II:

Equilibrium of force system:

Introduction, free-body diagram, Types of supports, Lami's theorem and its limitations, Equations of Equilibrium, Equilibrium of planar system.

Friction:

Types of friction, Mechanism of friction, Laws of Friction, Limiting friction, Static and Dynamic Frictions, Angle of Friction, Cone of limiting friction, Friction of wedge, block and Ladder.

UNIT–III:

Centre of Gravity:

Centre of Gravity: Introduction, Centroid of a lamina, Moment of an area about a point. Centroid of a line, Centroids of laminae of various shapes- Triangle, semicircle, Trapezium- Composite section, Theorems of Pappus.

Moments of Inertia:

Moment of Inertia of a laminae, Radius of gyration, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia of laminae of various shapes. Polar moment of inertia, Product of inertia.

UNIT–IV:

Kinematics of a particle:

Introduction, Types of motion, Review of a particle dynamics, Rectilinear motion, Projectile motion.

Kinetics of particles

Introduction, Types of motion, D'Alembert's principle and its applications in plane motion and connected bodies. Work Energy Principle and its application in plane motion of connected bodies.

UNIT–V:

Analysis of structures

Introduction, Types of trusses, elements of trusses, Two force member concept, Assumptions for truss analysis, Analysis of trusses-method of joints, method of sections.

TEXT BOOKS:

1. Singers Engineering Mechanics: Statics And Dynamics , 3Rd Ed. (Sl Units) by Reddy K Vijaya Kumar, BS Publications, 2010.
2. Engineering Mechanics by S.S. Bhavikatti, New Age International Publishers, India, 2019.

REFERENCE BOOKS:

1. Engineering Mechanics, Timoshenko, D H Young & J V Rao, McGraw Hill, India, 5th Edition, 2013.
2. Engineering Mechanics - Statics and Dynamics, R. C. Hibbeler, Pearson Education India Publications, 2017.
3. Engineering Mechanics, K.L Kumar, Tata McGraw Hill, India, 4th Edition, 2017.
4. Engineering Mechanics - Statics and Dynamics, N H Dubey, Tata McGraw Hill, India, 2017.
5. Engineering Mechanics, Ferdinand. L. Singer, Harper – Collins publishers, New Delhi,1998.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20PH11L02 – Engineering Physics Lab

B. Tech. CE I Year, I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Determine the frequency of a given tuning fork and a.c. source.
2. Determine the moduli of elasticity and coupling constant.
3. Determine radius of curvature of a plano convex lens, dispersive power of given prism and number of lines drawn on grating per inch.
4. Determine the resonant frequency and quality factor of LCR circuit.
5. Determine the wavelength of a given laser source, numerical aperture and attenuation of optical fiber.

Course Outcomes: At the end of the course, student would be able to

CO1. Compute the frequency of tuning fork and a.c. source.

CO2. Infer the moduli of elasticity of given material, explain the concept of conservation of energy and resonance.

CO3. Demonstrate the optical phenomena like interference and diffraction.

CO4. Compute the resonance frequency and quality factor of a LCR circuit.

CO5. Calculate the wavelength of given laser source and numerical aperture, bending losses in optical fiber.

List of Experiments: (Note: Any 8 experiments are to be performed)

1. **Melde's experiment:**
   Determination of frequency of a vibrating bar or tuning fork using Melde's arrangement.
2. **Torsional Pendulum:**
   Determination of rigidity modulus of the material of the given wire using torsional pendulum.
3. **Sonometer:**
   Determination of frequency of a.c. source using sonometer and electromagnet.
4. **Newton's rings:**
   Determination of radius of curvature of the plano convex lens by forming Newton's rings.
5. **Diffraction grating:**
   Determination of number of lines per inch of the grating.

6. **Dispersive power:**

   Determination of dispersive power of prism by using spectrometer.

7. **Coupled Oscillator:**

   Determination of coupling constant by single coupled oscillator.

8. **LCR Circuit:**

   Determination of resonant frequency and quality factor of LCR circuit.

9. **LASER:**

   Study the characteristics of LASER sources.

10. **Optical fiber:**

    Determination of bending losses and Numerical aperture of a given optical fiber.

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20CS11L01 – Programming for Problem Solving – I Lab

B. Tech. CE I Year, I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Developing flowcharts for given problem.
2. Understand the concepts of variables, constants, basic data types and input and output statements in C programming language.
3. Understand the use of sequential, selection and repetitive statements in algorithms implemented using C programming language.
4. Understand structured design by implementing programs with functions to solve complex problems.
5. Understand the concepts related to arrays and pointers along with dynamic memory allocation using C programming language.

Course Outcomes: At the end of the course, student would be able to

CO1. Demonstrate problem solving skills by developing algorithms to solve problems. Incorporate the concept of variables, constants, basic data types and input and output statement in a C language program.

CO2. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.

CO3. Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.

CO4. Write C programs using 1D and 2D arrays.

CO5. Write C programs using pointers and also with dynamic memory allocation.

LIST OF EXPERIMENTS

Week-1

Introduction to RAPTOR Tool

Draw Flow chart using RAPTOR to,

a. Read two numbers from user and calculate addition and subtraction of those numbers
b. Read two numbers from user at the time of execution and calculate multiplication and division of those numbers

c. Find the square of a given number (take the number from the user)

d. Calculate the value of Y from the equation $y = x^2 + 2x + 3$ (read the value of X from user)

e. Calculate the area of a Circle

f. Find the sum of square of two numbers

Week-2

a. Write a C program to perform arithmetic operations

b. Write a C program to implement increment and decrement operators

c. Write a C program to implement conditional operator

a. Write a C program to implement bit wise operator

Week-3

Draw Flow chart using RAPTOR tool and Implement using C program to,

a. Check whether the given number is Positive or Negative.

b. Check whether the given number is even or odd.

c.Calculate the Largest of two numbers.

d.Check the given year is leap year or not.

Week-4

Draw Flow chart using RAPTOR tool and Implement using C program to,

a. Calculate and display the grade of a student

   i. < 30 % - Fail

   ii. Between 31 and 50 – C grade

   iii. Between 51 to 60 – B grade

   iv. Between 61 to 75 – A grade

   v. Greater than 75 – distinction

b. Find the quadratic roots of an equation (real or imaginary)

c. Check the given number is multiple of 2,4and 8.

Week-5

Draw Flow chart using RAPTOR for,

a. Displaying n numbers using looping

b. Calculating the sum of n natural numbers

c. Calculating sum of even numbers and odd numbers from 1 to n (n value supplied by the user)

Week-6

a. Write a C program to implement arithmetic calculator using switch-case.

b. Write a C program to find sum of n natural numbers.

c. Write a C program to find sum of individual digits of the given number

d. Write a C program to find factorial of a given number

Week-7

a. Write a C program to check the given number is prime or not.

b. Write a C program to check the given number is Palindrome or not.

c. Write a C program to display the prime numbers below n.

Week-8

a. Write a C program to find GCD and LCM of two given numbers using functions

b. Write a C program to check the given number is Armstrong number or not using functions.

Week-9

a. Write a C program to find the sum of prime numbers from 1 to n using functions.

b. Write a C program to generate Fibonacci series for n number of terms.

Week-10

a. Write a C program to find the factorial of a given number using recursive function

b. Write a C program to generate the Fibonacci series using recursive function.

c. Write a C program to find GCD and LCM of two numbers using recursive function.

Week-11

a. Write a c program to find largest and smallest numbers in a list of array elements using functions

b. Write a C program to sort the given list of elements in ascending order using Bubble Sort.

c. Write a c program to search for a given element in the list of array and display the "location" if the number is found else print "the number is not found". Using fixed length and variable length array

Week-12

a. Find the duplicate elements in the list of sorted array

b. Write a C program that uses functions to perform the Addition of Two Matrices

c. Write a C program that uses functions to perform the Multiplication of Two Matrices

Week-13

a. Write a C program to swap two integers using following methods
   i. call by value
   ii. call by reference

a. Write a C program to find sum of even and odd numbers using functions and pointers

Week-14

a. Write a C program to find Largest Number Using Dynamic Memory Allocation.
b. Write a C program to return multiples values from a function using pointers

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20EN12001 – English

B. Tech. CE I Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course objectives: Develop ability to

1. Improve the language proficiency in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Comprehend any critical aspect effectively using theoretical and practical components of English.
3. Develop Study Skills and Communication Skills in formal and informal situations.
4. Speak proficiently and listen effectively.

Course Outcomes: At the end of the course, student would be able to

CO1. Infer /use the vocabulary appropriately in any situation.

CO2. Construct meaningful and explicit sentences in written form.

CO3. Acquire basic proficiency in English including reading comprehension and writing skills.

CO4. Communicate confidently in various contexts and different cultures.

CO5. Comprehend the given text and respond appropriately.

CO6. Speak proficiently and listen effectively.

UNIT – I:

'Raman effect' from the prescribed text book 'English for Engineers' published by Cambridge University press.

Vocabulary Building: Etymology; The Concept of word formation, the use of Prefixes and Suffixes, One-word substitutes.

Grammar: Identifying Common Errors in writing with reference to Articles and Prepositions.

Reading: Improving Reading Comprehension skills-Techniques for effective reading.

Writing: Importance of proper Punctuation, Types of sentences-simple, compound and complex sentences.

UNIT – II:

'Ancient Architecture in India', from the prescribed text book 'English for Engineers' published by Cambridge University press.

Vocabulary Building: Synonyms and Antonyms, homonyms ,homophones, homographs.

Grammar: Identifying Common Errors in writing with reference to Noun-Pronoun Agreement and Subject Verb-Agreement.

Reading: Improving Reading Comprehension skills; Skimming and Scanning: Techniques for good Comprehension.

Writing: Paragraph writing: types, Structures and features of Paragraph, Creating Coherence, Organizing Principles of Paragraphs in a document, expansion of proverbs.

UNIT – III:

'Patriotism beyond politics and religion' from 'Ignited Minds'-unleashing the power within India by Dr. APJ Abdul Kalam-Published by Penguin Books.

Vocabulary Building: Words from Foreign Languages and their use in English-word roots.

Grammar: Identifying common errors in writing with reference to misplaced and dangling modifiers and Tenses.

Reading: Sub skills of Reading; Skimming and Scanning.

Writing: Format of a formal Letter, Writing Formal Letters: Letter of Complaint, Letter of Requisition, Cover Letter with Resume, Abstract Writing.

UNIT – IV:

'What should you be Eating' from the prescribed text book 'English for Engineers' Published by Cambridge University press.

Vocabulary Building: Idioms and phrases, phrasal verbs.

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension-Intensive Reading and Extensive Reading, searching for implied meaning-answering the questions on theme and tone.

Writing: Writing Practices-Writing Introduction and Conclusion, Blog Writing and Responding to Blogs, Essay Writing - Précis Writing.

UNIT – V:

'How a Chinese Billionaire built her fortune' from the prescribed text book 'English for Engineers' Published by Cambridge University press.

Vocabulary Building: Practice exercises.

Grammar: Active and Passive Voice.

Reading: Reading Comprehension-Exercises for Practice-unseen passages.

Writing: Technical Reports; Introduction, Characteristics of report, categories of reports, Formats, Structure of reports (Manuscript Format) and Types of Report.

TEXT BOOKS:

1. Sudarshana, N.P. and Savitha, C. (2018). *English for Engineers,* Cambridge University Press.
2. Penguin Books eBook: Ignited Minds- unleashing the power within India by Dr. A.P.J.Abdul Kalam- Published by Penguin Books.

REFERENCE BOOKS:

1. Swan, M. (2016) *Practical English Usage*. Oxford University Press.
2. Mikulecky Beatrice S & Linda Jeffries, Pearson Publications, 2007

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20MA12001 – Multi Variable Calculus

B. Tech. CE I Year, II Sem

L	T	P/D	C
3	1	-/-	4

Prerequisite(s): 20MA11001- Basic Engineering Mathematics

Course objectives: Develop ability to

1. Compute partial derivatives, composite functions of several variables and apply the methods of differential calculus to optimize multivariable functions and evaluate improper integrals using Beta and Gamma functions.
2. Evaluate definite integrals to calculate surface and volume of revolutions of curves, multiple integrals and apply the same to solve engineering problems.
3. Explain properties of vector operators. To determine solenoidal/irrotational vectors, directional derivatives of vectors.
4. Determine the length of a curve, area between the surfaces and volumes of solids using vector integration.
5. Solve partial differential equations using method of separation of variables and their applications to solve heat and wave equations.

Course Outcomes: At the end of course, the student would be able to

CO1. Apply the method of Lagrange Multipliers to solve such constrained optimization problems, evaluate improper integrals,

CO2. Compute surface areas and volumes of revolutions of curves using definite integrals, multiple (Double and Triple) integrals and apply the concepts of same to find the areas and volumes

CO3. Calculate scalar potential for a vector and directional derivative of a scalar point function.

CO4. Compute length of a curve, area between the surfaces and volumes of solids using vector integrations.

CO5. Apply method of separation of variables to solve problems like one dimensional wave and heat equations that arise in engineering branches.

UNIT - I: Partial Differentiation, applications and Beta, Gamma Functions

Definitions of Limit and Continuity, Partial Differentiation, Euler's Theorem, Total derivative, Jacobian, Functional dependence and independence, *Maxima and Minima of functions of two variables and three variables using method of Lagrange multiplier.

Improper Integrals: Beta and Gamma functions and their applications.

UNIT - II: Multiple Integrals and Applications of Integration

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates).

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form).

Evaluation of Triple Integrals, change of variables (Cartesian to polar) for double integrals, (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

UNIT - III: Vector Differentiation

Vector point functions and Scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and Normal line, Vector Identities, Scalar potential function, Solenoidal and Irrotational vectors.

UNIT - IV: Vector Integration

Line, Surface and Volume Integrals. Fundamental theorems of Vector Integration: Green's Theorem, Gauss divergence Theorem and Stokes Theorem (without proofs).

UNIT - V: Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order Linear (Lagrangian) equation, Method of separation of variables for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation, One dimensional Heat equation.

*Enlightenment with flowchart and algorithmic approach.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th Edition, 2011.

REFERENCE BOOKS:

1. A Text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, 10th Edition, 2015.
2. Advanced Engineering Mathematics, H.K. Das, S. Chand and Company Ltd, 21st Edition, 2013.
3. Advanced Engineering Mathematics, Dr. A. B. Mathur and Prof. V.P. Jaggi, Khanna Publishers, 6th Edition, 2019.
4. Advanced Engineering Mathematics, R.K. Jain and S.R.K. Iyengar, Alpha Science International Limited, 4th Edition, 2013.

Geethanjali College of Engineering and Technology (Autonomous)
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20CS12001 – Programming for Problem Solving - II

B. Tech. CE I Year, II Sem

L	T	P/D	C
2	-	-/-	2

Prerequisite(s): 20CS11001 - Programming for Problem Solving-I

Course objectives: Develop ability to

1. Understand the concepts of strings ,structure, union, and enumerated types
2. Understand linear lists and their implementation using arrays and linked list.
3. Understand the classical approaches to sorting arrays: selection sort, quick sort, insertion sort; sequential and binary searching algorithms.
4. Concepts and principles of stacks and queues and their applications.
5. Understand the basic characteristics of text, binary files and C implementation of file I/O using streams and command line arguments.

Course Outcomes: At the end of the course, student would be able to

CO1. Implement string functions and use the type definition, enumerated types, define and use structures, unions in programs using C language.

CO2. Ability to implement linear lists in programs using C language.

CO3. Write programs that sort data using selection, quick, insertion sort techniques and perform search mechanisms either by sequential or binary search techniques using C language program.

CO4. Demonstrate the basic operations of stacks and queues using C program.

CO5. Write programs that read and write text, binary files using the formatting and character I/O functions.

UNIT – I

Strings – Concepts, C Strings, String Input / Output functions, string manipulation functions, arrays of strings, string / data conversion, C program examples.

Enumerated Types– The Type Definition (typedef), Enumerated types.

Structure and Union Types – Declaration, initialization, accessing structures, operations on structures, Complex structures, Structures and functions, passing structures through pointers, self-referential structures, unions, bit fields.

UNIT – II

Linear list - Singly linked list implementation, insertion, deletion and searching operations on linear list

UNIT - III

Sorting - Selection sort, Quick Sort, Insertion sort techniques (Using Arrays)

Searching - Linear search, Binary search techniques (Using Arrays)

UNIT – IV

Stacks – Introduction, Principle, Operations: Push and Pop, In-fix to Post-Fix Conversion and Post-Fix evaluation. (Array implementation.)

Queues - Introduction, Principle, Operations: Enqueue and Dequeue. (Array implementation.)

UNIT – V

File Input and Output – Concept of a file, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions.

Command line arguments.

Program Development – Multi-source files, Separate Compilation of functions.

TEXT BOOK(S):

1. Computer Science: A Structured Programming Approach Using C, B.A. Forouzan and R.F. Gilberg, Thompson Learning, 3rd Edition,

REFERENCE BOOKS:

1. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.
3. Programming with C, B.Gottfried, 3rd edition, Schaum‟s outlines, TMH.
4. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.
5. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CH12001 – Engineering Chemistry

B. Tech. CE I Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course objectives: Develop ability to

1. Impart the knowledge of atomic, molecular and electronic modifications for understanding properties of complexes.
2. Acquire the knowledge of various water treatment methods to resolve the problem of water hardness.
3. Understand the essential concepts of electro chemistry and corrosion with a perspective of their industrial applications.
4. Learn the synthetic aspects of drugs and polymers through organic reaction mechanisms.
5. Understand the significance of various spectroscopic techniques and their application in medical and other fields.

Course Outcomes: At the end of the course, student would be able to

CO1. Apply the concepts of atomic, molecular and electronic changes for the calculation of CFSE and magnetic moments in complexes.

CO2. Analyze ground water and choose an appropriate treatment method for domestic and industrial applications.

CO3. Interpret the concepts of electrochemistry for the construction of batteries and understanding corrosion for its prevention.

CO4. Explain various reaction mechanisms and apply them in the synthesis of organic compounds of industrial significance.

CO5. Use the principles of various spectroscopic techniques in medicine and other fields.

UNIT – I: Molecular structure and Theories of Bonding (9 hours)

Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), Molecular orbitals of diatomic molecules, Molecular Orbital Energy Level diagrams of N_2, O_2 and F_2 molecules. Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbitals in Tetrahedral and Octahedral geometries. Crystal Field

Stabilization Energies (CFSE). Applications of CFT- Magnetic Properties of the Octahedral and Tetrahedral Complexes.

UNIT - II: Water and its treatment (9 hours)

Introduction – Hardness of water – Causes of hardness - Types of hardness: temporary and permanent – Expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water - Reverse osmosis. Numerical problems.

UNIT - III: Electrochemistry and corrosion (12hours)

Electrochemical cells – Electrode potential, Standard electrode potential, Types of electrodes – calomel, quinhydrone and glass electrode. Nernst equation, Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

Causes and effects of corrosion – Theories of chemical and electrochemical corrosion – Mechanism of electrochemical corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroless plating of Nickel.

UNIT - IV: Reaction Mechanisms and polymeric materials (9 hours)

Reaction Mechanisms

Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions. Electrophilic and Nucleophilic addition reactions: Addition of HBr to propene. Markovnikov's and anti-Markovnikov's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydrohalogenation of alkyl halides, Saytzeff's rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and Chromic acid.

Reduction reactions: Reduction of carbonyl compounds using $LiAlH_4$ & $NaBH_4$. Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Polymeric materials

Classification of polymers, Types of Polymerization - addition and condensation, Differences

between addition and condensation polymers, Mechanism of free radical addition polymerization. Preparation, properties and engineering applications of PVC, Teflon and Nylon-6, 6.

UNIT - V: Spectroscopic techniques and applications (9 hours)

Introduction to spectroscopic techniques- Electronic spectroscopy- Beer lambert's law, Principle of UV-Visible spectroscopy, Selection rules, Types of electronic transitions and applications of UV-Visible spectroscopy; Vibrational and rotational spectroscopy- IR spectroscopy-Principle-Mode of vibrations, Selection rules, Applications of IR spectroscopy, Nuclear magnetic resonance Spectroscopy- Principle, Chemical shift, Factors influencing chemical shift, Medical application of NMR spectroscopy - Magnetic Resonance Imaging.

TEXT BOOKS:

1. Engineering Chemistry by B.Ramadevi, Prasanta Rath and Ch.Venkata Ramana Reddy, Cengage Publications, 2018.
2. A Text Book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publishers, 2020.

REFERENCE BOOKS:

1. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company, 17th edition, 2015.
2. Elements of Physical Chemistry by P.W. Atkins 4th Edition.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell, 4th Edition.
4. Selected topics in Inorganic Chemistry by Wahid U. Malik, G.D. Tuli and R.D Madan. S. Chand publications, 17th Edition.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE12001 – Engineering Geology

B. Tech. CE I Year, II Sem

L	T	P/D	C
2	-	-/-	2

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand weathering process of Rocks.
2. Understand engineering properties of minerals and rocks.
3. Understand the nature of geological structures and their importance in civil engineering structures.
4. Understand the concept of geophysical investigations for various foundations.
5. Understand geology of dams and tunnels.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain importance of geology in civil engineering and weathering process of rocks.

CO2. Classify minerals and rocks based on their properties.

CO3. Analyze geological structures in civil engineering constructions.

CO4. Categorize geophysical methods to study of subsurface conditions for foundation of civil engineering constructions.

CO5. Recommend tunneling sites and selection of a dam sites based on different geological factors.

Unit – I

Introduction: Internal structure of the earth and its composition. Importance of geology from civil engineering point of view. Brief study of case histories of failures of some civil engineering constructions due to geological drawbacks.

Weathering of rocks: Weathering and different types of weathering, Weathering of common rock like “Granite”

UNIT – II

Mineralogy: Definition of mineral, different methods of study of minerals. Advantages of study of minerals by the physical properties. Study of physical properties of following common rock forming minerals: Quartz, Feldsper, Flint, Jasper, Agate, Olivine, Hornblende, Muscovite,

Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Hematite, Magnetite, Pyrite, Galena, Pyrolusite, Graphite, Magnesite and Bauxite**.**

Petrology: Definition of rock - Geological classification of rocks - Igneous, Sedimentary and Metamorphic rocks. Common textures and structures of igneous, sedimentary and metamorphic rocks. Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT- III

Structural Geology: Geological time scale, strike and dip, study of common geological structures associating with the rocks such as folds, faults, unconformities and joints – their important types.

UNIT –IV

Geophysical Studies: Principles of geophysical study by Gravity methods, Magnetic methods, Radio metric methods and Geothermal methods. Special importance of Electrical resistivity methods and seismic refraction methods.

UNIT – V

Dams and Reservoirs: Types of dams - Geological considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Life of a reservoir.

Tunnels: Purposes of tunneling - Role of geological considerations (lithological, structural and ground water) in tunneling.

TEXT BOOK:

1. Engineering Geology by N.Chennkesavulu, Laxmi Publications, 2018.
2. Engineering Geology, D. Venkat Reddy, Vikas Publications,2017.

Reference Books:

1. Principles of Engineering Geology by K.V.G.K. Gokhale-B.S publications, 2013.
2. Engineering and General Geology, Parbin Singh, S.K. Kataria & Sons, 2013.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20EN12L01 – English Language Communication Skills Lab (ELCS)

B. Tech. CE I Year, II Sem

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Facilitate computer-assisted multimedia instruction enabling individualized and independent language learning.
2. Sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm.
3. Bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. Improve the fluency of students in spoken English and neutralize their Mother Tongue Influence.
5. Train students to use language appropriately for public speaking and interviews.

Course Outcomes: At the end of the course, student would be able to

CO1. Listen actively, speak fluently and write accurately.

CO2. Speak with clarity and confidence reducing MTI and enhance Employability Skills.

CO3. Demonstrate better understanding of nuances of English Language.

CO4. Communicate intelligibly at work place.

CO5. Perform effectively in Interviews.

CO6. Plan and present ideas explicitly.

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

Module-I

CALL Lab:

Understand: Listening: Listening Skill-Its importance-Purpose-Process-Types-Barriers to Listening.

Practice: Introduction to Phonetics-Speech Sounds-Vowels and Consonants-Minimal pairs.

ICS Lab:

Understand: Communication at Work Place-Spoken vs. Written language.

Practice: Speaking : Ice-Breaking Activity and JAM Session. Know your partner activity.

Module-II

CALL Lab:

Understand: Listening: Structure of Syllable, Word Stress and Rhythm, Weak Forms and Strong Forms in Context**.**

Practice: Basic Rules of Word Accent-Stress Shift-Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation–Non-verbal Communication.

Practice: Speaking: Telephone Etiquette, Situational Dialogues-Greetings-Taking Leave-Making request and seeking permission-Introducing oneself and others.

Module-III

CALL Lab:

Understand: Listening: Intonation; Errors in pronunciation-The interference of Mother Tongue (MTI) examples from different parts of the country.

Practice: Common Indian Variants in Pronunciation- Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Speaking: Descriptions- Places, Objects, Events and Process-Formal Presentations.

Module-IV

CALL Lab:

Understand: Listening for General Details. (2 practice exercises)

Practice: Listening Comprehension Tests. (2 practice exercises)

ICS Lab:

Understand: Public Speaking-Debate-Exposure to Structured talks.

Practice: Speaking: Making a Short Speech-Extempore. (2 practice exercises, Talks. (2 practice exercises) 'My Newspaper' activity.

Module-V

CALL Lab:

Understand: Listening: Listening for Specific Details. (2 practice exercises)

Practice: Listening Comprehension Tests. (2 practice exercises)

ICS Lab:

Understand: Speaking: General Interview Skills.

Practice: General Interview Strategies and Skills.

BOOKS RECOMMENDED

1. Krishna Mohan & N. P Singh: *Speaking English Effectively* 2nd ed., MacMillan Publishers, 2011.
2. ELCS Lab Manual prepared by Faculty, Department of English, GCET.

REFERENCE BOOKS:

1. English Language Communication Skills Lab Manual cum Workbook by Cengage Learning India, 2013.
2. Podcasts on Listening, Cambridge University Press.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CS12L01 – Programming for Problem Solving – II Lab

B. Tech. CE I Year, II Sem

L	T	P/D	C
-	-	2	1

Prerequisite(s): 20CS11L01-Programming for Problem Solving-I

Course objectives: Develop ability to

1. Understand the concepts of strings ,structure, union, and enumerated types
2. Understand linear lists and their implementation using arrays and linked list.
3. Understand the classical approaches to sorting arrays: selection sort, quick sort, insertion sort; sequential and binary searching algorithms.
4. Concepts and principles of stacks and queues and their applications.
5. Understand the basic characteristics of text, binary files and C implementation of file I/O using streams and command line arguments.

Course Outcomes: At the end of the course, student would be able to

CO1. Implement string functions and use the type definition, enumerated types, define and use structures, unions in programs using C language.
CO2. Ability to implement linear lists in programs using C language.
CO3. Write programs that sort data using selection, quick, insertion sort techniques and perform search mechanisms either by sequential or binary search techniques using C language program.
CO4. Demonstrate the basic operations of stacks and queues using C program.
CO5. Write programs that read and write text, binary files using the formatting and character I/O functions.

LIST OF EXPERIMENTS

Week 1:

a. Write a C program to find whether a given string is palindrome or not.
b. Write a C program to insert characters at a given location in a given string.
c. Write a C program to delete characters from a given string and position
d. Write a C program to print the number of vowels and consonants using Strings

Week 2:

a. Write a C program to convert Roman number to Decimal Number.
b. Write a C program to find the 2's Compliment of a given string
c. Write a C program to Reverse a String by Passing it to function
d. Write a C Program to Input a String with at least one Number, Print the Square of all the Numbers in a String

Week 3:

Write a C program to implement complex structures for the following operations.

i. Addition of two Complex numbers
ii. Multiplication of two Complex Numbers

Week 4:

a. Write a C program to implement arrays of structures?
b. Write a C program to implement bit fields in C?

Week 5:

a. Write a C Program to store the information (name, roll no, and branch) of a student using unions.
b. Write a C program to implement inter function communication by passing pointers to a structure.

Week 6:

Write a C program to implement singly linked list for the following operations.
a)Insertion b)Deletion c)Search

Week 7:

a. Write a C program to sort the elements using Selectionsort
b. Write a C program to sort the elements using Quick sort.

Week 8:

a. Write a C program to sort the elements using Insertion sort
b. Write a C program to search a string in a list of strings using linear search. If the string is found display the position, otherwise print "string not present".

Week 9:

Write a C program to search an element in a list of elements using Binary search. If the element is found, display the position, otherwise print "element not present".

Week 10:

Write a C program convert infix to postfix notation and postfix evaluation using stack.

Week 11:

Write a C program implement Queue using arrays for the following operations.
i)Enqueue ii)Dequeue iii) Peek iv)Display

Week 12:

Write a C program open a new file and implement the following I/O functions.

i) fprintf(), fscanf()
ii) getw(), putw()
iii) getc(), putc()

Week 13:

a. Write a C program to copy data from one file to another.
b. Write a C program to merge two files, using command line arguments.

Week 14:

Write a C program to implement multi file programming for basic arithmetic operations

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CH12L01 – Engineering Chemistry Lab

B. Tech. CE I Year, II Sem

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Estimate the hardness content in water and check its suitability for drinking purpose.
2. Use instrumental methods namely, Potentiometry and Conductometry to find the concentration of a given solution.
3. Measure physical properties like surface tension, adsorption, acid value and viscosity.
4. Explain the synthesis of simple drug molecules such as Aspirin.
5. Determine the rate constant of reactions from concentrations as a function of time.

Course Outcomes: At the end of the course, student would be able to

CO1. Determine parameters like hardness content in water and validate water for its potability.

CO2. Find the concentration of given solution using instrumental techniques such as Potentiometry and Conductometry.

CO3. Determine physical properties like surface tension, adsorption, acid value and viscosity.

CO4. Use preparatory techniques which are fundamental in the synthesis of Aspirin.

CO5. Estimate the rate constant of a reaction from concentration – time relationship.

List of Experiments

I. Titrimetry

1. Determination of total hardness of water by complexometric method using EDTA.
2. Determination of acid value of coconut oil.

II Instrumental Methods

A. Potentiometry

3. Estimation of HCl by Potentiometric titrations.
4. Estimation of Fe^{2+} by Potentiometry using $KMnO_4$.

B. Conductometry

5. Estimation of HCl by Conductometric titrations.
6. Estimation of Acetic acid by Conductometric titrations.

III. Physical Constants

7. Determination of viscosity of a given liquid by using Ostwald's Viscometer.
8. Determination of surface tension of a given liquid using Stalagmometer.

IV.Synthesis

9. Synthesis of Aspirin.

V. Kinetics

10. Determination of rate constant of acid catalysed hydrolysis of methyl acetate.

VI. Additional Experiments

11. Verification of Freundlich adsorption isotherm-adsorption of acetic acid on charcoal.
12. Determination of partition coefficient of acetic acid between n-butanol and water.

REFERENCE BOOKS:

1. Senior Practical Physical Chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi).
2. An introduction to Practical Chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi).
3. Vogel's text book of practical Organic Chemistry 5^{th} edition.
4. Text book on Experiments and calculations in Engineering Chemistry – S.S. Dara.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE12L01 – Engineering Geology Lab

B. Tech. CE I Year, II Sem

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand various physical properties of minerals.
2. Understand characteristics of rocks such as Igneous, Sedimentary and Metamorphic based on their formation.
3. Study of various structural models of rocks and understand the concept of folds and faults.
4. Understand structural geological problems.
5. Understand the operation of Electrical Resistivity Meter in studying the behavior of rocks and groundwater.

Course Outcomes: At the end of the course, student would be able to

CO1. Identify minerals based on physical properties.

CO2. Identify rocks based on megascopic properties.

CO3. Categorize rocks based on microscopic properties.

CO4. Recommend drawing of sections for geological maps of tilted beds and faults.

CO5. Determine structural geological problems such as Strike and Dip.

LIST OF EXPERIMENTS

1. Physical properties for identification of rock-forming minerals**.**
2. Megascopic description and identification of rocks.
3. Microscopic study of rocks.
4. Interpretation and drawing of sections for geological maps showing titled beds, faults, unconformities, etc.
5. Study of structural geological problems.
6. Study of structural geological models.
7. Measurement of Electrical resistivity of rocks and groundwater using electrical resistivity meter.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20ME12L01 – Engineering Workshop

B. Tech. CE I Year, II Sem

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

Course Objectives: Develop ability to

1. Provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
2. Impart a good basic working knowledge required for the production of various engineering products.

Course Outcomes: At the end of the course, student would able to

CO1: Identify and apply suitable tools for manufacturing a engineering components using different trades of engineering processes.

CO2: Explain basic operations of welding, fitting, smithy and carpentry work.

CO3: Analyze of the various electrical equipment connections and their operation.

CO4: Demonstrate an understanding of and comply with workshop safety regulations.

CO5: Demonstrate and practice on machine tools and their operations.

NOTE: *At least **TWO** exercises to be done from each trade.*

I. TRADES FOR EXERCISES:

A. Carpentry exercises:

a) Making of T-lap joint from given pieces of wood as per as for the job drawing.

b) Making of mortise and tenon joint from given pieces of wood as per as for the job drawing.

c) Making of Bridle joint from given pieces of wood as per as for the job drawing.

d) Making of Corner lap joint from given pieces of wood as per as for the job drawing.

e) Making of cross lap joint from given pieces of wood as per as for the job drawing.

B. Fitting exercises:

a) Making of L-Fitting joint from given pieces of mild steel as per as for the job drawing.

b) Making of "V" – joint from given pieces of mild steel as per as for the job drawing.

c) Making of "Half round" joint from given pieces of mild steel as per as for the job drawing.

d) Making of "Dovetail" joint from given pieces of mild steel as per as for the job drawing.

e) Making of "Square" joint from given pieces of mild steel as per as for the job drawing.

C. Tin-Smithy exercises:

a) Making of an Open scoop with soldering from given G.I. sheet as for the job drawing.

b) Making of Rectangular tray with soldering from given G.I. sheet as for the job drawing.

c) Making of Cylinder with soldering from given G.I. sheet as for the job drawing.

d) Making of Hopper with soldering from given G.I. sheet as for the job drawing.

e) Make a funnel with soldering from given G.I. sheet as for the job drawing

D. Black Smithy exercises:

a) Making of an "S-Hook" from given piece of mild steel rod by hand forging.

b) Making of "U-Hook" from given piece of mild steel rod by hand forging.

c) Making of "C-Hook" from given piece of mild steel rod by hand forging.

d) Making of "Flat chisel" from given piece of mild steel rod by hand forging.

E. House-wiring exercises:

a) Practicing of Wiring for simple light circuit for controlling light/fan point (PVC conduit wiring).

b) Practicing of Wiring for light/fan circuit using two way switches (staircase wiring)

c) Measurement of voltage, current and power in a single phase circuit using voltmeter, ammeter and wattmeter. Calculate power factor of the circuit.

d) Practicing of Wiring for a water pump with single phase starter.

F. Foundry exercises:

a) Preparation of mould for the given single piece pattern with green sand.

b) Preparation of mould for the given split piece pattern with green sand.

G. Welding Practice exercises:

a) Preparation of simple butt joint using arc welding from given pieces of mild steel.

b) Preparation of lap joint using arc welding from given pieces of mild steel.

c) Preparation of corner joint using arc welding from given pieces of mild steel.

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Work shop Manual – P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE12P01 - Design Thinking

B. Tech. CE I Year, II Sem

L	T	P/D	C
-	-	4	2

Prerequisite(s):
Knowledge of analyzing societal problems and a zeal to improve the current situation, in addition to usage of laptops/computers, internet, social media interaction and communication etiquette.

Course Objectives: Develop ability to

1. Increase ability to communicate with people, enhance their creative and innovative thinking skills.
2. Examine Design Thinking concepts and principles.
3. Apply Design Thinking methodologies to problems in the field of study and other areas as well.
4. Practice thinking creatively for innovative development.
5. Prepare the student for future engineering positions with scope of understanding dynamics of working between inter departments.

Course Outcomes: At the end of the course, student would be able to

CO1. Develop new ways of creative thinking to learn the innovation cycle of Design Thinking.

CO2. Propose real-time innovative and appropriate frameworks, strategies, techniques.

CO3. Apply the design Thinking approach and model to real world scenarios.

CO4. Perceive individual differences and its impact on everyday decisions and further create a better experience.

CO5. Analyze the role of research in design thinking.

UNIT–I:

Basics of Design Thinking: Definition of Design Thinking, Objective of Design Thinking, Concepts and Brainstorming, Stages of Design Thinking process (explain with examples) – **Empathize, Define, Ideate, Prototype, Test.**

UNIT–II:

Being Ingenious and Fixing problem: Understanding creative thinking process, Understanding problem solving, testing creative problem solving.

UNIT–III:

Prototyping and Testing: What is prototype? Rapid prototype development process, Testing

UNIT–IV:

Celebrating the difference: Understanding individual differences and Uniqueness.
Group discussion and activities to encourage the understanding, acceptance and appreciation of individual differences.

UNIT–V:

Feedback: Final presentation – "Solving practical Engineering problem through Innovative and Creative solution".

TEXT BOOKS:

All the relevant resources available from the authorized sources of internet will be utilized in the course delivery and for defining group activities.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE21001 - Surveying and Geomatics

B. Tech. CE II Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand working principles and importance of land surveying equipment such as chain.
2. Understand the determination of elevations of different points using levelling instruments and plot contour maps.
3. Understand the concepts of Trigonometric levelling using Theodolite and perform tacheometric surveying.
4. Understand evaluation of earthwork involved in excavation of canals, digging of trenches for underground pipelines, formation of bunds, earthen embankments, etc. Understand curves, methods of curve setting and study modern techniques in surveying using Total Station, Global Positioning System (GPS).
5. Understand the advanced surveying methods like photogrammetry, Remote Sensing and Geographic Information Systems (GIS).

Course Outcomes: At the end of the course, student would be able to

CO1. Explain the principles and classifications of plane surveying.

CO2. Perform simple levelling operations and plotting of contour maps.

CO3. Determine horizontal and vertical angles using theodolite and apply the concepts of trigonometric levelling and tachometric surveying.

CO4. Compute areas and volumes of regular and irregular field boundaries and determine the capacity of a reservoir and Design simple and compound curves and understand the applications of Total Station, GPS.

CO5. Explain the advanced land surveying systems like photogrammetry, Remote Sensing and GIS.

UNIT–I:

Introduction: Surveying Objectives - Classification and Principles of Surveying - Scales - Conventional symbols and code of signals - Instruments for surveying - Shrinkage of map.

Measurement of Distances

Linear distances- Approximate methods, Direct Methods- Chains and Tapes - Ranging - Tape corrections and chain corrections.

UNIT–II:

Levelling: Basic definitions - instruments for levelling - principle and classification of levelling - bench marks - levelling staff - readings and booking of levels - longitudinal and cross section, Plotting the profile - Height (level) computations - HI Method, Rise and Fall method - Effect of curvature of Earth and Refraction.

Contouring: Characteristics - Uses of contours - Contours of natural features - Direct & Indirect methods of contouring.

UNIT–III:

Theodolite Surveying: Theodolite and its Types - Fundamental lines - Adjustments - temporary and permanent - Measurement of horizontal angle by repetition method and reiteration method - Measurement of vertical angles - Trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of Traversing - Traverse computations and adjustments - Omitted measurements.

Tacheometric surveying: Instruments - Principles of tacheometry - Stadia and tangential methods of Tacheometry - Distance and Elevation formulae for Staff vertical position.

UNIT–IV:

Computation of Volumes: Determination of volume of earth work in cutting and embankments - Volume of borrow pits - Capacity of reservoirs.

Curves: Types of curves and their necessity - Elements of a curve - Design and setting out - Simple and Compound curves.

Modern Field Survey Systems: Electromagnetic wave theory - Electromagnetic distance measuring system. Electronic Theodolite - Introduction - Principle of working & EDM instruments - Uses and advantages. Total Station - Introduction - Principle of working - Uses - Comparison with conventional surveying. Global Positioning System - Component of GPS - Space segment, Control segment and User segment - Applications of GPS.

UNIT–V:

Photogrammetry Surveying: Introduction - Basic definitions and concepts - perspective geometry of aerial photograph - Basics of relief and tilt displacements.

Remote Sensing: Introduction - Introduction to remote sensing - Electromagnetic Spectrum - interaction of electromagnetic radiation with the atmosphere and earth surface - remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

Introduction to GIS: Introduction to GIS - GIS Components - GIS Applications in Real life - The Nature of geographic data - Maps - Types of maps - Map scale - Types of scale - Map and Globe - Coordinate systems - Map projections - Map transformation - Geo-referencing.

TEXT BOOKS:

1. Surveying and Levelling, R. Subramanian, Oxford University Press India, 2013.
2. Surveying (Volume - 1 & 2), S K Duggal, McGraw Hill Education, 2019.

REFERENCE BOOKS:

1. Text book of Surveying, C. Venkataramiah, Universities Press, 2011.
2. A Text book of Surveying and Levelling, R. Agor, Khanna Publishers, 2015.
3. Surveying (Vol 1, 2 & 3), K R Arora, Standard Book House, 2019.
4. Surveying (Volume - 1, 2 & 3), B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2015.
5. Text Book of Remote Sensing and Geographical Information Systems, M. Anji Reddy, BS Publications/BSP Books, Rpt.2019.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE21002 - Mechanics of Materials

B. Tech. CE II Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): 20CE11001 - Engineering Mechanics: Statics and Dynamics

Course objectives: Develop ability to

1. Understand basic concept of stresses and strains for different materials.
2. Understand analysis of simple beams subjected to various types of loads ,plot Shear force diagram, Bending moment diagram.
3. Understand Computation of shear stresses and bending stresses induced in the beam subjected to various loads .
4. Understand various methods for evaluation of deformations of beams and also the behaviour of columns subjected to axial and eccentric loadings .
5. Understand Principal stresses in structural members, theory of torsion and stresses developed.

Course Outcomes: At the end of the course, student would be able to

CO1. Evaluate the strength of various civil engineering materials against structural actions such as compression ,tension, shear and bending.

CO2. Construct shear force and bending moment diagrams for beams.

CO3. Compute shear stress and bending stress induced in the beams due to various loads, plot shear stress distribution diagram across the cross section of the beam.

CO4. Determine slope and deflections of various types of beams and to analyse columns and struts.

CO5. Determine principal stresses using analytical and graphical methods; design circular shafts.

UNIT–I:

Simple stresses and strains: Elasticity and plasticity – Types of stresses and strains – Hooke's law– Stress-strain curve for ductile materials –Working stress – Factor of safety – Lateral strain, Poisson's ratio and Volumetric strain – Elastic modulii and relationship between them – Bars of varying section – Composite bars –Temperature stresses – Elastic constants .

Strain Energy: Resilience – Strain energy due to Gradual, Sudden, Impact and Shock loadings – Simple applications.

UNIT–II:

Shear Force and Bending Moment: Definitions – Types of beams and loads – Concept of shear force and bending moment – Relationship between Shear force, Bending moment and rate of loading at a section in a beam – Shear force and bending moment diagrams for cantilever, simply supported and overhanging beams subjected to Point loads, Uniformly distributed loads, Uniformly Varying load, Couple and Combination of these loads – Point of contraflexure.

UNIT–III:

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, circular sections (hollow and solid) ,I,T ,angle and channel sections – Design of simple beam sections.

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

UNIT–IV:

Deflection of Beams : Beam bending into a circular arc – Slope, Deflection and Radius of Curvature – Differential equation for the elastic curve of a beam – Double integration and Macaulay's method for determination of slope and deflection for cantilever and simply supported beams subjected to point loads ,uniformly distributed loads –Mohr's theorems – Moment area method –Application to simple cases.

Columns and Struts: Types of columns – Axially loaded compression members –Buckling load – Crushing load – Euler's theorem for long columns – assumptions – Derivation of Euler critical load formulae for various end conditions –Equivalent length of a column – Slenderness ratio – Rankine–Gordon's formula – Long columns subjected to eccentric loads – Secant formula – empirical formula –Straight line formula – Prof.Perrys formula.

UNIT–V:

Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial and biaxial loading – Compound stresses – Normal and Tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear –Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Torsion of circular shafts: Theory of pure bending –Derivation of torsion equation – Assumptions –Torsional moment of resistance –Polar section modulus –Power transmitted by shafts.

TEXT BOOKS:

1. Strength of materials, B.S.Basavarajaiah and P Mahadevappa , Universities Press, 3rd edition,2010.
2. Strength of materials, S.S.Bhavikatti, Vikas Publishing, 4th edition, 2013.

REFERENCE BOOKS:

1. Strength of materials, R.Subramanian, Oxford University Press, 3rd edition, 2016.
2. Mechanics of Materials, Gere & Timoshenko, CBS Publishers, 2004.
3. Strength of materials, S.S.Rattan, McGraw Hill Education, 2011.
4. Fundamentals of solid mechanics, M.L.Gambhir, PHI Learning, 2009.
5. Basic Structural Analysis, C.S.Reddy, McGraw Hill Education, 3rd edition, 2017.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE21003 – Fluid Mechanics

B. Tech. CE II Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand properties of fluids, hydrostatic law and its application in pressure measurement; forces acting on various submerged planes.
2. Understand classification of fluid flow, continuity equation, velocity potential, stream function, flow net analysis.
3. Understand fluid dynamics using Euler's and Bernoulli's equations; measurement of flow using Pitot tube, Venturimeter, Orificemeter, orifices, mouthpieces, notches and weirs.
4. Understand flow characteristics of laminar and turbulent flows; hydraulic gradient line and total energy line; Losses in pipes: series and parallel.
5. Understand concepts of boundary layer theory; separation and control of boundary layer.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain fluid properties, measure fluid pressure and calculate hydrostatic forces acting on a submerged plane.

CO2. Identify and interpret types of flows with relevant equations and solve fluid flow problems by distinguishing velocity potential and stream functions.

CO3. Apply Bernoulli's equation; determine flow velocity and discharge using various instruments.

CO4. Determine minor and major losses through pipes for laminar and turbulent flows.

CO5. Apply the concepts of boundary layer theory.

UNIT–I:

Introduction: Dimensions and Units – Physical properties of fluids: Specific gravity, Density, Specific Weight, Specific Volume, Dynamic and Kinematic Viscosity, Surface Tension, Vapor Pressure and their influences on fluid motion. Classification of fluids – Ideal and Real Fluids. Pressure at a point, Pascal's law – Hydrostatic law – Atmospheric, Gauge and Vacuum pressure

– Measurement of pressure - Manometers: U-tube manometer (Simple & Differential) and mechanical gauges(classification).

Hydrostatic Forces: Hydrostatic forces on submerged plane, Horizontal, Vertical, Inclined and Curved surfaces – Center of pressure.

UNIT–II:

Fluid Kinematics: Description of fluid flow, Stream line, path line, streak lines and stream tubes. Classification of fluid flow: Steady and Unsteady, Uniform and Non-uniform, Laminar and Turbulent, Rotational and Irrotational flows – Equation of continuity for one, two and three-dimensional flows – Definition and properties of stream function and velocity potential function, circulation and vorticity, Characteristics and applications of Flow-net.

UNIT–III:

Fluid Dynamics: Surface and Body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Navier – Stokes equations (Explanation only. No derivation) - Momentum equation and its application – Forces on pipe bend.

Measurement of Flow: Pitot tube, Venturimeter and Orificemeter – Classification of Orifices and Mouthpieces; Flow over Rectangular, Triangular, Trapezoidal and Stepped Notches -Broad crested weirs.

UNIT–IV:

Closed Conduit Flow: Reynolds experiment – Characteristics of Laminar & Turbulent flows. Laws of Fluid friction – Darcy's equation, variation of friction factor with Reynolds number – Moody Charts, Minor losses – pipes in series – pipes in parallel – total energy line and hydraulic gradient line. Pipe network problems. Flow through inclined tubes, water hammer.

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UNIT–V:

Boundary Layer Theory: Boundary layer – concepts, Characteristics of boundary layer along a thin flat plate, Von Karman momentum integral equation, Laminar and Turbulent Boundary layers (no derivations), separation of Boundary Layer, control of Boundary Layer, flow around submerged objects-Drag and Lift- Magnus effect.

TEXT BOOKS:

1. Hydraulics and Fluid Mechanics including Hydraulics machines, P.N. Modi and S.M.Seth, Standard book house, 22nd edition, 2019.
2. Fluid Mechanics, Frank. M. White, McGraw-Hill Education, 2017.

REFERENCE BOOKS:

1. Fluid Mechanics, A.K. Jain, Khanna Publishers, 2014.
2. Fluid Mechanics and Hydraulic Machines, Er. R. K. Rajput, S. Chand publications, 2016.
3. Fluid Mechanics, J F Douglas, J M Gasiorek, J A Swaffield and L B Jack, Pearson 2015.
4. Fluid Mechanics, V.L. Streeter, E.B.Wylie and K.W. Bedford, McGraw-Hill Education, 2017.
5. Engineering Fluid Mechanics, K.L. Kumar, S Chand, 2014

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE21004 - Building Materials, Construction and Planning

B. Tech. CE II Year, I Sem

L	T	P/D	C
2	-	-/-	2

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the necessity of Civil Engineering.
2. Explore various construction materials.
3. Understand construction techniques followed in execution of a structure.
4. Understand various building services, components and types of formwork.
5. Understand the importance of prefabrication and sustainability.

Course outcomes: At the end of the course, students will be able to:

CO 1: Explain the importance of civil engineering.

CO 2: Develop ability to choose the modern construction material appropriate to the climate and functional aspects.

CO 3: Explain construction techniques to be followed in brick, stone, hallow brick masonry, flooring and roofing.

CO 4: Select suitable type of formwork and building services like plumbing and ventilation.

CO 5: Explain the importance of prefabrication and sustainability.

UNIT-I

Scope of Civil Engineering- Functions of a civil engineer – Units and unit conversion – Room dimensions - classification of buildings, relevant building by-laws and regulations (National Building Code of India and Municipality) – Selection of site for building construction.

Introduction to building construction: Building components viz: foundations, walls, lintels, roofs, openings, framed and masonry structures.

UNIT-II

Modern construction materials- Market forms of steel, Aluminum and alloys, Light roofing materials, Timber-Industrial timber products, glass for buildings- Plastics-Reinforced plastics, thermocol, PVC floor sheets, laminated plastics, polythene water tanks.

UNIT-III

Brick Masonry: Technical terms, types of bonds in brick work and their suitability, hallow brick masonry.

Stone Masonry: Technical terms, classification of stone masonry.

Floors: Technical terms – Components of a floor, selection of type of floor - Stone flooring, concrete flooring and Terrazzo flooring.

Roofs: Technical terms - Types of Roofs – Flat, Curved and Trussed Roofs

Damp proofing – Joinery – Doors- Windows – Materials and Types.

UNIT-IV

Building Components: Vertical transportation in buildings - Stair cases, Lifts, ramps, escalators.

Form Work: Types – Requirements of good form work – Standards – Scaffolding – Design; Shoring and Underpinning, Mivan technology.

Building Services: Plumbing services: Water Distribution, Sanitary lines and fittings.

Ventilation: Functional Requirements, Systems of ventilations.

UNIT-V

Prefabricated buildings: Sound insulations – Ventilation – Fire resisting construction prefabricated panels and structures – production, transportation and erection of structures.

Building drawing: Develop concept plan of a residential building (Hand drafting).

TEXTBOOKS

1. Building Materials and Construction, P.C. Varghese, Prentice Hall India Learning Pvt Ltd., 2nd edition, 2015.
2. Building Construction, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publication, 2016.
3. Fundamental building materials by Ken Ward-Harvey, 4th edition.

REFERENCE BOOKS

1. Building Construction by Arora.S.P & Bindra.S.P
2. Building Construction, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publication, 2016.
3. Building Materials, S.K. Duggal, New Age, 2012.

4. G.C. Sahu and Joygopal Jena, Building Materials and Construction, McGraw Hill Education, 2015.
5. Engineering Materials and Building Construction, Rangwala, Charotar, 2015.

Learning resources:

1. https://www.bamboohouseindia.org/
2. https://igbc.in/igbc/
3. https://ciigreenpro.com/ecolabelled-products/categories

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20MB21004 – Engineering Economics and Accounting

B. Tech. CE II Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course objectives: Develop ability to

1. Learn the basic Business types.
2. Understand the impact of the Economy on Business and Firms specifically.
3. Analyze the Business from the Financial Perspective.
4. Understand the importance of handling Capital.
5. Learn fundamental concepts of accounting.

Course Outcomes: At the end of the course, student would be able to

CO1. Understand Business and the impact of economic variables on them.

CO2. Understand the Demand, Supply concepts.

CO3. Analyze the Production, Cost, Market Structure, Pricing aspects.

CO4. Understand capital structure.

CO5. Study the Financial Statements of a Company.

UNIT – I:

Introduction to Business and Economics: Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance. Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II:

Demand and Supply Analysis: Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting. Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT - III:

Production, Cost, Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT - IV:

Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital – Trading Forecast, Capital Budget, Cash Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (AR A) and Net Present Value Method (simple problems).

UNIT - V:

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

TEXT BOOKS:

1. Managerial Economics, Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, 2nd Edition, McGraw Hill Education Pvt. Ltd. 2012.
2. Financial Management, S.N.Maheswari & S.K. Maheswari, Vikas, 2012.

REFERENCE BOOKS:

1. Financial Accounting for Management, Paresh Shah, 2nd Edition, Oxford Press, 2015.
2. Financial Accounting, S. N. Maheshwari, Sunil K Maheshwari, and Sharad K Maheshwari, 5the Edition, Vikas Publications, 2013.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20EE21001 – Basic Electrical Engineering

B. Tech. CE II Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the concepts of DC circuits and its analysis.
2. Understand the concepts of AC single phase circuits and its analysis.
3. Understand the concepts of single phase and three phase Transformers.
4. Understand the concepts of AC and DC machines.
5. Understand the working of various domestic electrical installation components.

Course Outcomes: At the end of the course, student would be able to

CO1. Analyze and solve DC electrical circuits using Circuit laws and theorems.

CO2. Analyze and solve AC electrical circuits.

CO3. Explain the construction, operation of AC and DC Machines

CO4. Analyze the characteristics of DC and AC machines.

CO5. Differentiate various domestic electrical installation components.

UNIT-I:

D.C. Circuits Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II:

A.C. Circuits Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series RL-C circuit.

UNIT-III:

Faradays Laws of Electromagnetic Induction. Statically and dynamically induced emf. Transformers: Ideal and practical transformers, equivalent circuit, losses in transformers and

efficiency. Auto-transformer and Three-phase transformer connections, voltage and current relation.

UNIT-IV:

Direct-Current Machines: Construction, operation and Types. Torque-Speed Characteristics of DC shunt and series motors and its applications. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Single-phase induction motor: Construction and working and its applications.

UNIT-V:

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries and their applications. Elementary calculations for energy consumption.

TEXT BOOKS:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. Electrical Engineering Fundamentals, Vincent Del Toro, Second Edition, Prentice Hall India, Pvt. Ltd.

REFERENCE BOOKS:

1. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
2. L.S. Bobrow, Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
3. “Basic Electrical Engineering”, T.K. Nagsarkar, M.S Sukhija, JNTU Edition, 2005.
4. “A text book of Electrical Technology”, Volume II, B.L.Thereja, A.K.Thereja.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE21L01 - Surveying and Geomatics Lab

B. Tech. CE II Year, I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand the different methods of area calculation and calculate the area using chain.
2. Understand the various levelling operations to find the solutions for field problems.
3. Understand the applications of Theodolite surveying in different field conditions.
4. Understand concept of Tacheometric surveying.
5. Understand the use of Total Station for solving Surveying problems and GPS for finding the positions, Geo-reference the toposheet.

Course Outcomes: At the end of the course, student would be able to

CO1. Measure the area using different methods, chain and plot it.

CO2. Carry out fly leveling, longitudinal, cross-sectioning and plotting of the same.

CO3. Determine the horizontal and vertical angles, measure the heights and distances using theodolite.

CO4. Compute the heights and distances using the principles of tachometric surveying.

CO5. Determine the remote height, distance, gradient between two inaccessible points using total station and find position of station using G.P.S, Geo-referencing the Toposheet.

LIST OF EXPERIMENTS:

1. Computation of Areas:
    a. Theoretical background behind area calculation by using different methods (Demonstration only).
    b. Determination of area by chain and plotting.
2. Fly Levelling (differential levelling).
3. Longitudinal and Cross Sectioning and plotting using Auto Level.
4. Theodolite:
    a. Measurement of horizontal and vertical angles.
    b. Trigonometric levelling (Base is inaccessible).

5. Heights and distances using the principles of Tacheometric surveying.
6. Total Station:
    a. Area determination.
    b. Traversing.
    c. Contouring.
    d. Remote height determination.
    e. Distance, gradient and difference in height between two inaccessible points.
    f. Stake-out.
7. Finding position of stations using G.P.S.
8. Geo-referencing of Toposheet in QGIS software.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE21L02 - Mechanics of Materials Lab

B. Tech. CE II Year, I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand the properties of materials such as Young's Modulus, Torsional strength, Shear strength, Bending strength, tensile strength, toughness and hardness of given metal specimens.
2. Understand the rigidity modulus property of a closed coil helical spring.
3. Understand the deflections of simply supported, Cantilever and Continuous beams.
4. Understand the application of Maxwell's theorem.
5. Understand the application of Electrical resistance strain gauges.

Course Outcomes: At the end of the course, student would be able to

CO1. Determine Young's modulus of materials of simply supported, cantilever and continuous beams by conducting deflection test.

CO2. Determine modulus of Rigidity of materials conducting torsion test and spring test.

CO3. Assess quality of materials by conducting hardness test and Impact test.

CO4. Determine strain using electric resistance strain gauge.

CO5. Determine strength of materials subjected to tension, shear and compression.

LIST OF EXPERIMENTS

1. Conduct tensile test on metal rods to determine Yield stress, ultimate stress, breaking stress, percentage elongation and percentage reduction in area.
2. Determination of Young's modulus, support reactions, shear force and bending moments by conducting deflection test on cantilever beam.
3. Determination of Young's modulus, support reactions, shear force and bending moments by conducting deflection test on Simply supported beam.
4. Determination of modulus of rigidity of a given specimen by conducting torsion test.
5. Determination of hardness for metal specimen namely Mild steel, high carbon steel, stainless steel, brass, copper and Aluminium using Brinnels and Rockwell Hardness

test.

6. Determination of modulus of rigidity using spring test for a given spring specimen.
7. Determination of compressive strength of a given brick/wood by conducting compression test.
8. Determination of Impact toughness of a given specimen using Izod Impact test and Charpy impact test.
9. Determine the strength of the given specimen by conducting shear test using Universal Testing Machine (UTM).
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Determination of Strains on a cantilever beam using Electrical Resistance strain gauges.
12. Determination of Young's Modulus for a given specimen by conducting deflection test on continuous beam.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20EE21L01 – Basic Electrical Engineering Lab

B. Tech. CE II Year, I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course Objectives: Develop ability to

1. Analyze a given network by applying various electrical laws and network theorems
2. Know the response of electrical circuits for different excitations.
3. Apply physical laws to solve for unknowns like currents, voltages, impedances, etc.
4. Inspect the speed torque characteristics of DC motor
5. Inspect the speed torque characteristics Three Phase Induction Motor

Course Outcomes: At the end of the course, student would be able to

CO 1. Get an exposure to basic electrical laws and theorems.

CO 2. Obtain the response of different types of electrical circuits to different excitations.

CO 3. Measure, calculate and relate the basic electrical parameters.

CO 4. Obtain the basic torque speed characteristic of DC motor

CO 5. Obtain the basic characteristics of AC machines.

List of experiments:

1. Verification of KVL and KCL
2. Verification of Superposition Theorem
3. Transient Response of Series RL and RC circuits using DC excitation
4. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
5. Resonance in series RLC circuit
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Load Test on Single Phase Transformer (Efficiency Calculations)
8. Measurement of Active and Reactive Power in a balanced Three-phase circuit
9. Torque-Speed Characteristics of a DC Shunt Motor
10. Torque-Speed Characteristics of a Three-phase Induction Motor

Additional Experiments:

11. Verification of Thevenin's Theorem.

12. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20EN21P01 – English for Effective Communication

Classroom Activity based Course. Hence, Lab. is not required.

B. Tech. CE II Year, I Sem

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Delineate the contextual meaning of various words and their functions in a sentence.
2. Equip themselves with English language skills related to Vocabulary.
3. Improve English language proficiency with an emphasis on Reading skills.
4. Develop study skills related to Critical Writing.

Course Outcomes: At the end of the course, student would be able to

CO1. Use words contextually and to communicate effectively.

CO2. Comprehend passages and make the right inferences.

CO3. Apply critical thinking abilities to make reasoned conclusions.

CO4. Inculcate the habit of using advanced vocabulary to be expressive.

Module-I

History of Words

Etymology: Word Origin, Advanced word roots, words borrowed from different languages to English, **Portmanteau words,** also called **blend**ed words (new coinage of words), assimilation of words.

Module-II

Word Analogy

Vocabulary**:** Same words with different meaning and different words with same meaning,

Analogies: different relationships: worker and tools, worker and article, time sequence, cause and effect, class and species, synonyms, antonyms, person and things sought or avoided, part to the whole and symbols that stand for, degree of intensity, parts of speech.

Module-III

Comprehension Techniques

Reading: Reading for facts, opinions and inferences, reading for critical understanding,

addressing point of view of the author/writer, jumbled paragraphs.

Module-IV

Sentence Equivalence

Writing: sentence completion, Picture perspective: critical thinking, individual perception and obtaining implications.

Classroom Activity based Course. Hence, Lab. is not required.

TEXT BOOKS:

1. Quirk Randolph:*A Comprehensive Grammar of the English Language*, Pearson publications.
2. Lewis Norman: *Word Power Made Easy*,Goyal Publisher, 2011.

REFERENCE BOOKS:

1. Fernald James Champlin, Synonyms and Antonyms, Project Gutenberg, www.gutenberg.net
2. 501 Word Analogy Questions, Learning Express, New York, 2002.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CH21M01 – Environmental Science

(Mandatory Course)

B. Tech. CE II Year, I Sem

L	T	P/D	C
3	-	-/-	-

Prerequisite(s): None

Course objectives: Develop ability to

1. Identify the importance of ecosystem and its functions.
2. Understand the natural resources and their usage in day to day life.
3. Understand the concept of bio-diversity, its values and conservation.
4. Be aware of the causes of different types of pollution and its control.
5. Understand various environmental impacts, requirement of various policies, and legislations towards environmental sustainability.

Course Outcomes: At the end of the course, the student would be able to

CO1. Explain ecosystem and its functions namely, food chain, ecological pyramids etc.

CO2. Acquire knowledge about different types of natural resources such as land, water, minerals, non-renewable energy and their excessive usage leading to detrimental effects on environment.

CO3. Comprehend ecosystem diversity, its values and importance of hot spots to preserve the same.

CO4. Explain different types of pollution, its control and impact on global environment.

CO5. Recognize various environmental impacts and the importance of various acts and policies towards environmental sustainability.

UNIT-I Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, food chains, food webs, and ecological pyramids. Flow of energy, Bio-geochemical cycles, Bioaccumulation, Bio magnification.

UNIT-II Natural Resources: Classification of Resources: Living and Non-Living resources, Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy Resources-renewable and non-renewable.

UNIT-III Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity Act.

UNIT-IV Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Waste water Treatment methods: Primary, Secondary and Tertiary. Overview of air pollution control technologies.

Global Environmental Issues and Global Efforts: Green House Gases and its effect, Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects, Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economic aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of sustainable development goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
2. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by R. Rajagopalan, Oxford University Press. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20MA22001 – Computational Mathematics

B. Tech. CE II Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): 20MA11001- Basic Engineering Mathematics

Course Objectives: Develop ability to

1. Construct a polynomial to satisfy the given set of data.
2. Calculate differentiation and integration for a given set of data/function using various numerical techniques.
3. Apply various numerical techniques to compute approximate solution of a given first order ordinary differential equation with initial condition.
4. Apply the method of least squares to find the best fit curve for the given set of data and calculate approximate zeros of an algebraic/transcendental equations.
5. Calculate solution of system of equations using various numerical methods

Course Outcomes: At the end of course, student would be able to

CO1. Construct a polynomial to satisfy the given tabulated (equally/unequally spaced) data and explore it.

CO2. Apply various numerical techniques to find the approximate differentiation and integration for a given set of data/function.

CO3. Estimate a solution of first order ordinary differential equation with initial condition using various numerical techniques.

CO4. Apply the method of least squares to find the best fit curve for the given set of data and estimate roots of given algebraic /transcendental equations by various numerical methods.

CO5. Apply various numerical methods to find the approximate solution of system of equations

UNIT – I: Interpolation

Introduction, Errors in polynomial Interpolation, Finite Differences: Forward Differences, Backward Differences, Central Differences, Symbolic relations and separation of symbols, Difference Equation: Formation and Complimentary function.

Interpolation with equal and unequal intervals: Newton's forward and backward difference formulae, Lagrange's interpolation formula.

UNIT – II: Numerical Differentiation and Integration

Numerical differentiation: Derivatives using Newton's forward and backward interpolation formula.

Numerical integration: General quadrature formula for equidistant ordinates, Trapezoidal rule, Simpson's $1/3^{rd}$and $3/8^{th}$ Rule.

UNIT – III: **Numerical Solutions of First Order Differential Equations**

Numerical Solution of Ordinary Differential Equations: Taylor's series method, Picard's method of successive Approximation, Single Step Methods for Linear Differential Equations: Euler's method, Euler's modified method, Runge-Kutta fourth order method.

UNIT – IV: **Curve Fitting and Root Finding Methods**

Fit a straight line, Second degree polynomial, Exponential curve and Power curve by method of least squares.

Solution of Algebraic and Transcendental Equations: Bisection Method, Regula-Falsi Method, Iteration Method, Newton-Raphson Method.

Unit-V: Numerical Methods for System of Equations, Eigenvalue Problems

Solving system of linear non-homogeneous equations: L-U Decomposition method (Crout's Method), Jacobi's and Gauss-Seidel Iteration methods.

Numerical computation of Eigenvalues and Eigenvectors using Power method

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th Edition, 2011.

REFERENCE BOOKS:

1. Introductory methods of Numerical Analysis by S.S. Sastry, PHI learning, 5th Edition, 2012.
2. Advanced Engineering Mathematics, Michael Greenberg, Pearson Education, 2nd Edition, 2013.
3. Numerical Methods in Engineering & Science with Programs in C, C++ & MATLAB, B. S. Grewal, Khanna Publishers, 10th Edition, 2012.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE22001 – Structural Analysis

B. Tech. CE II Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): 20CE21002 - Mechanics of Materials

Course objectives: Develop ability to

1. Understand various methods to evaluate propped cantilevers and fixed beams.
2. Analyse the structures by Moment distribution method.
3. Analyse the structures by Slope Deflection method.
4. Analyse the structures by Kani's method and energy theorems.
5. Use arches in structures.

Course Outcomes: At the end of the course, student would be able to

CO1. Analyse propped cantilever and fixed beams.

CO2. Analyse indeterminate structures by moment distribution method.

CO3. Analyse indeterminate structures by slope deflection method

CO4. Apply strain energy theorems in the analysis of indeterminate structures and to analyse by kani's method

CO5. Analyse three and two hinged arches.

UNIT–I:

Propped Cantilever and Fixed Beams: Determination of Static and Kinematic indeterminacies for beams - Analysis of Propped cantilever and Fixed beams, including the beams with different moments of inertia - subjected to different load conditions - Shear force, Bending moment diagrams and elastic curve for propped cantilever and Fixed beams - effect of sinking of support - effect of rotation of support.

Continuous Beams: Claypeyron's theorem of three moments for continuous beams – Analysis of continuous beams with constant and variable moment of inertia with simply supported ends-one or both ends fixed - continuous beams with overhangs

UNIT–II:

Moment Distribution Method: Basic proportions, distribution theorem – relative stiffness – application of continuous beams including settlement of supports – portal frames with and without sway- Horizontal thrust – vertical reactions – Portal frames with sway.

UNIT–III:

Slope Deflection Method: Sign conventions - derivation of slope deflection equations and their modifications for various end conditions – application to beams and frames with and without sway.

UNIT–IV:

Kani's Method: Expressions for final moments – application of rotation contribution method to continuous beams and non-sway portal frames.

Energy Theorems: Strain energy stored due to axial load – bending moment- shear force- work done by force – law of reciprocal theorem – Betti's Law – first theorem of castiglione's and its application – second theorem of castiglione's and its applications.

UNIT–V:

Three Hinged Arches: Support reactions – analysis of parabolic arches including supports at different ends - temperature effects on three hinged parabolic arches.

Two Hinged Arches: Horizontal thrust – analysis of semicircular arches and parabolic arches – reaction locus for two hinged arches.

TEXT BOOKS:

1. Structural Analysis Vol I & II by S.S.Bhavikatti, Vikas Publishing House Pvt.Ltd, 4th edition, 2013.
2. Structural Analysis, Devdas menon, Narosa Publishing House, 2010.

REFERENCE BOOKS:

1. Strength of Materials by S.S.Bhavikatti, Vikas Publishing, 4th edition, 2014.
2. Structural Analysis, Devdas menon, Narosa Publishing House, 2010.
3. Theory of Structures by S. Ramamrutam, Danpat Rai Publication, 2014

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE22002 – Hydraulics and Hydraulic Machinery

B. Tech. CE II Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): 20CE21003 Fluid Mechanics

Course objectives: Develop ability to

1. Understand types of channels and study the design of most economical channel section.
2. Understand surface profiles, hydraulic jump and energy dissipation.
3. Understand forces exerted by jet on fixed vane, moving vane on different planes.
4. Understand components, function, and uses of Pelton wheel, Kaplan and Francis turbines.
5. Understand components, function, and uses of centrifugal and reciprocating pumps along with the basic layout of hydropower plant.

Course Outcomes: At the end of the course, student would be able to

CO1. Design the most economical channel section using Chezy's and Mannings's formulae.

CO2. Compute flow profiles in channel transitions and analyze hydraulic transients; apply dimensional analysis to solve fluid flow problems and plan hydraulic similitude studies.

CO3. Evaluate the performance of vanes due to hydrodynamic forces acting on it.

CO4. Design components of turbines and study their performance characteristics.

CO5. Design components of pumps and study their performance characteristics; Explain basic concepts in Hydropower engineering.

UNIT–I:

Open Chanel Flow: Types of flows – Types of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's, and Bazin formulae for uniform flow – Most Economical sections.

Critical flow: Specific energy – critical depth – computation of critical depth – critical, sub – critical and super critical flows.

UNIT–II:

Non uniform flow: Dynamic equation for G.V.F**,** Surface profiles of various types of slopes, direct step method for surface profiles, Rapidly varied flow, energy dissipation – hydraulic jump, surges & its types.

Hydraulic Similitude: Dimensional analysis – Rayleigh's method and Buckingham's pi theorem, study of Hydraulic models – Geometric, kinematic and dynamic similarities, dimensionless numbers, Distorted and non-distorted models-scale effect.

UNIT–III:

Basics of Turbo Machinery: Hydrodynamic force of jet on stationery and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency – angular momentum principle.

UNIT–IV:

Hydraulic Turbines: Layout of a typical Hydropower installation – Heads and efficiencies, Classification of turbines – Pelton wheel, Francis turbine, Kaplan turbine – working , working proportions, velocity diagram, work done and efficiency, hydraulic design, function of draft tube and its efficiency, Governing of turbines, surge tanks, unit and specific quantities of turbines, performance characteristics curves, cavitation and preventive measures.

UNIT–V:

Centrifugal-Pumps: Classification, work done**,** Manometric head – minimum starting speed, losses and efficiencies, specific speed, multistage pumps, pumps in parallel, series, performace characteristic curves, Net positive Suction Head (NSPH), cavitation.

Reciprocating-pumps: Classification, working principle, function of air vessels, slip.

Hydropower Engineering: Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, hydropower potential.

TEXT BOOKS:

1. Flow in Open Channels, K.Subramanya, McGraw Hill Education, 2019.
2. Hydraulics and Fluid Mechanics including Hydraulic Machines, Dr.P.N. Modi and, Dr.S.M. Seth, Standard Book House, 22th Edition, 2019.

REFERENCE BOOKS:

1. Fluid Mechanics & Machinery, C.S.P. Ojha, R.Berndtsson and P.N. Chandramouli, Oxford University Press India, 2010.
2. Open-Channel Hydraulics, VenTe Chow, The Blackburn Press, 2009.
3. Hydraulic Machines, K. Subramanya, McGraw Hill Education, 2017.
4. Fluid Mechanics, Frank.M. White, McGraw-Hill Education, 2017.
5. Fluid Mechanics, A.K. Jain, Khanna Publishers, 2016.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20CE22003 - Concrete Technology

B. Tech. CE II Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand properties of cements.
2. Understand properties of aggregates.
3. Understand design and usage of admixtures in concrete.
4. Understand quality control and strength criteria's of hardened concrete.
5. Be aware of latest developments in concrete technology.

Course Outcomes: At the end of the course, student would be able to

CO 1: Identify various engineering properties and usage of cement.

CO 2: Classify various engineering properties and usage of aggregates.

CO 3: Assess the workability of fresh concrete and design the desirable concrete mix.

CO 4: Determine the strength properties of hardened concrete.

CO 5: Evaluate the concrete required for special environmental conditions.

UNIT–I:

Cement: History, Manufacturing of Portland Cement, Chemical composition, Hydration, Structure of hydrated cement, Types of cement, Grades of cement, Testing of Cement- Field and Laboratory tests as per BIS specifications.

Water: Quality of water, Sea water.

UNIT–II:

Aggregates: Classification, source, size, shape, texture, strength, impact value, abrasion value, modulus of elasticity, bulk density, specific gravity, absorption and moisture content, bulking of aggregates, deleterious substance in aggregate, soundness, alkali aggregate reaction, thermal properties, grading of fine and coarse aggregates, grading curve, fineness modulus, gap graded aggregate, maximum aggregate size, manufactured sand, physical and mechanical properties of aggregates as per BIS specifications.

UNIT–III:

Fresh Concrete: Workability, factors affecting workability, measurement of workability, segregation and bleeding, setting time of concrete, manufacturing of concrete, effect of time and temperature on concrete.

Admixtures: Classification- mineral and chemical admixtures, effect of admixtures on workability.

Mix Design: Factors governing selection of mix proportions, various methods of proportioning, BIS method.

UNIT–IV:

Hardened Concrete: Water / Cement ratio, Abram's Law, Gel/space ratio, strength with age, Maturity concept, Influence of size of aggregate on strength, Relation between compression and tensile strength, Curing.

Testing of Hardened Concrete: Compression test, Tension tests –Flexure tests, Splitting tensile test, Factors affecting strength results, Non-destructive testing methods as per codal provisions. Durability of concrete – Statistical Quality Control of concrete, Acceptance criteria.

UNIT–V:

Elasticity, Creep and Shrinkage: Modulus of elasticity, factors affecting Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Creep of concrete – Factors influencing creep, Effects of creep, Shrinkage, Types of shrinkage, factors affecting shrinkage.

Special Concrete: Light weight concrete, Cellular concrete, No-fines concrete, High strength concrete, Ultra high strength concrete, Fibre reinforced concrete, Polymer concrete, High performance concrete, Self compacting concrete.

TEXT BOOKS:

1. Properties of Concrete, A.M. Neville, Pearson Education, 2012.
2. Concrete Technology: Theory and Practice, M.S. Shetty, S. Chand, 2018.

REFERENCE BOOKS:

1. Concrete Technology, M.L. Gambhir, McGraw Hill Education, 2013.
2. Concrete Technology, A.R.Santhakumar, Oxford, 2006.
3. Concrete Technology, Job Thomas, Cengage Learning India, 2015.
4. Concrete: Microstructure, Properties and Materials, P. Kumar Mehta, Paulo J.M. Monteiro,

McGraw Hill Education, 2006.

BUREAU OF INDIAN STANDARDS (BIS) CODES:

1. IS 1269: 2013 Ordinary Portland cement, 53 Grade - Specification.
2. IS 1489 (part-1) 2015 Specifications for Portland Pozzolona Cement
3. IS 2386(Part 1): 1963 Methods of test for aggregates for Concrete.
4. IA 9103:1999 Specifications for admixtures for concrete
5. IS 10262: 2019 Guidelines for Concrete Mix Proportioning.
6. IS 456: 2000 Plain and Reinforced Concrete – Code of practice.
7. IS 516 – 2006 Methods of Tests for Strength of Concrete.
8. IS 13311(Part 1): 1992 Methods of Non – destructive testing of Concrete: Part 1 - Ultrasonic Pulse Velocity and Part 2 – Rebound hammer.

JOURNALS

1. Indian Concrete Institute (ICI).
2. Indian Concrete Journal (ICJ).

Geethanjali College of Engineering and Technology (Autonomous)
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20EE22062 – Industrial Safety and Hazards
(Open Elective – I)

B. Tech. CE II Year, II Sem

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Determine responsibility for safety in the workplace.
2. Learn to recognize workplace hazards.
3. Learn how to develop procedures to eliminate or lessen those hazards.
4. Apply basic Federal and State Safety Rules to the workplace.

Course Outcomes: At the end of the course, student would be able to

CO1.Understand the fundamental concepts of accident prevention with a basic knowledge of safe work rules designed to promote an accident free workplace.

CO2. Understand the relief systems.

CO3. Understand the electrical hazards and safety handling of equipment's.

CO4. Understand the effects of momentum and buoyancy.

CO5. Undergo different case studies.

UNIT I:

Fire and explosion: Introduction-Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Industrial hygiene. Factories Act, 1948 and Environment (Protection) Act, 1986 and rules thereof. Shock wave propagation, vapour cloud and boiling liquid expanding vapours explosion (VCE and BLEVE), mechanical and chemical explosion, multiphase reactions, transport effects and global rates.

UNIT II:

Relief systems: Preventive and protective management from fires and explosion-inerting, static electricity passivation, ventilation, and sprinkling, proofing, relief systems –relief valves, flares, scrubbers.

UNIT III:

Electrical hazards: Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage

classifications excess energy-current surges-Safety in handling of war equipment's-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc-ignition energy-national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation–earthing, specifications, earth resistance, earth pit maintenance.

UNIT – IV:

Leaks and leakages: Spill and leakage of liquids, vapours, gases and their mixture from storage tanks and equipment; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal and adiabatic flows of gases, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxics and dispersion. Naturally buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mitigation measures for leaks and releases.

UNIT V:

Case studies: Flixborough, Bhopal, Texas, ONGC offshore, HPCL Vizag and Jaipur IOC oil-storage depot incident; Oil, natural gas, chlorine and ammonia storage and transportation hazards.

TEXT BOOK (S):

1. Fordham Cooper, W., "Electrical Safety Engineering" Butterworth and Company, London, 1986.

REFERENCE BOOKS:

1. Crowl D.A. and Louvar J.F., "Chemical Process Safety: Fundamentals with Applications", 2nd Ed., Prentice Hall.2001
2. Mannan S., "Lee's Loss Prevention in the Process Industries", Volume. I, 3rdEd., Butterworth-Heinemann.2004.
3. Indian Electricity Act and Rules, Government of India.
4. Power Engineers –Handbook of TNEB, Chennai, 1989.
5. Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt. LTd., England,1988.

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20ME22063 –Nano Materials and Technology

(Open Elective – I)

B. Tech. CE II Year, II Sem

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Expose the students to a highly interdisciplinary subject
2. Enable the students to understand the basic concepts of Nanotechnology
3. Enhance the knowledge of students in nanomaterials, properties and their applications

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

CO1: Identify nano materials by their superior characteristics

CO2: Demonstrate synthesis of zero dimensional nano structured materials.

CO3: Illustrate conducive methods to synthesize one dimensional nano structures

CO4: Compare and comprehend methods to produce two dimensional nano structures.

CO5: Comprehend synthesis of thin films and special nano materials

UNIT I:

INTRODUCTION: Importance of Nano-technology, Emergence of Nano-Technology, Bottom-up and Top-down approaches, challenges in Nano Technology.

UNIT II:

ZERO DIMENSIONAL NANO-STRUCTURES: Nano particles through homogenous nucleation; Growth of nuclei, synthesis of metallic Nano particles, Nano particles through heterogeneous nucleation; Fundamentals of heterogeneous nucleation and synthesis of nano particles using micro emulsions and Aerosol.

UNIT III:

ONE DIMENSIONAL NANO-STRUCTURES: Nano wires and nano rods, Spontaneous growth: Evaporation and condensation growth, vapor-liquid-solid growth, stress induced re-crystallization.

Template based synthesis: Electrochemical deposition, Electro-phoretic deposition. Electro-spinning and Lithography

UNIT IV:

TWO DIMENSIONAL NANO-STRUCTURES: Fundamentals of film growth. Physical vapour Deposition (PVD): Evaporation molecular beam epitaxy (MBE), Sputtering, Comparison of Evaporation and sputtering.

Chemical Vapour Deposition (CVD): Typical chemical reactions, Reaction kinetics, transportant phenomena, CVD methods, diamond films by CVD.

UNIT V:

THIN FILMS: Atomic layer deposition (ALD), Electro-chemical deposition (ECD), Sol-Gel films.

Special Nano Materials: Carbon fullerence and nano tubes. Carbon fullerness: formation, properties and applications. Carbon Nano tubes: formation and applications.

TEXT BOOKS:

1. Nano structures and Nano materials: Synthesis, properties and applications, Guozhong Cao, Imperial College press in 2004, 2nd edition.
2. Nanotechnology, Rechard Booker and Earl Boysen, Willey, 2006.

REFERENCE BOOKS:

1. Nano: The Essentials; T. Pradeep, Tata McGraw-Hill, 2008.
2. Nanotechnology and Nano electronics, W.R. Fahrner, Springer, 2006.

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20EC22064 – Electronic Measuring Instruments
(Open Elective – I)

B. Tech. CE II Year, II Sem

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Note: No detailed mathematical treatment is required for this course.

Course Objectives:

1. It provides an understanding of various measuring systems functioning and metrics for performance analysis.
2. Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3. Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes: At the end of the course, student would be able to

CO1. Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.

CO2. Measure various physical parameters by appropriately selecting the transducers.

CO3. Use various types of signal generators, signal analyzers for generating and analyzing various realtime signals.

UNIT-I:

Block Schematics of Measuring Systems and Performance Metrics: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

UNIT-II:

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, and Specifications.

UNIT-III:

Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC

Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range,

True RMS Responding Voltmeters, Specifications of Instruments. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes.

UNIT-IV:

Recorders: X-Y Plotter, Curve tracer, Galvanometric Recorders, Servo transducers, pen driving mechanisms, Magnetic Recording, Magnetic recording techniques.

UNIT-V:

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

TEXT BOOKS:

1. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

REFERENCE BOOKS:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

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20CS22065 –Web Programming

(Open Elective – I)

B. Tech. CE II Year, II Sem

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Understand web programming
2. Use HTML language to design web pages
3. Use CSS to for designing interfaces
4. Understand Java Script programs
5. Use XML and PHP as back end and server side technologies

Course Outcomes: At the end of the course, student would be able to

CO1. Develop web programs using HTML

CO2. Develop intuitive interfaces using CSS

CO3. Use JavaScript for client side validations

CO4. Design web applications using XML as back end

CO5. Implement web applications using PHP as server side script

UNIT-I

Introduction – HTML, XML, and the World Wide Web. Protocols, IP and TCP, HTTP, CGI HTML – Basic HTML, The Document Body, Text, Hyperlinks, Lists, Using color and images, Images, More HTML – Tables, Frames, Forms.

UNIT-II

CSS – Introduction, Using Styles, Defining your own styles, Properties and Values in styles, Formatting blocks of Information.

UNIT-III

JavaScript – Basics, Variables, String manipulation, Mathematical functions, Statements, Operators, Arrays, Functions, Objects in Java Script – Data and Objects in JavaScript, Regular Expressions, Built – in Objects, Events

UNIT-IV

XML – Basic XML, Document Type Definition, XML Schema

UNIT-V

PHP – Introduction, Data Types, Program Control, Arrays, User-defined Functions, Built-in Functions, Using Files, Building web applications using PHP

TEXT BOOK(S):

1. Web Programming: Building Internet Applications, 3rd Edition, Chris Bates

REFERENCE BOOKS:

1. Programming the World Wide Web, 4th edition, Robert W Sebesta
2. Web Technologies, Uttam K Roy, Oxford University Press

Geethanjali College of Engineering and Technology (Autonomous)
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20MB22066 –Intellectual Property Rights
(Open Elective – I)

B. Tech. CE II Year, II Sem

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course objectives: Develop ability to

1. Understand the various concepts, importance and types of intellectual property rights.
2. Discuss the purpose of trademarks.
3. Analyze the fundamental laws of copy rights and patents.
4. Understand trade secret laws, trade secret litigation and unfair completion.
5. Understand the latest developments in IPR.

Course outcomes: At the end of the course, student would be able to

CO1: Acquire knowledge on intellectual property rights

CO2: Track the regulation process of trademark. Discuss the functions of trademark.

CO3: Identify the importance of copyrights, patents searching process and transfer of Ownership

CO4: Know about secret laws, unfair competition, false advertising.

CO5: Reciprocate to new developments of intellectual property rights.

UNIT - I:

Introduction to Intellectual property: Concepts, types of intellectual property, international organizations, agencies and treaties, and importance of intellectual property rights.

UNIT - II:

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT - III:

Law of Copy Rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right laws.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT - IV:

Trade Secrets: Trade secrete law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation. Unfair competition-misappropriation right of publicity, false advertising.

UNIT - V:

Latest development of Intellectual Property Rights: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata Mc Graw Hill Publishing Company Ltd.

REFERENCE BOOKS:

1. Cases and materials on intellectual property. Cornish, William Rodolph. Sweet & Maxwell, 5/e, 2006.
2. How to make patent drawings: a patent it yourself companion, Lo, Jack and Pressman, David.. Nolo, 5/e 2007.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20MA22L01 – Computational Mathematics Lab

B. Tech. CE II Year, II Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): 20CS11001 – Programming for Problem Solving -I

Course objectives: Develop ability to

1. Estimating the value of a function for any intermediate value of the independent variable.
2. Evaluate the solution of definite integrals for a given set of data using numerical integration methods.
3. Apply various numerical techniques to compute approximate solution of a given first order ordinary differential equation with initial condition.
4. Estimate zeros of an algebraic/transcendental equations using Bisection, Newton-Raphson method and Regula-Falsi Method.
5. Calculate the solution of a system of linear equations using L-U decomposition, Gauss-Seidel method, power method and Gauss Jordan method.

Course Outcomes: At the end of the course, student would be able to

CO1. Determine the values of y corresponding to any value of $x = x_i$ between x_0 and x_n.

CO2. Calculate approximate area by applying various Numerical integration techniques.

CO3. Determine a solution of a first order ordinary differential equation with the initial condition using various numerical techniques.

CO4. Apply suitable numerical methods to find the approximate root / solution of algebraic / transcendental equations.

CO5. Estimate the solution of system of linear equations using various methods.

List of Programmes:

1. Program to determine y for a given x, if two arrays of x and y of same size are given (using Newton's forward interpolation method).
2. Program to determine y for a given x, if two arrays of x and y of same size are given (using Newton's backward interpolation method).
3. Program to determine y for a given x, if two arrays of x and y of same size are given (using Lagrange's interpolation).
4. Program to evaluate definite integral using trapezoidal rule, Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule.
5. Program to solve a given first order ordinary differential equation with initial condition using Runge-Kutta fourth order method.
6. Program to find the root of algebraic / transcendental equation by using Program to solve a given first order ordinary differential equation with initial condition using Modified Euler's method.
7. Program to find the root of algebraic / transcendental equation by using Bisection method and Newton-Raphson method.
8. Program to find the solution of given system of linear non-homogeneous equations using L-U decomposition method.
9. Program to find the solution of given system of linear non-homogeneous equations using Gauss-Seidel iteration method.
10. Program to compute largest eigenvalue and eigenvectors of a given matrix using Power method.

Additional Programmes:

1. Program to find the solution of given system of linear non-homogeneous equations using Gauss Jordan elimination method.
2. Program to find the best fit of straight-line ($y = a + bx$) for the given data by the Method of Least squares.
3. Program to find the root of algebraic/transcendental equation by using Regula-Falsi Method.

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20CE22L01 - Computer Aided Drafting of Buildings Lab

B. Tech. CE II Year, II Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Use the commands on AutoCAD.
2. Prepare plans, sections of single storey building.
3. Prepare plans, section of multi storey building.
4. Prepare Elevations of single storey and multi storey buildings.
5. Develop 3Dimensional figures using AutoCAD.

Course Outcomes: At the end of the course, student would be able to

CO1. Demonstrate the expertise on the commands of AutoCAD.

CO2. Develop Plans, Sections of Single storey building.

CO3. Develop Plans sections of multi- storey building.

CO4. Develop Elevations of single and multi-storey building.

CO5. Draw 3-Dimensional figures using AutoCAD.

LIST OF EXERCISES

1. Introduction to Computer Aided Drafting.
2. Practice Exercise on CAD software.
3. Develop plans of Single storey building.
4. Develop Plans of Multi storey building.
5. Develop Section and Elevation of Single storey building.
6. Develop Section and Elevation of Multi storey building.
7. Introduction to 3Dimensional modelling.
8. Practice exercise on 3D figures.

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20CE22L02 – Fluid Mechanics and Hydraulic Machinery Lab

B.Tech. CE II Year, II Sem

Prerequisite(s): 20CE21003 Fluid Mechanics

L	T	P/D	C
-	-	2/-	1

Course objectives: Develop ability to

1. Understand Bernoulli's theorem.
2. Understand working principles, components, functions of Venturimeter, Orificemeter, orifices mouthpieces and notches.
3. Understand minor and major losses in pipes.
4. Study the basic energy features of the hydraulic jump i8n channel and also determine the loss of energy due to the jump.
5. Study performance of turbines (Pelton wheel, Francis and Kaplan turbine) and Pumps (Centrifugal and Reciprocating pumps)

Course Outcomes: At the end of the course, student would be able to

CO1. Conduct experiment for verification of Bernoulli's theorem and analyze hydraulic jump characteristics.

CO2. Compute co-efficient of discharge through various flow measuring devices.

CO3. Demonstrate practical understanding of minor, major losses and water hammer in pipe flow.

CO4. Determine the coefficient of impact of jet on a stationary vane.

CO5. Demonstrate practical working of different turbines and pumps.

LIST OF EXPERIMENTS

1. Calibration of Venturimeter and Orificemeter.
2. Determination of Coefficient of discharge for a small orifice/mouthpiece by constant head method.
3. Calibration of contracted Rectangular Notch and / Triangular Notch.
4. Determination of friction factor of a pipe.
5. Determination of Coefficient for minor losses.
6. Verification of Bernoulli's theorem.
7. Impact of jet on vanes.
8. Study of Hydraulic jump.

9. Study of water hammer.
10. Performance test on Pelton wheel.
11. Performance test on Francis turbine.
12. Performance test on Kaplan turbine.
13. Performance characteristics of a single stage/ multi-stage centrifugal pump.,
14. Performance characteristics of a reciprocating pump.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20EN22P01 – English for Career Development

Classroom Activity based Course. Hence, Lab. is not required.

B. Tech. CE II Year, II Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand the importance of vocabulary to be used in different situations.
2. Read, comprehend the passages, summarize and paraphrase information in a text.
3. Communicate effectively in different socio cultural contexts with proper articulation.
4. Write precisely.

Course Outcomes: At the end of the course, student would be able to

CO1. Synergize the acquired skills to improve employability prospects

CO2. Acquire relevant vocabulary

CO3. Make inferences and predictions based on comprehension of a text.

CO4. Use effective conveying strategies and develop effective Presentation Skills.

CO5. Produce well organized essays and use a variety of accurate sentence structures.

Module-I

Must have words/Word power

Vocabulary: Collocations: noun and noun, noun and verb, noun and adverb, noun and adjective, prepositional phrases-connotative words.

Module-II

Cognitive Reading

Reading: Reading comprehension: rapid reading (vertical reading), meta-cognition, cloze tests, paragraph jumbles.

Module-III

Advanced Articulation

Speaking: Narrating: techniques, events, experiences, stories. Interactive speaking: Contextual Vocabulary and Oral presentations.

Module-IV

Essentials of composition

Writing: Picture interpretation: analyzing and expressing in either oral or written form. Sentences out of context, summarizing, Essay (Analytical, argumentative and exploratory) writing practice.

Classroom Activity based Course. Hence, Lab. is not required.

TEXT BOOK(S) RECOMMENDED

1. Wilfred J.Funk, Six Weeks to Words of Power, Binny Publishing House.
2. Sue Gilbert, The Essentials of Grammar and Composition, Oxford University Press.

REFERENCE BOOKS:

1. Inc. Bar Charts, English Composition & Style, Inc. Bar Charts , 2009-11-30
2. K.Buehler Huber Gray, *Practical Exercises in English*, Project Gutenberg, www.gutenberg.net

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301
20MB22M04 – Professional Ethics

(Mandatory Course)

B. Tech. CE II Year, II Sem

L	T	P/D	C
3	-	-/-	-

Prerequisite(s): None

Course Objectives: Develop ability to

1. Imbibe and internalize the Values and Ethical Behaviour
2. Understand the basic theories of Ethics
3. Practice as a professional engineer.
4. Identify work place ethics.
5. Understand international ethical practices.

Course Outcomes: At the end of the course, student would be able to

CO 1: Understand the importance of Values and Ethics in their personal lives.

CO 2: Understand ethics in professional careers.

CO 3: Learn the rights and responsibilities as an employee.

CO 4: Understand work ethics

CO 5: Understand Global ethics

UNIT – I:

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT – II:

Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT – III:

Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT – IV:

Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation. Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

UNIT – V:

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

REFERENCE BOOKS:

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

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20CE31001 – Design of Reinforced Concrete Structures

B. Tech. CE III Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):

20CE21002- Mechanics of Materials
20CE22003- Concrete Technology

Course objectives: Develop ability to

1. Understand general mechanical behavior of reinforced concrete, design philosophies.
2. Understand the basic principles of Limit state design, and flexural design procedures for singly reinforced and doubly reinforced rectangular beam.
3. Grasp the fundamentals of analysis and design of rectangular beams for shear and torsion, checking for bond and applying serviceability check for beams.
4. Know the procedures for analysis and design of one-way simply supported, two-way simply supported and continuous slabs.
5. Learn the design and detailing of columns and footings of rectangular and circular sections.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain the fundamentals of RC design and apply it to Singly Reinforced beams.
CO2. Apply limit state design for beam sections subjected to shear, bond and torsion.
CO3. Design Reinforced Concrete columns.
CO4. Analyse and design one way and two way RC slabs.
CO5. Design RC footings and staircase.

UNIT–I:

Concepts of R.C. Design: Design philosophies, materials used types of steel, reinforcement, types of loads, limit state concept, characteristic values and design values, stress-strain relationship for concrete and steel, stress block parameters, analysis and design of singly reinforced beams.

UNIT – II:

Limit State of Collapse- Flexure, Shear, Bond and Torsion: Shear stresses in beams, types of shear reinforcements, I.S. recommendations for shear design, design examples, bond and development Length, anchorage, concept of torsion, analysis and design of doubly reinforced beams, Introduction to the analysis of T- beams and Continuous beams.

UNIT – III:

Limit state of Collapse- Compression: Classification of columns, effective length, I.S. specifications, design of short columns, design aids, design of columns with uniaxial bending and biaxial bending using the design aids, Introduction to design concepts of long columns.

UNIT – IV:

Slabs: Types, load distribution in a slab, I.S. recommendations for design, design of one-way slab, continuous slab and two-way slabs.

Limit state of serviceability: Limit state of deflection, I.S. code recommendations, limit state of cracking.

UNIT – V:

Footings: Classifications, Codal provisions for design of isolated footing, design of isolated, square and rectangle footings, design concepts of strip and combined footings.

Staircase: Classifications, terminology, design of dog legged staircase.

TEXT BOOKS:

1. Design of Reinforced Concrete Structures: IS: 456-2000, N. Krishna Raju, CBS Publishers, 2016.
2. Limit state designed of reinforced concrete, P. C. Varghese, Prentice Hall of India, 2008.

REFERENCE BOOKS:

1. Reinforced Concrete Design, S. Unnikrishna Pillai& Devdas Menon, Third Edition, McGraw Hill Education, 2017.
2. Reinforced concrete design, N. Subrahmanian, Oxford University Press, 2013.
3. Design of concrete structures, Arthus H. Nilson, David Darwin, and Chorles W. Dolar, McGraw Hill Education, 16th edition, 2020.
4. Reinforced Cement Concrete Design by Neelam Sharma, S. K. Kataria & sons publications,2015.
5. Fundamentals of reinforced concrete, N.C. Sinha and S.K Roy, S. Chand publisher, 2017.

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20CE31002 – Transportation Engineering

B. Tech. CE III Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):

20CE21001- Surveying and Geomatics
20CE21L01- Surveying and Geomatics Lab

Course objectives: Develop ability to

1. Understand the importance of highway development and factors affecting alignment.
2. Understand the various geometric elements of a highway system.
3. Understand the traffic characteristics.
4. Understand the pavement materials and methods of road construction.
5. Understand the characteristics of aircraft and design parameters of runway.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain the importance of highway development in India and the principles of Highway alignment.

CO2. Design the various geometric elements of a highway system.

CO3. Analyze the traffic flow parameters and conduct various traffic studies.

CO4. Develop an understanding of highway material characterization and methods of road construction.

CO5. Design the runway and taxiway.

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 affecting Alignment- Engineering Surveys – Drawings and Reports – Highway Project.

UNIT–II:

Highway Geometric Design: Importance of Geometric Design - Design controls and Criteria - Highway Cross Section Elements - Sight Distance Elements- Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance - Design of Horizontal Alignment - Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical Alignment-Gradients- Vertical curves.

UNIT–III:

Traffic Engineering and Regulations: Basic Parameters of Traffic-Volume, Speed and Density - Traffic Volume Studies - Data Collection and Presentation - Speed studies - Data Collection and Presentation - Origin and Destination studies, Parking Studies – On street and Off street Parking - Road Accidents - Causes and Preventive Measures - Accident Data Recording – Condition Diagram and Collision Diagrams - Traffic Signs – Types and Specifications – Road Markings - Need for Road Markings-Types of Road Marking.

UNIT–IV:

Highway Material and Construction Maintenance: Highway Material Characterization, Subgrade- Bitumen Material- Stone Aggregate- Construction of Gravel Roads- Construction of Water Bound Macadam Roads- Construction of Bituminous Roads- Surface Dressing- Bitumen Bound Macadam- Bituminous Concrete- Construction of Joints in Cement Concrete Pavements, Joint Filler and Seal-Pavement Failures- Highway Drainage.

UNIT–V:

Introduction to Airport Engineering:

Introduction – aircraft characteristics and their influence on planning of airports, Component parts of airport and site selection, Runway Orientation, Basic Runway Length – corrections. Geometric design of runway and taxiways–Design considerations of exit taxiways.

TEXT BOOKS:

1. Highway Engineering, S. K. Khanna, C. E. G. Justo, A. Veeraragavan, Nem Chand & Bros Publishers, Revised 10th edition, 2017.
2. Airport Engineering: Planning, Design and Development of 21st Century Airports, Norman J. Ashford, Saleh Mumayiz, Wiley Publisher, 2011.

REFERENCE BOOKS:

1. Traffic Engineering and Transport Planning, Dr. L. R. Kadiyali, Khanna Publishers, 9th Edition, 2011.
2. Traffic and Highway Engineering, Nicholas J. Garber & Lester A. Hoel, Cengage, 2015.
3. Airport Engineering Planning and Design, Subash C. Saxena, CBS publisher, 2020.
4. IRC 37-2018: Tentative guidelines for design of flexible pavement.
5. IRC 58-2015: Guidelines for design of plain jointed rigid pavements.

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20CE31003 – Geotechnical Engineering

B. Tech. CE III Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):

20CE12001- Engineering Geology
20CE21003- Fluid Mechanics

Course objectives: Develop ability to

1. Classify properties of soil and to determine the behavior of soil under various conditions and loads.
2. Understand the permeability tests of soil.
3. Evaluate the stress distribution in the soil.
4. Understand consolidation principles and properties.
5. Understand shear strength of soil by different laboratory tests.

Course Outcomes: At the end of the course, student would be able to

CO1. Identify the given soil and its basic properties
CO2. Determine the permeability of soil using various methods.
CO3. Analyze the stresses due to applied loads and perform compaction tests.
CO4. Estimate various types of settlements in soil.
CO5. Compute the shear strength of soils by different methods.

UNIT–I:

Introduction: Soil formation, Phase diagrams -Mass- Volume relationship, soil structure & clay Mineralogy,

Index Properties & Classification of Soils: Grain size analysis – Sieve analysis, consistency limits and indices, Relative density, I.S. Classification of soils.

UNIT–II:

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

Effective Stress and Seepage through Soils: Total, neutral and effective stress, Seepage through soils – quick sand condition, Flow nets: Characteristics, seepage calculation from flow net.

UNIT-III

Stress Distribution in Soils: Boussinesq's and Westergaard's theories for point load, line load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, 2:1 approximation method and Newmark's influence chart for irregular areas.

Compaction: Mechanism of compaction, factors affecting compaction, laboratory and in-situ methods of compaction, effects of compaction on soil properties – Field compaction Equipment, compaction quality control.

UNIT–IV:

Consolidation: Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay, e-p and e-log(p) curves, normally consolidated soil, over consolidated soil and under consolidated soil, pre -consolidation pressure and its determination, Terzaghi's 1-D consolidation theory, coefficient of consolidation, square root time and logarithm of time fitting methods.

UNIT–V:

Shear Strength of Soils: Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters based on drainage conditions –strength envelops – Shear strength of sands - Dilatancy – critical void ratio, liquefaction –shear strength of clay.

TEXT BOOKS:

1. Basic and Applied Soil Mechanics, Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, 2016.
2. Soil Mechanics and Foundation Engineering, K.R. Arora, Standard Publishers and Distributors, 2020.

REFERENCE BOOKS:

1. Soil Mechanics in Engineering practice, Karl Terzaghi, Wiley India Pvt Ltd, 2009.
2. Soil Mechanics and Foundation Engineering, VNS Murthy, CBS Publishers and Distributors, 2018.
3. Principles of Geotechnical Engineering, Braja M. Das, CL Engineering 2020.
4. Geotechnical Engineering, C. Venkatramaiah, **New** Age International ,2017

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20MA31002-Statastical Applications in Civil Engineering

B. Tech. CE III Year, I Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisites(s): None

Course Objectives:

Develop ability to

1. Understand different types of random variables and their distributions.
2. Estimate population parameters statistically from a sample of population.
3. Estimate correlation coefficient and coefficient of regression of the given data.
4. Examine statistical hypothesis for large samples.
5. Examine statistical hypothesis for small samples.

Course Outcomes:

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

CO1. Distinguish between random variables pertaining to discrete/ continuous distribution systems and apply the discrete distributions like Binomial and Poisson and continuous distribution like Normal and their properties.

CO2. Calculate sample statistics from the given population and estimate the population parameters.

CO3. Identify the relation between the two variables using coefficient of correlation and regression.

CO4. Apply the hypothesis procedure to test means and proportions using z-test for large samples.

CO5. Apply the hypothesis procedure to test means and proportions using t-test, F-test, chi-square test for small samples.

UNIT-I: Single Random variables and probability distributions

Review of Probability; Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution, Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution, Binomial, Poisson & normal distributions and their properties. [9]

UNIT-II: Sampling Distributions & Estimations

Definitions of population, sampling, statistic, parameter, Types of sampling, expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimations – likelihood estimate, interval estimations. [8]

UNIT-III: Correlation & Regression

Correlation, coefficient of correlation, rank correlation (Karl Pearson's coefficient of

correlation, Spearman's coefficient of correlation), regression, regression coefficient, lines of regression. [8]

UNIT-IV: Testing of hypothesis (Large Samples)

Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, two-sided test, large sample tests: (i) Test of Equality of means of two samples equality of sample mean and population mean (cases of known variance & unknown variance, equal and unequal variances) (ii) Tests of significance of difference between sample S.D and population S.D. (iii) Tests of significance difference between sample proportion and population proportion & difference between two sample proportions. [9]

UNIT-V: Testing of hypothesis (Small Samples)

Small sample tests: Student t-distribution, its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples Snedecor's F- distribution and its properties. Test of equality of two population variances Chi-square distribution, it's properties, Chi-square test of goodness of fit. [9]

TEXT BOOKS:

1. Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press, fifth edition, 2014.
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017

REFERENCE BOOKS:

1. Probability and Statistics by John J. Schiller, Murray R Spiegel, A. V. Srinivasan, Tata McGraw - Hill Education.
2. Probability and Statistics by T. K. V. Iyengar & B. Krishna Gandhi Et, S. Chand.
3. Fundamentals of Mathematical Statistics by S C Gupta and V. K. Kapoor S. Chand and Sons, New Delhi.
4. An Introduction to Statistical Learning with Applications in R by James, G., Witten, D., Hastie, T., Tibshirani, R. Springer 2013.

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20CE31L01–Geotechnical Engineering Lab

B. Tech. CE III Year, I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand the index properties of the soil.
2. Understand the dry sieve analysis of soil.
3. Understand the compaction parameters of the soil.
4. Understand the shear strength of the given soil.
5. Understand the coefficient of consolidation and other properties of given clays.

Course Outcomes: At the end of the course, student would be able to

CO1. Classify the soil and to determine the Index properties of a given soil

CO2. Determine shear strength parameters of soil based on drainage conditions

CO3. Determine coefficient of permeability of given soil.

CO4. Determine compaction parameters for a given soil.

CO5. Determine coefficient of consolidation of given clayey sample.

LIST OF EXPERIMENTS

1. Atterberg's Limits (Liquid Limit, Plastic Limit, Shrinkage limit)
2. Field density by core cutter method and sand replacement method
3. Determination of Specific gravity of soil by pycnometer.
4. Grain size distribution by sieve analysis
5. Permeability of soil by constant and variable head test methods
6. Standard Proctor's Compaction Test
7. Unconfined compression strength test
8. Direct shear test
9. Vane shear test
10. California Bearing Ratio Test (CBR Test)
11. Tri-axial shear test
12. Consolidometer test

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20CE31L02- Highway Engineering and Concrete Technology Lab

B.Tech. CE III Year, I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):
20CE22003 - Concrete Technology

Course objectives: Develop ability to

1. Understand properties of various types of cement.
2. Understand usage of admixtures in concrete.
3. Understand design of concrete mixes of requisite strength.
4. Perform laboratory tests on aggregates for road construction along with its specifications.
5. Analyze various tests on bitumen and bituminous mix along with its specifications.

Course Outcomes: At the end of the course, student would be able to

CO1. Identify the various engineering properties and usage of cement.

CO2. Assess the workability of fresh concrete and strength properties of hardened concrete under various environments.

CO3. Design the desirable concrete mix and evaluate the concrete required for special environmental conditions.

CO4. Evaluate aggregates used for road construction along with its suitability.

CO5. Determine the stability parameters of bitumen mixes.

LIST OF EXPERIMENTS

I. Test on Cement

1. Normal consistency and Fineness of cement.
2. Initial setting time and Final setting time of cement.
3. Specific gravity of cement.
4. Soundness of cement.
5. Compressive strength of cement.

II. Test on Fresh Concrete

1. Slump flow test.
2. Compaction factor test.
3. Vee-bee test.
4. Flow table Test.

III. Test on Hardened Concrete

1. Compression test on cubes and cylinders.
2. Flexure test.
3. Splitting tensile test
4. Modulus of elasticity.

IV. Tests on Aggregates

1. Aggregate Crushing Value Test
2. Aggregate Impact Test
3. Specific Gravity and Water Absorption
4. Abrasion Test
5. Flakiness and Elongation Indices of Coarse Aggregates.

V. Tests on Bitumen

1. Penetration Test
2. Ductility Test
3. Softening Point Test
4. Flash and Fire Point Test
5. Marshal stability Test. (Demonstration only)

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20MA31L02-Statastical Applications in Civil Engineering Lab

B. Tech. CE III Year, I Sem.
Prerequisite(s): Nil

L	T	P/D	C
-	-	2	1

Course Objectives: Develop ability to

1. Understand the basic concepts of R-programming.
2. Learn descriptive statistics and data types in R -programming.
3. Acquire the concepts of various central tendencies and moments in R -programming.
4. Identify the relation between the variables using coefficient of correlation and regression in R -programming.

Course Outcomes: At the end of the course, student would be able to:

CO1. Perform built-in commands and operations with matrices in R-programming.

CO2. Analyze the appropriate data type of variables and evaluate various Frequency Distributions in R -programming.

CO3. Evaluate measure of central tendency and calculate moments about origin and mean in R – programming.

CO4. Compute various correlation coefficients and coefficient of regression of the given data in R – programming.

List of Programmes

Week	Description	Content
1	Basic calculations with R software-1	● Introduction to R Software ● Basics and R as a Calculator
2	Basic calculations with R software-2	● Calculations with Data Vectors ● Built-in Commands and Missing Data Handling ● Operations with Matrices
3	Introduction to descriptive statistics-1	● Objectives, Steps and Basic Definitions ● Variables and Types of Data
4	Introduction to descriptive statistics-2	● Absolute Frequency, Relative Frequency ● Frequency Distribution and Cumulative Distribution Function
5	Central Tendency of Data-1	● Arithmetic Mean ● Median ● Quantiles
6	Central Tendency of Data-2	● Mode, Geometric Mean and Harmonic Mean ● Range, Interquartile Range and Quartile Deviation

7	Moments	● Raw moments ● Central Moments
8	Correlation Coefficient	● Karl Pearson's Correlation Coefficient
9	Rank Correlation Coefficient	● Spearman's rank correlation Coefficient
10	Regression	● Regression line of x on y ● Regression line of$y$ on x

Additional Programmes:

- Graphics and Plots
  - Bar Diagrams
  - Subdivided Bar Plots and Pie Diagrams
  - 3D Pie Diagram and Histogram
- Frequency distribution
  - Skewness
  - Kurtosis

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20MA31P01 – Logical Reasoning-I*

B. Tech. CE III Year, I Sem.
Prerequisite(s): None

L	T	P/D	C
0	0	4	2

Course Objectives: Develop ability to

1. Distinguish between simple and compound interest and demonstrate how to determine each; Evaluate profit/loss for the given various price related problems; Understand the importance of percentage, ratio and proportions while solve the problems in different scenarios.
2. Evaluate the average by various methods; Understand the concepts of speed, distance and time, solve the related problems; Understand the concepts of work done in a given period of time in various contexts.
3. Understand the statements and their connectives; Identify the validity of conclusions drawn from the given statements and identify strong/weak arguments from a given statement; Determine various Analogies to identify the similarities of the objects.
4. Understand the various concepts of Non-Verbal reasoning; Create awareness on blood relations and solve the related problems; Understand the concepts of binary logic and solve the analytical problems.

Course Outcomes: At the end of the course, the students will be able to:

CO 1: Analyze the difference between simple and compound interest and solve various related problems; Analyze the factors that influence the level of profit/loss for the given problem; Evaluate percentages of different quantities and apply ratios and proportions to solve real-life problems.

CO 2: Apply the various types of averages to analyze the feature of the given data; Apply various principles to solve problems on time and distance; Analyze the time period of work done problems.

CO 3: Derive the logical connectives for the given simple and compound statements; Interpret the validity of conclusions drawn from the given statements and determine strong/weak arguments from a given statement; Deduce the similarities of the objectives for various analogies.

CO 4: Use critical thinking and logic to solve problems on Non-Verbal reasoning; Construct a family tree based on the given information and solve blood relation problems; Solve analytical puzzles using binary logic.

Quantitative Aptitude:

1. **Simple Interest**: Definitions, Problems on interest and amount, Problems when rate of interest and time period are numerically equal. **Compound Interest:** Definition and

formula for amount in compound interest, Difference between simple interest and compound interest for 2 years on the same principle and time period. [4]

2. **Profit & Loss:** Cost price, selling price, marked/list price, profit/gain, discount, use of false scale for selling an article, discount series and net selling price, successive Selling. [4]
3. **Percentages, Ratio & Proportions:**
   Calculating a percentage, calculating increase or decrease, calculating percent change, calculating successive percentages, definition of ratio and proportions, direct proportion, Inverse or reciprocal proportion, continued proportion, Mean proportion, Third proportion, Fourth proportion, compound ratio. [4]
4. **Averages:** Definition of Average, Rules of Average, Problems on Average, Problems on Weighted Average, finding average using assumed mean method**.** [4]
5. **Time and Distance:** Relation between speed, distance and time, converting km/h into m/s and vice versa, Problems on average speed, Problems on relative speed, Problems on trains. [4]
6. **Time and Work:** Problems on Unitary method, Relation between Men, Days, Hours and Work, Problems on Man-Day-Hour's method, Problems on alternate days, Problems on Pipes and Cisterns. [4]

Logical Reasoning:

7. **Logical Connectives:** Definition of simple statement, Definition of compound statement, finding the implications for compound statements, finding the negations for compound statements. [4]
8. **Syllogism:** Definition of statement/premises and conclusion, explanation through Venn diagram, problems on two/three statements and one/two conclusions, identification of statements and conclusions from the given set of statements. **Statements and Arguments**: Types of arguments, Strong argument, weak argument, identifying strong/weak arguments from a given statement. [4]
9. **Analogy Classifications:** Definition of Analogy, Problems on number analogy, Problems on letter analogy, Problems on verbal analogy. [6]
10. **Non-Verbal Reasoning:** Identification of continued figure or odd figure by using analogy, series, rotation in clockwise and rotation in anticlockwise, vertical, horizontal, alternative rotation, addition, subtraction. [6]

11. **Blood Relations:** Blood relations on Family Tree concepts (relationships in the family), paternal side relations, maternal side relations, simple and direct relationships, relation puzzles, coded relations. [4]
12. **Binary Logic:** Definition of a truth-teller, Definition of a liar, Definition of an alternator, solving problems using method of assumptions, solving analytical puzzles using binary logic. [4]

TEXT BOOKS:

1. A modern approach to Logical reasoning, R S Agarwal, S. Chand Publications, 2013.
2. Quantitative Aptitude for Competitive Examinations, Dinesh Khattar, Pearson Education, 4th Edition, 2019.

REFERENCE BOOKS:

1. Quantitative Aptitude and Reasoning, R. V. Praveen, PHI Learning Private Ltd, 2nd Edition, 2013.
2. Quantitative Aptitude for competitive examinations, Abhijith Guha, McGraw Hill Education, 6th Edition, 2017.
3. Analytical & Logical Reasoning, Peeyush Bhardwaj, Arihant Publications, 4th Edition, 2015.
4. Logical Reasoning for the CAT, Arun Sharma, McGraw Hill Education, 2nd Edition 2014.

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20EN31P01-English for Professional Success*

Classroom Activity based Course. Hence, Lab. is not required.

B. Tech. CE III Year, I Sem

L	T	P/D	C
0	0	2	1

Course objectives: Students will be able to

1. Recognize and understand the meanings of Phrases, Phrasal verbs and Idioms.
2. Read critically to comprehend the given text.
3. Understand the nature and importance of presentation skills.
4. Know the importance of organizational communication.

Course Outcomes: At the end of the course, student would be able to

CO1 Appreciate the value of using Phrases, Phrasal verbs and Idioms.

CO2 Identify the supporting statements, their relevance or irrelevance, common arguments, opposing points of views and refutations.

CO3 Use effective body language and tone to deliver a fervent and well-knit presentation.

CO4 Prepare circulars, notices, minutes and memos effectively.

Module-I
Advanced Vocabulary
Vocabulary: Idioms and phrases, phrasal verbs: practice exercises. Jargon-Technical Vocabulary

Module-II
Critical Reading
Reading: Book review/ Article review: reviewing skills.

Module-III
Oral Skills
Speaking: Oral Technical Presentations, Project Presentations: genre, originality and accountability.

Module-IV
Official Correspondence
Writing: Circulars, notices, memos, Agenda, Minutes of Meeting (MoM)
Letter of Recommendation.

Classroom Activity based Course. Hence, Lab. is not required.
Text Book(s)
1. Objective English by Edger Thorpe and Showick Thorpe, Pearson, 6th Edition.
2. All About Words: an adult approach to vocabulary by Maxwell Nurnberg, Prentice-Hall.

Reference book(s):
1. Oxford Collocation Dictionary by Diana Lea.
2. Ed Swick, Writing Better English for ESL Learners, Mc.GrawHill, 2nd ed.

20CE31004– Internship

B.Tech. CE III Year, I Sem

Prerequisite(s): None

L	T	P/D	C
-	-	4/-	2

There shall be an Internship, which the student shall carryout immediately after second year second semester examinations and pursue it during summer vacation. Internship shall be submitted in a report form, duly approved by the departmental internal evaluation committee, and presented before the examination committee in third year first semester. It shall be evaluated for 100 marks as CIE. There shall be no Semester End Examination (SEE) for Internship.

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20CS31M02 – Introduction to Artificial Intelligence

B. Tech. CE III Year, I Sem
Prerequisite(s): None

L	T	P/D	C
3	-/-	-/-	-

Course Objectives: To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

UNIT – I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents **Basic Search Strategies**: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non- monotonic Reasoning, Other Knowledge Representation Schemes

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT - IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT - V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOKS:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice- Hall, 2010.

REFERENCE BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

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20CE32001 – Hydrology and Water Resources Engineering

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-/-	-/-	3

Prerequisite(s):
20CE22002 - Hydraulics & Hydraulic Machinery

Course objectives: Develop ability to

1. Understand the basic concepts of engineering hydrology and its applications.
2. Understand the effect of hydrological losses and runoff on the hydrological cycle.
3. Understand the different methods of measuring stream flow.
4. Understand how to estimate peak flood.
5. Study the influence of aquifer parameters on the groundwater occurrence.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain various components of a hydrologic cycle and estimate rainfall.

CO2. Evaluate abstractions from precipitation data for a catchment area.

CO3. Determine stream flow to calculate yield from a catchment and reservoir capacity; Derive hydrographs for a catchment.

CO4. Calculate flood discharge over a catchment to formulate and solve flood routing models.

CO5. Assess different aquifer parameters influencing the groundwater occurrence and apply concepts of wells.

UNIT-I

Introduction to Engineering Hydrology and its applications – Global Water Budget – Hydrologic cycle - Types and forms of precipitation - Rainfall measurement, Types of rain gauges – Rain gauge network - Test for continuity and consistency of data - Presentation of rainfall data – Computation of average rainfall over a basin - Depth Area Duration (DAD) Relationship – Recurrence Interval - Intensity Duration Frequency Curves – Probable Maximum Precipitation.

UNIT-II

Abstractions from precipitation – Interception and Depression storage - Evaporation and its process – Factors affecting evaporation – Measurement of evaporation — Transpiration – Evapotranspiration – Measurement and estimation of evapotranspiration – Infiltration – Factors affecting infiltration – Measurement of Infiltration – Infiltration indices.

UNIT-III

Runoff – Factors affecting Runoff – Runoff Characteristics of Stream – Yield from a catchment - Runoff over a Catchment – Empirical and Rational Formulae - Flow duration curve and Flow mass curve - Calculation of Reservoir capacity.

Distribution of Runoff – Hydrograph Analysis – Flood Hydrograph – Base flow – Base Flow Separation – Effective Rainfall - Direct Runoff Hydrograph – Unit Hydrograph, definition, limitations and applications of Unit Hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa – S-hydrograph and Instantaneous Unit Hydrograph – Synthetic Unit Hydrograph.

UNIT‑IV

Floods – Design flood, Estimation of peak discharge - Rational method, Empirical method, Envelope curve, Unit hydrograph method and Flood frequency analysis. Gumbel's method – Safety factor.

Flood routing – Concepts of flood routing, Reservoir routing – Goodrich Method, Channel routing - Muskingum method.

UNIT-V

Groundwater – Occurrence, movement and distribution of groundwater, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers. Types of wells – Well construction – Well Development.

TEXT BOOKS:

1. Engineering Hydrology, K. Subramanya, McGraw Hill Education, 2020.
2. A Textbook of Hydrology, Dr. P. Jaya Rami Reddy, Laxmi Publications, 2021.

REFERENCE BOOKS:

1. Applied Hydrology, Ven T Chow, David R Maidment and Larry W Mays, McGraw Hill Education, 2017.
2. Introduction to Hydrology, W. Viessman and G Lewis, Pearson Education India, 2002.
3. Engineering Hydrology, CSP Ojha, P. Bhunya, R. Berndtsson, Oxford University Press, 2008.
4. Irrigation and Water Power Engineering, B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2021.
5. Hydrology: Principles, Analysis and Design, H. M. Raghunath, New Age International, 2015.

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20CE32002 – Environmental Engineering

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course objectives: Develop ability to

1. Understand different types of water demands, population forecasting methods, design period and sources of water.
2. Understand drinking water and wastewater quality parameters, their testing procedures and standards set up by Government of India.
3. Understand the purpose of drinking water and wastewater treatment units, their principles, design, operations and maintenance of each process.
4. Understand the design of water distribution systems and sewerage systems.
5. Understand sludge treatment and its disposal methods.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain concepts of water supply engineering and population forecasting.

CO2. Design a drinking water treatment plant to meet societal needs.

CO3. Select suitable water distribution layout and design it for a community.

CO4. Explain wastewater characteristics and design a sewerage network with suitable sewer appurtenances from collection to disposal of sewage.

CO5. Design Sewage treatment plant (STP) and solids handling system.

UNIT–I:

Introduction: Waterborne diseases – Protected water supply – Population forecasts – Design period – Types of water demand – Factors affecting – Fluctuations – Fire demand – Water quality and testing – Drinking water standards – Sources of water – Comparison from quality and quantity and other considerations – Intakes – Infiltration galleries.

UNIT–II:

Layout and general outline of water treatment units – Sedimentation – Principles – Design factors – Coagulation – Flocculation – Clarifier design – Coagulants – Feeding arrangement – Filtration – Theory - Working of slow and rapid gravity filters – Multimedia filters – Design of filters – Troubles in operation – Comparison of filters – Disinfection – Types, Chlorination, chlorine demand.

UNIT–III:

Distribution systems requirement – Method and layouts – Design procedures – Hardy Cross and Equivalent pipe methods – Service Reservoir and determination of its storage capacity – Pipe materials, joints, valves and water meters – Laying and testing of pipe lines – Pump house – Conservancy and water carriage systems – Sewage and Stormwater estimation – Time of concentration.

UNIT–IV:

Characteristics of sewage – Cycles of decay – Decomposition of sewage, examination of sewage-BOD equation – COD – Design of sewers – Shapes and materials – Sewer appurtenances like manholes, catch basins, flushing tanks, inverted syphons, Stormwater overflow devices, pumps and pump houses – House drainage – Component's requirements – Sanitary fittings – Traps – One pipe and two pipe systems of plumbing – Ultimate disposal of sewage – Dilution, Self- purification of rivers, Sewage farming.

UNIT–V:

Wastewater treatment plant – Flow diagram – Primary treatment – Design of screens, Grit chambers, Skimming tanks and Sedimentation tanks – Principles of design of Biological treatment – ASP and its modifications - Trickling filters – Standard and High rate – Construction and design of oxidation ponds. Sludge digestion – Factors effecting – Design of Digestion tank – Sludge disposal by drying – Septic tanks working principles and design.

TEXT BOOKS:

1. Environmental Engineering by H.S. Peavy, D. R. Rowe, G. Tchobanogolous, Mc Graw Hill education, 2017.
2. Water Supply Engineering Vol 1, Sewage Disposal and Air Pollution Engineering Vol 2, S.K. Garg, Khanna Publishers, 2015.

REFERENCE BOOKS:

1. Environmental Engineering: A Design Approach, A.P. Sincero and G.A. Sincero, PearsonEducation India, 2015.
2. Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy, McGraw Hill, 2017.
3. Water and Wastewater Technology, Mark J Hammer and Mark J. Hammer Jr., Prentice HallIndia Learning Private Limited, 2013.

4. Water Supply, Waste Disposal and Environmental Engineering, A.K. Chatterjee, KhannaPublishers, 2010.
5. Unit Operations in Environmental Engineering, M. K. Saseetharan, R. Elangovan, New ageInternational, 2015.
6. Wastewater treatment - Concepts and design approach, G. L. Karia and R.A. Christian, Prentice Hall of India, 2013.
7. Theory and Practice of Water and Wastewater Treatment, Ronald L. Droste, Wiley IndiaPvt. Ltd, 2018.

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20CE32003-Design of Steel Structures

B.Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE31001-Design of Reinforced Concrete Structures.

Course Objectives: Develop ability to

1. Design the connections among components of steel structures.
2. Design the tension and compression members.
3. Design the steel beams.
4. Design the steel columns and column bases.
5. Design the plate girders for long spans and heavy loads.

Course Outcomes: At the end of the course, student would be able to

CO1. Discuss the properties of structural steel and design bolted and welded connections.

CO2. Design tension and compression members of structural steel.

CO3. Design the steel beams.

CO4. Design the built-up steel columns and their supporting systems.

CO5. Design the welded plate girder.

UNIT–I:

Materials & Specifications: Steel, structural steel, rolled steel sections, loads, and design criteria for limit state method, partial safety factors, design strengths, deflection limits, and serviceability.

Bolted Connections: Types of connections, types of bolts, types of joints, failure of joints, specifications, types of connections, tensile strength, efficiency, slip critical connections, prying action.

Welded Connections: Types, design of fillet welds, design of groove welds, fillet welds for truss members.

UNIT–II:

Design of Tension members: Types, net sectional area, effective net area for angles, types of failures, design strength, lug angle, splices, gusset plate.

Design of Compression members: Effective length, slenderness ratio, types of sections, classification of sections, column formulas, design strength, design of axial loaded compression members, built-up laced columns.

UNIT–III:

Column Bases: Types, design of slab base, introduction to gusset base.

Beam Column connections: Types, design of bolted frames connection and unstiffened seated connection.

Plastic Analysis: Behavior of beams in flexure, plastic hinge length, plastic moment, redistribution of moments, classification of cross sections, shape factor, load factor.

UNIT–IV:

Beams: Types of sections, classification of cross section, stability, bending strength, shear strength, web-buckling and web-crippling, deflection, design of rolled beams and built-up beams.

Design of roof trusses: Types of roof-trusses, loads on trusses – purlin design

UNIT-V:

Welded Plate Girder: Types of sections, elements, proportioning of web and flanges, flexural strength, shear strength, stiffeners- intermediate, load bearing and horizontal stiffeners, Introduction to web and flange splices.

TEXT BOOKS:

1. Steel Structures: Design and Practice Oxford University Press, 2010.
2. Limit State Design of steel structures, S.K. Duggal, McGraw Hill Education, 2019.

REFERENCE BOOKS:

1. Design and drawing of steel structures, S.S. Bhavikatti, Dreamtech Press, 2019.
2. Design of steel structures Edwin H.gaylord, Jr. charless N.gaylord and Jams Stallmeyer, McGraw Hill Education, 2010.
3. Fundamental of Structural Steel Design, M L Gambhir, McGraw Hill Education, 2017.
4. Structural Design and Drawing, N. Krishna Raju, Universities Press, 2005.
5. Design of Steel structures, K.S. Sai Ram, Person Education, 2013.

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20CE32004 – Advanced structural analysis
(Professional Elective-I)

L	T	P/D	C
3	-	-/-	3

B. Tech. CE III Year, II Sem

Prerequisite(s):
20CE22001- Structural analysis

Course objectives: Develop ability to

1. Analyze and adapt the fundamentals of matrix approach with respect structural analysis.
2. Analyze and adapt the various relations ship theories that act as the basis for the advanced structural analysis.
3. Understanding the computation techniques that system adopts in solving the real time problems during the analysis of structures.
4. Interpret and apply the concepts, in the analysis of plane and space structures using matrix approach.

Course Outcomes: At the end of the course, student would be able to

CO1. Fundamentals of matrix approach and structural analysis to solve 2D and 3D problems.

CO2. Relation between flexibility and stiffness methods to analyze the structures.

CO3. Apply the concepts of flexibility method in solving the plane and space structure problems.

CO4. Apply the concepts of stiffness method in solving the plane and space structure problems.

CO5. Apply the concepts of direct stiffness method in solving the plane and space structure problems.

UNIT–I:

Introduction to matrix method, Framed structures, cartesian co-ordinate system, Co-ordinate systems for force and displacements, Node and elements, Nodal degrees of freedom, Global and local co-ordinate systems, Specifications of geometry of the structure, Equivalent nodal loads, Static and Kinematic indeterminacy, Methods of structural analysis.

UNIT–II:

Force-Displacement relation of a structure, Work and energy, Symmetry of flexibility and stiffness method, Relation between stiffness and flexibility coefficients and strain energy.

UNIT–III:

Coordinates for forces and displacements, Equilibrium equations and force transformation matrix, Force – Displacement relations, Compatibility conditions, Structure flexibility matrix, Transformation used in flexibility method, Analysis of static determinate and indeterminate method.

UNIT–IV:

Coordinates for displacements and forces, Compatibility conditions and displacement transformation matrix, Equilibrium matrix and the principle of contra-gradience, Force – Displacement relations, Structure stiffness method, Equilibrium equations, Transformations used in stiffness method, Procedure for analysis of structures using stiffness method.

UNIT–V:

Coordinates used in direct stiffness method, Transformation law for vectors, Element stiffness matrix with respect to global axis, Transformation used in direct stiffness method, Assembly of equations and structure stiffness matrix, Procedure for analyzing framed structure using direct stiffness method, Introduction to non-linear structural analysis.

TEXT BOOKS:

1. Matrix methods of structural analysis, Praveen Nagarajan, CRC press, 2019.
2. Advanced structural analysis, Devdas Menon, Narosa publisher, 2009.

REFERENCE BOOKS:

1. Structural analysis, A. Ghali, A. M. Neville, CRC Press, 7th edition, 2017.
2. Advanced structural analysis with MATLAB, Srinivasan Chandrasekaran, CRC Press, 2019.
3. Matrix analysis of framed structures, Wilian Weavers, Jr., James M. Gere, 2nd edition, CBD Publishers, 2004.

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20CE32005 – Foundation Engineering
(Professional Elective-I)

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE31003-Geotechnical Engineering

Course objectives: Develop ability to

1. Impart knowledge of various soil exploration techniques.
2. Understand the concepts of earth slopes.
3. Understand earth pressure theories.
4. Understand the different types of shallow foundations.
5. Understand the principles and design of deep foundation.

Course Outcomes: At the end of the course, student would be able to

CO1. Differentiate various soil exploration methods.

CO2. Estimate various factor of safety for finite and infinite slope.

CO3. Differentiate various earth pressures and evaluate the stability of retaining wall.

CO4. Estimate the bearing capacity of soil by various methods.

CO5. Justify the need of deep foundations.

UNIT–I:

Soil Exploration: Purpose – methods of soil exploration – Test pits, boring and sampling methods – penetration tests –Geo-physical methods– planning of soil exploration Programme and preparation of soil investigation report.

UNIT–II:

Slope Stability: Infinite and finite earth slopes – types of failures – factor of safety of infinite Slopes – stability analysis by Swedish slip arc method, Taylor's Stability number- stability of slopes of earth dams under different conditions.

UNIT-III

Earth Pressure Theories: Rankine's theory of earth pressure – different cases, Bell's theory earth pressures in layered soils– Coulomb's earth pressure theory, Culmann's graphical method.
Retaining Walls: Types of retaining walls, stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, Drainage from backfill.

UNIT–IV:

Shallow Foundations: Types, choice of foundation, location and depth, safe bearing capacity shear criteria, Terzaghi's, Meyerhof's, and Skempton's, settlement criteria allowable bearing pressure based on SPT N- value and plate load test, allowable settlements of structures.

UNIT–V:

Pile Foundations: Pile**,** types of piles, load carrying capacity of piles based on static pile formulae, dynamic pile formulae, load carrying capacity of pile groups in sands and clays, Settlement of pile groups in clay, negative skin friction,

Well Foundations- components, different types of cassion's, tilts and shifts- rectifying measures

TEXT BOOKS:

1. Principles of Foundation Engineering, Braja M. Das and Nagaratnam Sivakugan, Cengage Learning, 2017.
2. Soil Mechanics and Foundation Engineering, V.N.S. Murthy, CBS Publishers, 2018.

REFERENCE BOOKS:

1. Foundation Analysis and Design, Joseph Bowles McGraw Hill Education; 5 edition 2017.
2. Soil Mechanics and Foundation Engineering, Santosh Kumar Garg, Khanna Publishers 2003.
3. Foundation Engineering, P.C. Varghese, Prentice Hall India Learning Pvt. Ltd., 2005.

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20CE32006– Intelligent Transportation Systems
(Professional Elective-I)

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):

20CE31002: Transportation Engineering

Course objectives: Develop ability to

1. Understand the fundamental concepts of ITS.
2. Acquire knowledge on Telecommunications in ITS.
3. Describe the user needs in functional areas of ITS.
4. Understand the various applications and services of ITS.
5. Apply the concepts of ITS in automated highway system.

Course Outcomes: At the end of the course, student would be able to

CO1. Understand the importance of ITS.

CO2. Explain the application of sensors to Traffic management.

CO3. Acquire knowledge on of ITS functional areas.

CO4. Select appropriate ITS technology depending upon user needs and Services.

CO5. Design and implement ITS for Traffic and incident management.

UNIT–I:

Fundamentals of ITS: Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

UNIT–II:

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

UNIT–III:

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

UNIT–IV:

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

UNIT–V:

Automated Highway Systems: Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

TEXT BOOKS:

1. Fundamentals of intelligent transportation systems planning, Mashrur A. Chowdhury, Adel Wadid Sadek, 2003.
2. Sussman, J. M., Perspective on ITS, Springer Publishers, 2010.

REFERENCE BOOKS:

1. Sensor Technologies and Data Requirements for ITS, Lawrence A. Klein, Artech House Publishers,2001.
2. Intelligent Transport Systems, Pradeep Kumar Sarkar, Amith Kumar Sarkar,PHI Learning, 2018.
3. Intelligent Transportation Systems: Functional Design for Effective Traffic Management, Robort Gorden, Springer, 2016.
4. ITS Hand Book 2000: Recommendations for World Road Association (PIARC), Kan Paul Chen, John Miles.

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20CE32007 – Disaster Mitigation and Management
(Professional Elective-I)

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course objectives: Develop ability to

1. Acquire knowledge on disasters and assess their causes, impacts and mitigation measures.
2. Comprehend the monitoring techniques of disasters.
3. Understand the issues and policies involved in the disaster management.
4. Evaluate the pre-disaster risk and vulnerability reduction strategies.
5. Assess the role of NGO's, Government bodies and Public in the disaster mitigation and Management.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain concepts of disaster along with national and international policies.

CO2. Explain types of natural disasters, their occurrence, effects, mitigation and management systems.

CO3. Summarize the causes, impacts, mitigation measures and management of Human induced hazards.

CO4. Apply RS & GIS in all phases of disaster mitigation and management.

CO5. Develop understanding on the concepts of risk, vulnerability, warning and forecasting methods in disaster management.

UNIT–I:

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation and Management. Meaning and Concept of Natural and Human made disasters. Types and effects – Role of civil engineers in disaster management – International decade of natural disaster reduction (IDNDR), International strategy of natural disaster reduction (ISDR).

UNIT–II:

Natural Disasters: Hydro meteorological disasters: Causes, types, impacts, early warning systems and mitigation measures for floods, drought and cyclones.

Geographical based disaster: Earthquakes, Volcano's, Tsunamis, Landslides and avalanches: Overview, causes, types, impacts, zoning and mitigation measures.

UNIT–III:

Human Induced Hazards: Risks and control measures in a chemical industry, causes, impacts and mitigation measures for chemical accidents, chemical disaster management, current status and perspectives, Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy, Vizag incident, Management of chemical terrorism disasters and biological disaster, Radiological emergencies and case studies, case studies related to major power break down, fire accidents and traffic accidents.

UNIT–IV:

Remote sensing and GIS for disaster mitigation and management: Scope of application of ICST (Information Communication and Space Technologies) in disaster mitigation and management-critical applications and infrastructure, Potential application of Remote sensing and GIS in disaster mitigation and management.

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UNIT–V:

Disaster Management: Introduction to disaster management, Relationship between risk, vulnerability and a disaster, Disaster management cycle, Disaster risk reduction and resilience. Principles of disaster mitigation: Hazard identification and vulnerability analysis, early warning systems and forecasting, Infrastructure and development in disaster management, Disaster management act and policy in India, organizational structure for disaster management in India, Preparation of state and district disaster management plans.

TEXT BOOKS:

1. Disaster Management in India, Ministry of Home Affairs, Government of India https://www.undp.org/content/dam/india/docs/disaster_management_in_india.pdf
2. Disaster Management, Dr.Mrinanlini Pandey, Wiley India Pvt Ltd., 2014.
3. Disaster Science and Management, Tushar Bhattacharya, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Manual on National Disaster Management Plan, National Disaster Management Authority, Ministry of Home affairs, Government of India (http://ndma.gov.in/images/policyplan/dmplan/National%20Disaster%20Management%20Plan %20May%202016.pdf)
https://ndma.gov.in/images/pdf/NDMP-2018-Revised-Draft-1-2018OCT16-A.pdf

2. Disaster Management Global Challenges and Local Solutions, Rajib, S and Krishna Murthy, R.R, Universities Press Hyderabad, 2012.
3. Environmental Hazards: Assessing Risk and Reducing Disaster, Keith Smith, Routledge, 2013.
4. Disaster Mitigation: Experiences and Reflections, Pardeep Sahni, Alka Dhameja and Uma Medury, PHI Learning, 2010.
5. Natural Hazards and Disasters, Donald Hyndman and David Hydman, Cengage Learning, 2015.
6. Earth and Atmospheric Disaster Management: Nature and Manmade, Navale Pandharinath & C.K. Rajan, B.S. Publications, Hyderaabd, 2009.
7. Disaster Risk Reduction in South Asia, Sahni and Pardeep and Madhavi Malagoda A, PHI learning Pvt Ltd, 2012.

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20CE32008 – Modern Construction Materials
(Professional Elective-I)

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE21004- Building Materials, Construction and Planning

Course objectives: Develop ability to

1. Understand properties and uses of different modern building materials such as fly ash bricks, soil-cement blocks, calcium silicate bricks, red mud jute fibre polymer composite and glass reinforced gypsum.
2. Explore various types of modern construction materials and concrete.
3. Understand properties and uses of different types of cement, fibre and concrete.
4. Understand properties and uses of different types of polymers.
5. Understand the use of conventional and modern water proofing and insulating materials.

Course Outcomes: At the end of the course, student would be able to

CO1. Understand the use of modern construction material.
CO2. Use of geosynthetics and bituminous materials in construction.
CO3. Apply knowledge of modern materials in production of variety of concrete.
CO4. Apply knowledge of composites and chemicals in production of modern concrete.
CO5. Use of modern water proofing and insulating materials in construction.

UNIT–I:

Introduction, properties and uses of modern building materials: fly ash bricks, soil – cement blocks, calcium silicate bricks, red mud jute fibre polymer composite (RFPC), glass reinforced gypsum.

UNIT–II:

Introduction, properties and use of: geosynthetics, bituminous material, fire resistant materials (chemicals, paints, tiles, bricks, glass), metals, light – weight concrete, mass concrete, waste material-based concrete.

UNIT–III:

Introduction, properties and use of: Ferro cement & fibre reinforced concrete, different types of fibres, high density concrete, nuclear concrete, heat resisting & refractory concretes, prefabricated systems.

UNIT–IV:

Introduction, properties and use of: Polymers, fibre reinforced polymers, polymer concrete composites (PCCs), Sulphur concrete and Sulphur – infiltrated concrete.

UNIT–V:

Introduction, properties and use of: Conventional and modern water proofing materials, Conventional and modern insulating materials (thermal, sound and electrical insulating materials). Concept of polymer floor finishes.

TEXT BOOKS:

1. Ghambhir M.L. "Concrete Technology" Tata McGraw Hill education private limited.
2. A.R. Santhakumar, Concrete Technology, Oxford University Press.

REFERENCE BOOKS:

1. Building Materials, P.C. Varghese, Prentice – Hall India.
2. Shetty, M.S., "Concrete Technology" S.Chand Publication.
3. Krishnaraju .N., Advanced Concrete Technology, CBS Published.
4. Materials Science and Engineering: An introduction, W.D. Callister, John Wiley.
5. Nevile. A.M., Concrete Technology, Prentice Hall, Nweyork.
6. Dr. U. K. Shrivastava, Building Materials Technology, Galgotia Publication Pvt Ltd.

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20CE32009 – Prefabricated Structures
(Professional Elective-II)

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE21004- Building Materials, Construction and Planning
20CE31001- Design of Reinforced Concrete Structures

Course objectives: Develop ability to

1. Understand the process of Prefabricated Structural needs.
2. Learn design of components of Prefabricated building.
3. Gain Knowledge of flexural elements like floor, stair
4. Understand selection of suitable type of wall.
5. Understand the components of industrial buildings.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain the civil engineering requirements of Prefabricated Structures.
CO2. Detail various components of Prefabricated building.
CO3. Design flexural elements like floor, stair.
CO4. Choose suitable type of wall.
CO5. Identify the components of industrial buildings and their connections.

UNIT- I:

Design Principles: General Civil Engineering requirements, specific requirements for planning and layout of prefabrication plant. IS Code specifications. Modular co-ordination, standardization, Disuniting of Prefabricates, production, transportation, erection, stages of loading and code provisions, safety factors, material properties, Deflection control, Lateral load resistance, Location and types of shear walls.

UNIT-II:

Reinforced Concrete: Prefabricated structures - long wall and cross-wall large panel buildings, Framed buildings with partial and curtain walls, -Connections – Beam to column and column to column.

UNIT- III:

Floors, Stairs and Roofs: Types of floor slabs, analysis and design example of cored and panel types and two-way systems, staircase slab design, types of roof slabs and insulation requirements, Description of joints, their behavior and reinforcement requirements, Deflection control for short term and long-term loads, Ultimate strength calculations in shear and flexure.

UNIT IV:

Walls: Types of wall panels, Blocks and large panels, Curtain, Partition and load bearing walls, load transfer from floor to wall panels, vertical loads, Eccentricity and stability of wall panels, types of wall joints, their behavior and design, Leak prevention, joint sealants, sandwich wall panels, approximate design of shear walls.

UNIT-V:

Industrial Buildings and Joints in Structural Members:

Components of single-Storey industrial sheds with crane gantry systems, R.C. Roof Trusses, Roof Panels, corbels and columns, wind bracing design.

Joints: Joints for different structural members, Joints for different structural connections – expansion joints. Dimensions and Detailing.

TEXT BOOKS:

1. Alternate & Innovative construction system for housing, A joint initiative of BMTPC & School of planning, Delhi, 2021.
2. Precast Concrete Structures", Hubert Bachmann, Alfred steinle Precast Concrete Structures, 2011.

REFERENCE BOOKS:

1. Residential Structural Design Guide A State-of-the-Art Engineering Resource for Light-Frame Homes, Apartments, and Townhouses, Second Edition, Prepared for U.S. Department of Housing and Urban Development, Office of Policy Development and Research, Prepared by Coulbourne Consulting, October 2017.
2. Prefabricated Structures by V. Soundrarajan, R. Jagadeesh Kumar, S. Kalpanadevi from ARS Publications. 2013.

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20CE32010 – Ground Improvement Techniques
(Professional Elective – II)

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE31003- Geotechnical Engineering

Course objectives: Develop ability to

1. Recognize the importance of ground improvement
2. Understand various ground improvement techniques involved in improving the bearing capacity of soil.
3. Gain knowledge on grouting.
4. Understand the concepts of compaction.
5. Gain knowledge on soil reinforcement.

Course Outcomes: At the end of the course, student would be able to

CO1. Discuss the various methods of ground improvement techniques

CO2. Identify the suitable techniques for various problematic soils

CO3. Compare the available hydraulic modification methods and choose in a given situation.

CO4. Evaluate shallow and deep stabilization methods and decides appropriate technique.

CO5. Explain the modern reinforcing methods of Ground Improvement

UNIT–I:

Introduction to Engineering ground modification: Need and objectives, Identification of soil types, in-situ and laboratory tests to characterize problematic soils. Mechanical, hydraulic, physico-chemical, electrical, thermal methods etc and their applications.

UNIT–II:

Mechanical modification: Principles of soil densification – properties of compacted soil, compaction control tests, specification of compaction requirements.

Deep compaction techniques: Blasting, Vibro-compaction, Dynamic tamping and compaction piles.

UNIT–III:

Hydraulic modification: objectives and techniques, traditional dewatering methods and their choice, Electro-osmosis.

Geosynthetics: Types of geosynthetics, filtration, drainage and seepage control with geosynthetics, preloading and vertical drains.

UNIT–IV:

Stabilization: Methods of stabilization- mechanical stabilization, cement, lime, bitumen and chemical stabilization. Shotcreting and Guniting technology.

Grouting: permeation grouting, compaction grouting and jet grouting.

Thermal modification: Ground freezing and heating.

UNIT–V:

Modification by inclusions and confinement: Soil reinforcement- soil reinforcement with strip, bar, mesh, sheet and grid.

In-situ ground reinforcement: Soil nailing, ground anchors and rock bolting.

TEXT BOOKS:

1. Engineering principles of ground modification, Manfred R. Hausmann, McGraw Hill Education, 2013.
2. Ground Improvement Techniques, Dr. P. Purushothama Raj, Laxmi Publications, 2016.

REFERENCE BOOKS:

1. Engineering Treatment of soils, F.G. Bell, CRC Press, 2014.
2. Ground Improvement Techniques, Nihar Ranjan Patra, Vikash publishing house, 2012
3. Earth Reinforcement and Soil structures, Colin JEP Jones, Butterworth-Heinemann Publishers, 2013.
4. Ground Improvement, M.P.Moseley and K.Kirsch, CRC Press, 2004.
5. Ground Improvement, Klaus Kirsch & Fabian Kirsch, CRC Press, 2010.
6. Soil Improvement and Ground Modification Methods, Peter G. Nicholson, Butterworth – Heinemann Publishers, 2014.

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20CE32011 - Traffic Engineering and Management
(Professional Elective – II)

B. Tech. CE III Year, II Semester

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE31002-Transportation Engineering

Course objectives: Develop ability to

1. Understand the basic principles of Traffic Engineering
2. Understand and analyze Traffic engineering studies
3. Understand the design principles of Intersections
4. Understand the principles of signal timings and signal coordination
5. To learn the skills of traffic control and management

Course Outcomes: At the end of the course, student would be able to

CO1. Explain the principles of Traffic Engineering and Traffic capacities

CO2. Carryout traffic engineering studies and analyze

CO3. Carryout Intersection design for safety

CO4. Design signal timings and coordinate the signals

CO5. Implement Traffic Management systems

UNIT - I

Introduction: Objectives and scope of Traffic Engineering – Components of road traffic: vehicle, driver and road – Road user and vehicle characteristics and their effect on road traffic – traffic maneuvers – Traffic stream Characteristics – Relationship between Speed, Flow and Density.

Highway Capacity: Importance of capacity in Highway Transportation, Passenger Car Unit, Level of Service Concept as per HCM, Factors affecting Capacity and Level of Service.

UNIT-II

Traffic Engineering Studies and Analyses: Objectives, methods, equipment, data collection, analysis and interpretation of (a) Traffic Volume (b) Speed and delay, (c) Origin and destination, (d) Parking, (e) Accident and other studies.

UNIT-III

Intersection Design: Types of Intersections - Conflicts at Intersections - Requirements of At Grade intersections - Types of At-Grade Intersections; Channelized and Un-Channelized

Intersections - Traffic Islands - Types of grade Separated Intersections - Rotary Intersection - Concept of Rotary - Design Factors of Rotary - Advantages and Limitations of Rotary Intersections.

UNIT - IV

Traffic Control: Traffic Control Regulation, Traffic signals - Types of Signals, Principles of Phasing; Time space Diagram; Design of Isolated Traffic Signal by Webster method, Warrants for Signalization. Signal Coordination method, Simultaneous, Alternate, Simple progression and Flexible progression systems.

UNIT - V

Traffic Management: Parking studies – parking parameters, parking surveys, parking requirements - on street and off-street parking. Lay-byes and bus stops. Principles of Traffic Control: Basics of traffic management. Traffic System Management - speed control, one-way streets, reversible lanes, access control, bus priority measures, turning restrictions.

TEXT BOOKS:

1. Introduction to Traffic Engineering, R. Srinivasa Kumar, Universities Press Pvt. Ltd., 2018
2. Traffic Engineering and Transport Planning, Dr. L. R. Kadiyali, Khanna Publishers, 2013.

REFERENCE BOOKS:

1. Traffic Engineering, Dr. Roger P. Roess, Elena S. Prassasand William R. McShane, Pearson Publication, 2018.
2. Transport Planning and Traffic Engineering, O Flaherty, 2018.
3. Principles of Highways Engineering and Traffic Analysis, Fred Mannering & Walter Kilareski, John Wiley & Sons Publication, 2007.
4. Transportation Engineering – An Introduction – C. Jotin Khisty, Pearson India Education services Pvt.Ltd. Publication, 2017.
5. Indian Highway Capacity Manual (Indo-HCM) CSIR Publications, New Delhi-110025, December 2017.

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20CE32012 – Advanced Surveying
(Professional Elective – II)

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE21001 - Surveying and Geomatics

Course objectives: Develop ability to

1. Understand various modern surveying instruments.
2. Understand geodetic surveying principles, triangulation concepts, base line and marking of stations.
3. Understand the basics of astronomy, conversion of time and determination of azimuth, latitude and longitude.
4. Understand aerial photogrammetry, vertical and tilted photographs, photo interpretation, Drone's, Scanning devices and their applications.
5. Understand the applications of remote sensing, DGPS, GIS in surveying.

Course Outcomes: At the end of the course, student would be able to

CO1. Demonstrate various modern surveying instruments used for surveying involving the latest technologies.

CO2. Apply the principles of geodetic surveying in finding the distances between stations and marking the stations using triangulation concept.

CO3. Demonstrate the basics of astronomy, conversion of time and determination of azimuth, latitude and longitude.

CO4. Measure the distance and area on the aerial vertical and tilted photographs, visually interpret objects on the photographs, and demonstrate the use of drone's and scanning devices.

CO5. Apply the concepts of remote sensing, DGPS and GIS in surveying.

UNIT–I:

Modern Equipment's For Surveying: Digital levels, Digital Planimeter - Electronic Distance measurement (EDM) - Electronic Theodolites - Total Station - Global Positioning Systems (GPS), Components, Types, Methods and Applications.

UNIT–II:

Geodetic Surveying: Introduction to Geodetic Surveying - Principal &classification of triangulation system - Selection of base line and stations - Orders of Triangulation-triangulation figures - Station marks, selection and marking of stations.

UNIT–III:

Field Astronomy: Introduction & Instruments purpose - Astronomical terms - Time & conversion of time - Abbreviations, Determination of azimuth, Latitude and longitude - spherical triangles.

UNIT–IV:

Aerial photogrammetry: Introduction – Principle – Uses - Aerial camera, Aerial photographs, Definitions - Scale of vertical and tilted photograph, Vertical and titled photographs distortion in aerial photographs – stereoscopic vision - photo interpretation - Applications, Procedure of aerial survey - Photomaps and mosaics.

Use of Drone and Scanner devices in surveying: Principle - classification - data acquisition process.

UNIT–V:

Remote Sensing, DGPS & GIS: Introduction to Remote sensing, principles of energy interaction in atmosphere and earth surface features, Visual Image interpretation techniques. DGPS - Principle, Functioning and uses. Integration of remote sensing and GIS - GIS applications in civil engineering, Projection and Coordinate system in GIS Map Scale - Coordinate systems, spatial reference, map projections.

TEXT BOOKS:

1. Chandra, A.M., "Higher Surveying", New Age International (P) Limited, 3rd Edition, 2015.
2. Punmia B. C, Ashok K. Jain, Arun K. Jain, Higher Surveying, Laxmi Publications, 15th edition, 2017.
3. Anji Reddy, M., "Remote sensing and Geographical information system", B. S. Publications, 3rd Edition, 2012.

REFERENCE BOOKS:

1. Remote sensing and Image interpretation by T.M Lillesand,. R.W Kiefer and J.W Chipman, 7th edition, John Wiley and Sons India, 2015.
2. Surveying and leveling by Subramanian, R., Oxford University Press, New Delhi, 2nd edition, 2012.
3. Advanced Surveying: Total Station, GPS, GIS & Remote Sensing by Satheesh Gopi, R. Sathikumar, N. Madhu, Pearson Education, Second Edition, 2017.

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20CE32013 – Green Building Systems
(Professional Elective – II)

B. Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course objectives: Develop ability to

1. To expose the students to green buildings, their features and importance in the present context of sustainable development.
2. Understand green building assessment and LEED certification process.
3. To introduce various sustainable building materials for green buildings.
4. Learn emerging building materials and their application.
5. To acquire knowledge on various design concepts and construction aspects of green buildings

Course Outcomes: After the competition of course, student should be able to

CO1. Explain the importance, features and requisites of a green building.

CO2. Identify suitable sustainable building materials for construction of green building.

CO3. Plan and design various systems for green buildings.

CO4. Explain various codal provisions of green buildings and accordingly rate a building

CO5. Explain the implementation of green buildings and its future scope.

UNIT – I:

Introduction: Definition of Green Buildings - Typical features of green buildings - Benefits of Green Buildings - Green Building Materials and Equipment in India - Key Requisites for Constructing a Green Building - Important Sustainable features for Green Building - Climate responsive buildings - Carbon footprint and eco footprints of buildings.

UNIT – II:

Green Building Materials: Introduction to sustainable building materials – Sustainable Concrete – Partial replacements in concrete - Natural building materials - Bio materials - Mycelium - Engineered Wood - Structural insulated panels (SIPs) - Natural Fiber - Nontoxic materials: low VOC paints, organic paints, coating and adhesives - Use of waste materials such as paper, Cellulose, glass bottles, tires, shipping containers - Use of industrial waste such as fly-ash, bags, building demolition waste.

UNIT – III:

Design of Green Buildings: Indoor environmental quality requirement and management: Thermal comfort - HVAC - Visual perception - Illumination requirement - Auditory requirement

– Energy Efficiency - Lighting and day lighting - Steady and non-steady heat transfer through the glazed window and the wall – Indoor air quality - Local climatic conditions – temperature, humidity, wind speed and direction.

UNIT – IV:

Construction Of Green Buildings: IoT Integrated Automated Building Systems - Synthetic Roof Underlayment - Green Roofs - Grid Hybrid System - Passive Solar - Greywater Plumbing Systems - Electrochromic Glass - Solar Thermal Cladding - Structural 3D Printing - Self-healing Concrete - Bird Friendly Design - Landscaping for Parking Lot Runoff - Composting Toilets - Proactive Maintenance - Green Cleaning.

UNIT – V:

Green Building Rating Systems and Codes: Green building rating systems: BREAM, LEED and GRIHA, ISO 14020 – Green building codes: ECBC and NBC 2016 - Green materials: Standard specifications – Case Studies: Dockland Building in Hamburg, SOKA Building in Wiesbaden, KSK Tuebingen, Nycomed, Constance, DR Byen, Copenhagen.

TEXT BOOKS:

1. Sustainable Construction: Green Building Design and Delivery, Charles.J.Kibert, John Wiley & Sons, New Jersey, 2016
2. Green Building: Guidebook for Sustainable Architecture, M.Bauer, P. Mosle and M. Schwarz, Springer, Verlag Berlin Heidelberg, 2010.

REFERENCE BOOKS:

1. Mike Montoya, ―Green Building Fundamentals‖, Pearson, USA, 2010.
2. Marketing Green Buildings: Guide for Engineering, Construction and Architecture, Jerry Yudelson, The Fairmont Press Inc., 2006.
3. Green by Design: Creating a Home for Sustainable Living, Angela M. Dean, Gibbs Smith Publication, 2003.
4. Indian Green Building Council Website: https://igbc.in/igbc/
   http://cpwd.gov.in/Publication/Guideleines_Sustainable_Habitat.pdf
5. For case studies: http://www.nmsarchitects.com/
6. For case studies: http://www.nmsarchitects.com/

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20EN32L01 – Professional Communication Skills Lab (PCS Lab)

B. Tech. CE III Year, II Sem

L	T	P/D	C
-	-	2/-	1

Course objectives: Develop ability to

1. Acquire behavioral skills required for their personal and professional life.
2. Help students develop their leadership skills.
3. Read and comprehend texts and respond appropriately in different Socio-Cultural contexts.
4. Communicate their ideas effectively orally and in written form.

Course Outcomes: At the end of the course, student would be able to

CO1. Demonstrate effective Listening and Speaking Skills

CO2. Develop proficiency in academic reading and writing.

CO3. Cultivate employability skills thereby increasing Job prospects

CO4. Communicate confidently for all official purposes.

Module-I:

Activities on Fundamentals of Inter-Personal Communication: Responding appropriately and relevantly using the right body language, discourse skills. Resilience and Personal Management-Managing stress, time, anger and other emotions, assertiveness and culture shock.

Module-II:

Activities on Reading Skills: Reading for facts, reading for specific information, reading between the lines, negative facts, inferential reading, critical reading.

Module-III:

Activities on Writing Skills: Writing process, gather information, analyzing the content, formatting, editing, Resume writing and CV preparation, writing SOP, letter writing and email writing and Video Resume or Visume'.

Module-IV:

Activities on Presentation Skills: Oral Presentations (individual & group), seminars, ppts and written presentations through posters, projects, portfolio building or management, brochures and reports.

Module-V:

Activities on Group Discussion and Interview Skills: Dynamics of Group Discussion-Videos of Mock GDs-intervention, summarizing, body language, relevance and organization of ideas and rubrics for evaluation. Three stages of Interviews-pre, during and post interview planning,

opening strategies, answering strategies, interview through Tele-Conference and Video Conference and Mock Interviews, Videos of Mock Interviews, H.R questions, SJT questions.

TEXT BOOKS:

1. PCS Lab Manual prepared by the Faculty of English, Freshman Engineering Department.
2. David A. McMurrey& Joanne Buckley: Handbook for Technical Communication, Cengage Learning Pvt. Ltd ., New Delhi, 2012.

REFERENCE BOOKS:

1. Paul V. Anderson: Technical Communication, Cengage Learning Pvt. Ltd., New Delhi, 2007.
2. O'Connor Tamara, Generic Skills Integration Project (GENSIP)Interpersonal Skills Module Exercises & Handouts, University of Dublin, Trinity College, 2003.

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20CE32L01 – Environmental Engineering Lab

B. Tech. CE III Year, II Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):
20CH12001- Engineering Chemistry

Course objectives: Develop ability to

1. Understand drinking water quality parameters, their sampling, testing procedures and standards set up by Government of India.
2. Gain knowledge on wastewater characteristics, their sampling, testing procedures and effluent standards set by Government of India.
3. Perform experiments to determine water and wastewater characteristics.
4. Apply principles understood in various instrumental methods and solve complex environmental engineering problems.
5. Apply the concepts learnt in theory classes to the practical sessions.

Course Outcomes: At the end of the course, student would be able to

CO5. Select suitable equipment and chemicals required to perform experiments.
CO6. Estimate water characteristics of given samples and compare with IS 10500 specifications.
CO7. Analyze the given wastewater samples for various parameters.
CO8. Determine optimum coagulant dosage.
CO9. Determine break-point chlorination and plot it.

LIST OF EXPERIMENTS

Determination of:

1. pH
2. Turbidity.
3. Electrical Conductivity.
4. Total Solids (Organic and Inorganic).
5. Alkalinity.
6. Acidity.
7. Chlorides.
8. Fluorides.
9. Dissolved Oxygen (Winkler Method).
10. Optimum Coagulant dosage.
11. Chlorine demand.
12. Biological Oxygen Demand (BOD).
13. Chemical Oxygen Demand (COD).

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20CE32L02-Structural Drafting Lab

L	T	P/D	C
-	-	2/-	1

III Year. B.Tech. CE– II Semester

Prerequisite(s):
20CE22L01- Computer Aided Drafting of Buildings Lab
20CE32003- Design of Steel structures

Course objectives: Develop ability to

1. Provide hands on experience for structural drafting.
2. Prepare detailing of RCC and steel structural members as per the IS specifications.
3. Impart detailing skills of Beams and Slabs as per the IS specifications.
4. Understand drawings of Columns and Footings.
5. Understand drawings of Roof trusses.

Course Outcomes: At the end of the course, student would be able to

CO1. Draw the detailing of various structures for the requirements of the society as per IS codes.

CO2. Summarize the detailing of various RCC structural elements.

CO3. Draw the reinforcement details of different types of columns and Footings.

CO4. Draw the reinforcement details of staircase.

CO5. Draw Structural detailing of steel sections

LIST OF EXERCISES:

Draw the reinforcement details of RC members:

1. Reinforcing Detailing of Simply Supported Beams and Cantilever Beams.
2. Structural detailing of one-way slab and two-way slab.
3. Reinforcement detailing of RC columns and RC footings.
4. Structural detailing of Staircase.
5. Detailing of Connections.
6. Detailing of steel built up compression members.
7. Detailing of Column bases–slab base.
8. Detailing of steel roof truss.

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20MA32P01 – Logical Reasoning-II*

B.Tech. CE III Year, II Sem

L	T	P/D	C
-	-	4/-	2

Prerequisite(s): Logical Reasoning-I

Course Objectives: Develop ability to

1. Distinguish between permutation and combination and demonstrate how to determine each; Understand the basic concept of probability and illustration of Venn diagram; Classify the numbers and compute LCM, HCF, Square Roots, Cube Roots, Surds and Indices; Understand the concepts of allegation and mixture
2. Distinguish between the linear and circular sitting arrangements and also understand the coding and decoding problems; Understand the pattern of number and letter series.
3. Understand concepts of calendars; Classify the different forms of Alphabet Arrangements; Interpret the clues in the form of direction wise.
4. Identify the placements of numerals and hands on clock; Understand the various properties of cubes; Understand the concepts of data sufficiency and data interpretation.

Course Outcomes: At the end of the course, student would be able to

CO1. Analyze the difference between permutation and combination and solve various arrangement and selection related problems; Evaluate probability problems using various rules; Apply appropriate methods to evaluate LCM, HCF, Square Roots, Cube Roots, Surds and Indices; Apply the rules of allegation to solve the problems related to mixture.

CO2. Analyze the linear and circular sitting arrangements and also solve the coding and decoding problems with same and different set of letters; Evaluate the problems of number and letter series.

CO3. Solve calendar related problems; Illustrate different forms of Alphabet Arrangements and problems based on letter word; Solve the problems using the various concepts of directions.

CO4. Perform mathematical operations on clocks; Evaluate various problems on cubes and cuboids; Solve problems on data sufficiency and interpretation of data using various types of graphs.

Quantitative Aptitude:

1. **Permutation and Combinations:** Fundamental Principle of Counting, Counting Methods, Definition of permutation, Linear Permutations, Rank of a word, Circular Permutations, Definition of Combinations, Problems on Combinations. [4]

2. **Probability:** Definitions of Probability, Addition and Multiplication Theorems. Deductions: Introduction, expressing different types of statements using Venn diagrams, Definition of complimentary pairs, finding the conclusions using Venn diagrams for two and more statements. [4]
3. **Number system:** Classification of numbers, Divisibility rules, Finding the units digit, finding remainders in divisions involving higher powers, LCM and HCF Models**,** Decimal fractions, Simplifications, Square Roots & Cube Roots, Surds and Indices. [4]
4. **Allegation and Mixture:** Definition of allegation, mean price, rules of allegation on quantity and cost price, diagrammatic explanation, removal and replacement. [4]

Logical Reasoning:

5. **Sitting Arrangement:** Problems on Linear arrangement, Problems on Circular arrangement, Problems on Double line-up, Problems on Selections, Problems on Comparisons. **Coding and decoding:** Coding using same set of letters, Coding using different set of letters, Coding into a number Comparison & Elimination. [6]
6. **Number and letter Series:** Difference series, Product series, squares series, Cubes series, Alternate series, Combination series, Miscellaneous series, Place values of letters. [4]
7. **Day sequence/Calendars**: Definition of a Leap Year, Finding the number of odd days, framing the year code for centuries, finding the day of any random calendar date. [6]
8. **Alphabet Test:** Alphabetical order of verbs, letter-word problems, rule-detection, alphabetical quibble, word formation. [4]
9. **Direction sense Test:** Direction from the initial point: directions, cardinal directions, problems on distances, problems on clocks, problems on angles, problems on shadows. [4]
10. **Clocks**: Finding the angle when the time is given, Finding the time when the angle is known, Relation between Angle, Minutes and Hours, Exceptional cases in clocks. [4]
11. **Cubes:** Basics of a cube, finding the minimum number of cuts when the number of identical pieces are given, Finding the maximum number of pieces when cuts are given, Problems on painted cubes of same and different colours, Problems on cuboids, Problems on painted cuboids, Problems on Dice. [4]
12. **Data Sufficiency:** Different models in Data Sufficiency, Problems on Data sufficiency, Problems on data redundancy. **Data Interpretation:** Problems on tabular form, Problems on Line Graphs, Problems on Bar Graphs, Problems on Pie Charts. [4]

TEXT BOOKS:

1. A modern approach to Logical reasoning, R S Agarwal, S. Chand Publications, 2013.
2. Quantitative Aptitude for Competitive Examinations, Dinesh Khattar. Pearson Education, 4th Edition, 2019.

REFERENCE BOOKS:

1. Quantitative Aptitude and Reasoning, R. V. Praveen, PHI Learning Private Ltd, 2nd Edition, 2013.
2. Quantitative Aptitude for competitive examinations, Abhijith Guha, McGraw Hill Education, 6th Edition, 2017.
3. Analytical & Logical Reasoning, Peeyush Bhardwaj, Arihant Publications, 4th Edition, 2015.
4. Logical Reasoning for the CAT, Arun Sharma, McGraw Hill Education, 2nd Edition 2014.

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20CS32M03 -Introduction to Cyber Security

B.Tech. CE III Year, II Sem

L	T	P/D	C
3	-	-/-	-

Prerequisite(s): None

Course Objectives: Develop ability to

1. To familiarize various types of Cyber Security concepts, cyber-attacks and cyber-crimes.
2. To give an overview of the cyber laws, National Cyber Security Policy, Forensics Investigation.
3. To study the defensive techniques against Mobile and Wireless attacks
4. To Learn about Cyber security and Cyber terrorism.
5. To familiarize various Basic Data Privacy Concepts.

Course Outcomes (COs): At the end of the course, the student should be able to:

CO1: Classify information security aspects, namely, security attacks, services and mechanisms.

CO2: Understand about how National Cyber Security works, Forensics Investigation.

CO3: Know about crime that involves a computer and a network.

CO4: How to protect them self and the entire Internet community from Cyber-attacks.

CO5: Analyze how data is shared with third parties.

UNIT I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defence, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT II

Cyberspace and the Law and Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones.

Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT IV

Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases: Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, First Edition, Nina Godbole and Sunit Belpure, Wiley, 2011.
2. Computer and Cyber Security: Principles, Algorithm, Applications and Perspectives Brij B. Gupta, Dharma. P. Agrawal, Haoxiang Wang, CRC Press Taylor and Francis Group, 2019.

REFERENCE BOOKS:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press Taylor and Francis Group, 2010.
2. Introduction to Cyber Security, Chwan-Hwa(John) Wu, J.David Irwin, CRC Press Taylor and Francis Group, 2013

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20CE41001-Estimation and Costing

B.Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE21004- Building Materials, Construction & Planning
20CE32L02- Structural Drafting Lab

Course Objectives: Develop ability to

1. Classify the basic concepts, techniques and application of Estimation and costing.
2. Identify the preparation of bar bending schedule for reinforcement works.
3. Understand earth work quantity calculations for roads and canals.
4. Analyze the rates for various items of work and to prepare an abstract estimate.
5. Understand Valuation of buildings.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain various estimation methods and standard principles.

CO2. Perform detailed estimation of buildings and Reinforcement bar bending.

CO3. Demonstrate and Calculation of earthwork quantity for roads and canals.

CO4. Analyze rates for various items of works in civil construction.

CO5. Evaluate the valuation of building.

UNIT – I

Introduction -Need for Estimation-Duties of Estimator- General items of work in Building – Standard Units of Measurements of various items of civil engineering works and materials - General specifications for Different items of work -Types of Estimates – Approximate method of Estimating-Plinth area method, Cubical content Method, Service Unit Method.

UNIT – II

Detailed Estimates of Buildings -Long wall and short wall Method -Centre line Method - For a Single roomed Building-For a Two Roomed Building - For a Three Roomed Building - Reinforcement bar bending and bar requirement schedules-Simply Supported R.C.C beams Simply Supported lintel-R.C.C Slabs.

Practicing typical Exercises using Excel.

UNIT – III

Earthwork for roads: Introduction -Cross section Area of An Embankment and cutting -Volume of Earth work -Mid Sectional Area Method -Mean Sectional Area Method -Trapezoidal Rule - Prismoidal Rule.

Earthwork for Canals: Introduction of Earth work of Canals- Different cases of Canal section and Their Cross section - for Fully Excavation - for Partly Excavation & Partly embankment - for Fully Embankment.

UNIT- IV

Rate Analysis: Introduction to rate analysis-material required for various items of work- labours required for various items of work-Preparation of Lead Statement -Rates of Materials and Labours-Working out data for various items of work over head and contingent charges.

UNIT-V

Valuation of buildings -Purpose of Valuation- Types of Value -Sinking Fund -Depreciation - Factors Governing Valuation-Methods of Depreciation -Methods of Valuation-Fixation of Rent - Standard specifications for different items of building construction – Introduction to Building information Modelling (BIM)

TEXT BOOKS:

1. Estimating and Costing, B.N. Dutta, UBS publishers, 2017
2. Estimation, Costing and Specifications, M. Chakraborthi, Laxmi publications, 2006.

REFERENCE BOOKS:

1. Estimating and Costing, G.S. Birdie, Dhanpat Rai Publishers, 2014.
2. Standard Schedule of rates and standard data book, Public works department.
3. I.S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)

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20CE41002 – Pavement Analysis and Design

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE31002 – Transportation Engineering

Course objectives: Develop ability to

1. Understand the factors affecting pavement design.
2. Gain knowledge of stresses in flexible and Rigid Pavements.
3. Learn the characteristics of pavement materials.
4. Gain Knowledge of different methods of pavement Design.
5. Understand the Principles of Design of low volume roads and overlays.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain design factors for flexible and rigid pavements.

CO2. Analyze the stresses developed in flexible and Rigid Pavements.

CO3. Identify suitable materials for Pavement Construction.

CO4. Design the thickness of flexible and Rigid Pavements as per IRC guidelines.

CO5. Design low volume Roads and Overlays as per IRC Guide Lines.

UNIT–I:

Introduction to Pavements: Variables Considered in Pavement Design-Types of Pavements - Functions of Individual Layer - Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles- Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure - Contact Pressure - EAL and ESWL Concepts - Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT–II:

Stresses in Flexible Pavements: Visco-Elastic Theory and Assumptions - Layered Systems Concepts - Stress Solutions for One, Two and Three-Layered Systems, Fundamental Design Concepts.

Stresses in Rigid Pavements: Westergaard's Theory and Assumptions - Stresses due to Curling, Stresses and Deflections due to Loading - Frictional Stresses - Stresses in Dowel Bars & Tie Bars.

UNIT–III:

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil - Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen - Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes - Permanent Deformation Parameters and other Properties - Effects and Methods of Stabilization and Use of Geo Synthetics.

UNIT–IV:

Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations- IRC Method of Flexible Pavement Design as per IRC 37 Guidelines.

Design of Rigid Pavements: Calibrated mechanistic design process, PCA, IRC Method of Design of Rigid Pavement, Design of Dowel bar and Tie Bar as per IRC 58 Guidelines. Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement design.

UNIT–V:

Design of Pavement for Low Volume Roads: Pavement design for low volume roads - Rural Road designs.

Design of Overlays: Types of Overlays - Suitability – Design of Overlays.

TEXT BOOKS:

1. Principles and Practices of Highway Engineering, Dr. L. R. Kadyali and Dr. N.B. Lal, Khanna publishers, 2017.
2. Principles of Pavement Design, E.J. Yoder, M.W. Witczak, Wiley India Pvt Ltd., 2015.

REFERENCE BOOKS:

1. Pavement Analysis & Design, Yang H. Huang, Pearson Publications, 2010.
2. IRC 37-2018: Tentative guidelines for design of flexible pavement.
3. IRC 58-2015: Guidelines for the design of plain jointed rigid pavements.
4. IRC 81-1997: Guidelines for design of overlay using Benkelman Beam Deflection Technique
5. IRC SP 62 2014: Guidelines for design and construction of cement concrete Pavements for low volume roads
6. IRC SP 72 2015: Guidelines for the design of flexible pavements for low volume rural roads.

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20CE41003 – Prestressed Concrete structures
(Professional Elective – III)

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE31001 - Design of Reinforced Concrete Structures

Course objectives: Develop ability to

1. Understand the principles and necessity of prestressed concrete structures.
2. Get the knowledge on systems of prestressing and various losses of prestress.
3. Understand Analysis and design of prestressed beams.
4. Analyse and design of prestressed concrete structure for shear and deflection.
5. Understand concepts of post tensioning for precast systems.

Course Outcomes: At the end of the course, student would be able to

CO1. Discuss the basic concepts of prestressed concrete.

CO2. Articulate the systems of prestressing and estimate the losses of prestress.

CO3. Analyze and design of prestressed beams.

CO4. Perform shear and deflection related analysis and carryout end block design for transfer of prestress.

CO5. Explain the concepts of post tensioning for precast systems.

UNIT–I:

Introduction: Historic Development-General principles of pre-stressing, pre-tensioning and post- tensioning-Advantages and limitations of prestressed concrete-General principles of PSC-Classification and types of pre-stressing- Materials- high strength concrete and high tensile steel their characteristics. Analysis of beams with concentric tendon, eccentric tendon, bent tendon.

UNIT–II:

Systems of pre-stressing: Classification of members, pre-tensioning and post-tensioning methods.

Losses of pre-stress: Losses during tensioning process, losses at the anchoring stages, time-developed losses.

UNIT–III:

Design of Beams: Analysis with parabolic tendon, pressure line, eccentricity of tension, design lever arm concept.

Design concepts of prestressed concrete slabs.

UNIT–IV:

Shear Analysis: Introduction. Basic principles and design of shear reinforcements-IS Code provisions.

Deflection: Importance of control of deflections- Factors influencing deflections- short term deflections of uncracked beams- prediction of long-time deflections.

UNIT–V:

Transfer of pre-stress: Introduction- Stress distribution in end block-Analysis by Guyon, Magnel methods. - Cable at eccentricity- IS code provisions.

Post-tensioning for pre-cast systems: Introduction- Investigation on anchorage zone stresses, anchorage zone reinforcement, design of post tensioned beams.

TEXT BOOKS:

1. Prestressed concrete, N. Krishna Raju, McGraw Hill Education, 2018.
2. Precast Concrete Structures, Hubert Bachmann and Alfred Steinle, Wiley India Pvt. Ltd., 2018.

REFERENCE BOOKS:

1. Prestressed Concrete, S. Ramamrutham, Dhanpat Rai Publishing Company, 2016.
2. Prestressed Concrete, N. Rajagopalan, Narosa Publishing House, 2015.
3. Design of Prestressed Concrete Structures, T. Y. Lin and Ned H. Burns, Wiley India Pvt. Ltd, 2010.
4. Precast Concrete Structures, Kim S. Elliott, CRC Press, Second Edition, 2016.
5. IS 1343:2012 Code of Practice Prestressed Concrete.

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20CE41004 – Soil Dynamics and Machine Foundation
(Professional Elective – III)

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE32005- Foundation Engineering

Course objectives: Develop ability to

1. Familiarize the students with wave propagation and the dynamic properties of soil
2. Understand the importance of designing machine foundation for reciprocating and impact machines.
3. Understand the mechanism of liquefaction.
4. Understand the various difficulties involved in case studies.
5. Design the machine foundations and its relative components.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain the theory of vibrations and its characteristics.

CO2. Explain the method of determining the natural frequency of foundation soil.

CO3. Determine liquefaction potential of soil.

CO4. Explain the properties of isolation materials.

CO5. Design different types of machine foundation.

UNIT–I:

Fundamentals of vibration: Definitions, simple harmonic motion, free and forced vibrations with and without damping, logarithmic decrement, determination of viscous damping, transmissibility, systems with two and multiple degrees of freedom, vibration measuring instruments.

UNIT–II:

Wave propagation and dynamic soil properties: Propagation of seismic waves in soil deposits. Stress- strain behavior of cyclically loaded soils, strength of cyclically loaded soils, dynamic soil properties of soils – field testing techniques, natural frequency of foundation soil system – Barken's and IS methods of determining natural frequency. Tschebotarioff's reduced natural frequency.

UNIT–III:

Liquefaction of soils: Definitions, mechanism of liquefaction, laboratory studies, dynamic triaxial test, cyclic simple shear test, comparison of cyclic stress causing liquefaction under triaxial and shear tests. Standard curves and correlation for liquefaction.

UNIT–IV:

Vibration isolation: Types and methods of isolation, active isolation and passive isolation, dynamic properties of isolation materials, case studies pertaining to vibration problems of foundation.

UNIT–V:

Design of machine foundations: Types of machine foundations, general requirements, permissible amplitudes and bearing pressures, analysis and design requirements of foundations for rotary, reciprocating and impact type of machines as per IS code.

TEXT BOOKS:

1. Soil dynamics and machine foundations, Swami Saran, Galgotia publications (P) Ltd, 2016.
2. Foundations for machines: Analysis and Design, Prakash Shamsher and Vijay K. Puri, John Wiley & Sons, 2004.

REFERENCE BOOKS:

1. Handbook of Machine Foundations, P. Srinivasulu and C.Vaidyanathan, McGraw Hill Education, 2017.
2. Advanced soil dynamics and Earthquake Engineering, Bharat Bhushan Prasad, PHI learning, 2012.
3. Principles of soil dynamics, Braja M Das and G.V.Ramana, Cengage Learning, 2014.
4. Dynamics of Structure and Foundation, Indrajit Chowdhury and Shambu P Dasgupta, CRC Press, 2008.

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20CE41005 - Railway Engineering
(Professional Elective – III)

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE31002- Transportation Engineering

Course objectives: Develop ability to

1. Understand the basics and design of various components of Railway Engineering.
2. Understand the requirements for designing the railway tracks.
3. Describe the various components of Railway Track system
4. Understand the types of Station and yards
5. Understand the Modernization of Railways

Course Outcomes: At the end of the course, student would be able to

CO1. Explain the basics and various components of Railway Engineering

CO2. Design the geometric requirements of railway tracks

CO3. Explain the Railway track system

CO4. Explain the concept of Stations and Yards

CO5. Explain the Modernization of Railways

UNIT - I

Introduction of Railways: Role of Indian Railways in National development - Railways for Urban transportation - LRT, Mono Rail, Metro Rail & MRTS. Engineering surveys for Track alignment. Permanent Way - Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and Kinks Sleepers - Functions, Materials, Density - Functions, Materials.

UNIT-II

Geometric Design of Railway Track: Gradients and Grade compensation, Super-Elevation, Curves - Transition Curves, Horizontal and Vertical Curves, Widening of Gauges in Curves.

UNIT-III

Points and Crossings: Points and Crossings - Turnouts, working principles

Signaling and Interlocking: Classification of Signals - Interlocking - Methods of Interlocking - Track Circuiting.

UNIT - IV

Railway Accidents - Classification - Causes and their prevention

Railway Station and Yards: Site selection for a Railway station - Classification, Station Yards - types.

UNIT - V

Modern Developments in Railways: Introduction - Speed trends - Structural requirements of Track components for High speeds - Geometric requirements of Track - Conditions of Higher speeds on Indian Railways.

TEXT BOOKS:

1. A Textbook of Railway Engineering, S C Saxena and S P Arora, Dhanpat Rai Publishers, 2017.
2. Railway Engineering, Satish Chandra & M M Agarwal, Oxford University Press, 2016.

REFERENCE BOOKS:

1. Indian Railway Track, M.M Agarwal, Prabha and Co., 2017.
2. Railway Engineering, S.C. Rangwala, Charotar Publishing House, 2016.

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20CE41006 – Irrigation Engineering and Hydraulic Structures
(Professional Elective – III)

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE32001 - Hydrology and Water Resources Engineering

Course objectives: Develop ability to

1. Understand different methods of irrigation and soil-water plant relationship.
2. Study different irrigation theories of canals for required discharge.
3. Study the principles in design of gravity dams, earth dams and spillways.
4. Understand different components of diversion headworks.
5. Understand canal falls, canal regulators and cross drainage works.

Course Outcomes: At the end of the course, student would be able to

CO1. Apply concepts of Irrigation Engineering; design a suitable irrigation canal.

CO2. Explain storage works and design a gravity dam.

CO3. Design earthen dams and spillways.

CO4. Explain and design various components of diversion headworks.

CO5. List the design criteria for canal falls, canal regulators, canal escapes and cross drainage works.

UNIT–I:

Irrigation: Types of irrigation systems, Methods of application of irrigation water, Soil- water-plant relationship, vertical distribution of soil moisture, soil moisture constants, Methods of improving soil fertility, Irrigation water quality- Duty and Delta, factors affecting duty- Design discharge for a water course. Depth and frequency of Irrigation, Irrigation efficiencies- Irrigation requirements of crops- Consumptive Use- Water logging.

Canal Systems: Types of canals, Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, Design of lined canal- Triangular and Trapezoidal shapes.

UNIT–II:

Storage Works: Reservoirs- Types of reservoirs, zones of storage of a reservoir, Reservoir sedimentation, Life of reservoir. Types of dams, factors governing selection of site for a dam, factors governing selection of type of a dam.

Gravity Dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary and practical profile of a gravity dam, limiting height of a gravity dam, factors of safety- Stability analysis, Foundations, Galleries.

UNIT–III:

Earth Dams: Types of earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam- Graphical method, Measures for control of seepage.

Spillways: Types of spillways, Design principles of Ogee spillways- Spillway gates. Energy Dissipaters and Stilling Basins. Significance of Jump Height Curve and Tail water rating Curve.

UNIT–IV:

Diversion Head works: Types of Diversion head works- Weirs and Barrages, Layout of diversion head work- Components. Causes of failure of Weirs and Barrages and their remedies- Silt Ejectors and Silt Excluders.

Weirs on Permeable Foundations: Creep Theories- Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction factors- Design principles of weirs on permeable foundations using Creep theories- Exit Gradient, U/s and D/s Sheet Piles- Launching Apron.

UNIT–V:

Canal falls: Types of falls and their location, Design of Notch Fall and Sarda Type Fall.

Canal Regulators: Principles of design of distributary head regulators and cross regulators.

Canal Escapes: and its Types- Canal outlets and types- proportionality, sensitivity and flexibility.

Cross Drainage works: Types, selection of suitable type.

TEXT BOOKS:

1. Irrigation & Water Resources Engineering, G. L. Asawa, New Age Publishers, 2017.
2. Irrigation, Water Power & Water Resources Engineering, Dr. K. R. Arora, Standard Publishers, 2018.
3. Irrigation Engineering and Hydraulic Structures, S.K. Garg, Khanna Publishers, 2014.

REFERENCE BOOKS:

1. Irrigation, Water Resources & Water Power Engineering, Dr. P. N. Modi, Standard Book House, 2014.
2. Irrigation and Water Power Engineering, B.C. Punmia, Laxmi Publications, 2016.
3. Water Resources Engineering: Principles and Practices, Satya N. Challa Murthy, New Age International Publishers, 2017.

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20CE41007 – Solid Waste Management
(Professional Elective – III)

B.Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CH21M01-Environmental Science.

Course objectives: Develop ability to

1. Understand types of solid waste along with solid waste management rules and regulations.
2. Understand solid waste generation, handling, storage, transport and disposal.
3. Understand solid waste processing techniques.
4. Understand design criteria of landfills, their operational issues and remedies.
5. Understand hazardous waste management

Course Outcomes: At the end of the course, student would be able to

CO1. Explain different types of solid wastes, sources, sampling, composition, impact on environment, management and regulations related to solid waste.

CO2. Select suitable method of handling, collection, storage, transport, and processing of solid waste to meet environmental rules and regulations.

CO3. Explain the techniques and methods used in transformation, conservation and recovery of materials from solid wastes.

CO4. Explain design, operation and maintenance aspects of landfills.

CO5. Explain hazardous waste management systems which include biomedical waste, nuclear waste and e-waste.

UNIT–I:

Solid Waste and their Handling: Definition - Types of solid wastes – Sources – Industrial, mining, agricultural and domestic – Characteristics and perspectives - Properties of solid waste - Sampling of solid wastes - Solid waste problems – Impact on environmental health - elements of solid waste management – Integrated solid waste management – Solid Waste Management Rules and Regulations.

UNIT–II:

Engineering Systems for Solid Waste Management: Solid waste generation – on-site handling, storage and processing – collection of solid wastes – Stationary container system and Hauled container systems – Route planning – Transfer and transport – Processing Techniques – Ultimate disposal.

UNIT–III:

Engineering Systems for Resource and Energy Recovery: Processing techniques – materials recovery systems – recovery of biological conversion products – composting - pre and post processing – types of composting – critical parameters – Problems with composting – recovery of thermal conversion products – Pyrolysis – Gasification - RDF – recovery of energy from conversion products – materials and energy recovery systems.

UNIT–IV:

Landfills: Evolution of landfills – Types of Construction of landfills – Site selection, design and operation of landfills – Life of landfills – Landfill problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfill's reclamation.

UNIT–V:

Hazardous waste Management: Hazardous Waste (HW) – Characterization of HW; Generation; Handling of Hazardous Wastes - the "Cradle to Grave" Concept; Transport of Hazardous Waste; Incineration for Ultimate Disposal of MSW and HW – Incineration; Fundamentals; Types of Incinerators; Environmental Concerns; MSW Landfills and HW Landfills–Sources and characteristics – Effects on environment – Risk assessment – Disposal of hazardous wastes – Secured landfills.

TEXT BOOKS:

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A. Vigil, McGraw Hill Education, 2014.
2. Hazardous Waste Management, Charles A. Wentz, McGraw Hill Education, 2000.

REFERENCE BOOKS:

1. Recent trends in solid waste management status, challenges, and potential for the future Indian cities-volume2-december 2020– A review
2. Solid Waste Engineering, Vesilind PA, Worrell W and Reinhart D, Cengage Learning, 2010.
3. Criteria for Hazardous waste landfills, CPCB guideline, 2000.
4. John Pichtel Waste Management Practices CRC Press, Taylor and Francis Group 2005.
5. Standard Handbook of Hazardous Waste Treatment and Disposal, Harry M. Freeman, McGraw Hill Education, 1997.

6. Management of Solid waste in developing countries, Frank Flintoff, WHO regional publications.
7. Central Pollution Control Board (CPCB) guidelines: http://cpcb.nic.in/
8. Environmental Studies by R. Rajagopalan, Oxford University Press.
9. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
10. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

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20CE41008 – Health Monitoring and Retrofitting of Structures
(Professional Elective – IV)

B.Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):

20CE31001 – Design of Reinforced Concrete Structures

Course objectives: Develop ability to

1. Understand the condition of sub and super structures which are subjected to numerous climatic effects.
2. Analyze the Internal damages that concrete and reinforcement undergo during different exposures.
3. Gain knowledge in numerous testing procedures to understand the life span of structures.
4. Apply various health monitoring techniques to understand the physical changes taking place in structures during its life time.

Course Outcomes: At the end of the course, student would be able to

CO1. Develop an overview of the terminologies used in the rehabilitation of structures

CO2. Assessing damage done to structures, due to corrosion of steel reinforcement and fire accidents.

CO3. Introduce to fundamental ideas of various defect, distress and damage detection techniques of the structure and its components.

CO4. Basic of numerous damages optimizing techniques adopted in the repair of sub, supper and underwater structures.

CO5. Develop an understanding of life prediction of buildings and bridges using health monitoring techniques.

Unit – I

Introduction, Deterioration of structures, Distress in structures, Causes and prevention, Mechanism of damage, Type of damage.

Unit – II

Corrosion of steel reinforcement – causes - mechanism - prevention, Damage of structures due to fire, Fire rating of structures, Phenomena of dissociation.

Unit – III

Inspection and testing, Symptoms and diagnosis of distress, Damage assessment, Nondestructive testing – Rebound hammer, Windsor probe, UPV, Pull-off test.

Unit – IV

Damage in structures, Repair of structures, Common type of repairs, Repair in concrete structures, Repairs in under water structures – Guniting – Shortcreteing – Underpinning, strengthening of structures, strengthening methods – Retrofitting – Jacketing.

Unit – V

Risk associated with civil structures, Basics of health monitoring, Structural health monitoring-Aims, Advances, Structural Health Monitoring System and Strategy, Potential benefits of SHM in civil engineering and challenges, Sensor and its types, Sensor measurements in structural monitoring, uses of sensors, Building instrumentation, Introduction and structure of bridge management system.

TEXT BOOKS:

1. Health monitoring of bridges, Helmut Wenzel, Wiley & Sons Publications, 2009.
2. Concrete structures repair rehabilitation and retrofitting, CBS publisher, 2019.

REFERENCE BOOKS:

1. Maintenance repair & rehabilitation & minor works of buildings, P. C. Varghese, PHI, 2014.
2. Repair and rehabilitation of concrete structures, Poonam I. Modi, Chirag N. Patel, PHI, 2016.
3. Concrete structures protection repair and rehabilitation, R. Dodge Woodson, BH publications, 2009.
4. Structural health monitoring of large civil engineering structures, Hua-Pend Chen, Wiley Blackwell, 2018.

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20CE41009 – Earth Retaining Structures
(Professional Elective – IV)

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE32005- Foundation Engineering

Course objectives: Develop ability to

1. Understand lateral earth pressure theories and design of retaining walls
2. Design cantilever sheet pile wall
3. Understand the pressure envelops and design of struts in braced cuts
4. Know the civil engineering applications of cofferdams
5. Understand the earth pressure diagrams for various sheet piles

Course Outcomes: At the end of the course, student would be able to

CO1. Calculate earth pressure on various earth retaining structures such as gravity retaining walls, sheet pile.

CO2. Design a relevant earth retaining structure for given soil condition.

CO3. Design of sheet pile wall without anchors.

CO4. Compute the forces on a strut in braced excavations.

CO5. Compare various types of coffer dams.

UNIT–I:
Introduction to earth pressure- basic concepts – active, passive and at rest earth pressures, Rankine's and Coulomb's earth pressure theories – graphical methods.

UNIT–II:
Types of earth retaining structures: gravity retaining wall, cantilever retaining wall, counterfort retaining wall. Specifications, selection criteria, comparisons. Introduction to MSE walls.

UNIT–III:
Sheet piles in granular and cohesive soils without anchors – materials used for sheet piles – Free earth and fixed earth support methods.

UNIT–IV:
Braced excavations: Soil pressures on braced walls and stability of vertical cuts, lateral pressure in sand and clays.

UNIT–V:
Introduction to cofferdams – embankment type, sheet pile, braced, double wall, cellular cofferdams (circular & diaphragm type).

TEXT BOOKS:

1. Foundation Analysis and Design, J. E. Bowels, McGraw-Hill Education, 5th edition 2017.
2. Principles of Foundation Engineering, B. M. Das, Cengage India Private Limited, 8th Edition, 2017.

REFERENCE BOOKS:

1. Advanced Foundation Engineering, V. N. S. Murthy, CBS Publishers, (30 January 2010)
2. Geotechnical Engineering, Manoj Datta and S Gulhati, McGraw Hill Education, 1st edition (1st July 2017)
3. Foundation Engineering, P. C. Varghese, Prentice Hall India Learning Private Limited (2005).

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20CE41010 – Smart Cities Planning and Development
(Professional Elective – IV)

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE31002- Transportation Engineering

Course objectives: Develop ability to

1. To introduce students on smart city basic concepts, global standards and Indian context of smart cities
2. To understand smart community, smart transportation and smart buildings
3. To identify project management techniques for smart city development
4. To understand the role of green building techniques in smart city development.
5. To acquire knowledge of smart urban transportation systems

Course Outcomes: At the end of the course, student would be able to

CO1. Explain smart city concepts and their international and national standards.
CO2. Recognize smart community, transportation and building concepts
CO3. Develop work break down structure, scheduling and project management of smart cities
CO4. Application of green building techniques to smart city planning.
CO5. Predict the various smart urban transportation systems and the transition from existing city towards a smart city

UNIT–I:
Introduction to Smart Cities: Introduction to City Planning - Understanding Smart Cities - Dimensions of Smart Cities - Global Experience of Smart Cities– Global Standards and Performance Benchmarks, Practice Codes -Indian scenario - India “100 Smart Cities” Policy and Mission.

UNIT–II:
Smart Cities Planning and Development: Introduction to Smart Community - Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Energy and Water.

UNIT–III:
Project Management in Smart Cities: Philosophy &Concepts of Project Management, Phases, Stages of Project & their Approval Status, Work Break down Structure, Project Organization

Structure, Project Cost Analysis, Resource Allocation & Leveling, Line of Balance Technique, Project Monitoring &Control, Project Risk Management.

UNIT–IV:
Green Buildings in Smart Cities: Introduction to green buildings, Sustainability, Rating System of Green Building, Energy saving system.

UNIT–V:
Smart Urban Transportation Systems: Smart Transportation Technologies - Driverless and connected vehicles - ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems.

REFERENCES:

1. Sustainable Construction: Green Building Design and Delivery, Charles.J.Kibert, John Wiley & Sons, New Jersey, 2016
2. Jo Beall (1997); “A city for all: valuing differences and working with diversity”; Zed books limited, London (ISBN: 1-85649-477-2)
3. UN-Habitat; “Inclusive and sustainable urban planning: a guide for municipalities”; Volume 3: Urban Development Planning (2007); United Nations Human Settlements Programme (ISBN: 978- 92-1-132024-4)
4. Arup Mitra; “Insights into inclusive growth, employment and wellbeing in India”; Springer (2013), New Delhi (ISBN: 978-81-322-0655-2)
5. William J. V. Neill (2004); “Urban Planning and cultural identity”; Routledge, London (ISBN: 0- 415-19747-3)
6. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_3.12.2014__REVISED_AND_LATEST_.pdf)

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20CE41011 – Environmental Impact Assessment
(Professional Elective – IV)

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CH21M01-Environmental Science

Course objectives: Develop ability to

1. To study importance of Environment Impact Assessment.
2. To know the impact of development activities.
3. Understand phenomena of impacts in the environment.
4. Know format of EIA audit report
5. Know Environment legislation Environment.

Course Outcomes: At the end of the course, student would be able to

CO1. Identify the environmental attributes to be considered for the EIA study.

CO2. Formulate objectives of the EIA studies.

CO3. Identify the suitable methodology and prepare Rapid EIA.

CO4. Preparation of Audit reports.

CO5. Identify and incorporate mitigation measures

UNIT–I:

Basic concept of EIA - Initial environmental Examination - Elements of EIA - factors affecting E-I-A - Impact evaluation and analysis - preparation of Environmental Base map - Classification of environmental parameters- Introduction Impact of development projects – Sustainable development- Environmental Impact Statement (EIS) – EIA capability and limitations

UNIT–II:

EIA Methodologies: introduction - Criteria for the selection of EIA Methodology - EIA methods - Ad-hoc methods - matrix methods - Network method Environmental Media Quality Index method - overlay methods - cost/benefit Analysis- Check lists.

UNIT–III:

Assessment of Impact on land - water, air, social & cultural activities and on flora & fauna - Procurement of relevant soil quality - Impact prediction - Assessment of Impact significance - Identification and Incorporation of mitigation measure.

UNIT–IV:

Environmental Audit & Environmental legislation objectives of Environmental Audit - Types of environmental Audit - Audit protocol - stages of Environmental Audit - onsite activities - evaluation of Audit data and preparation of Audit report - Post Audit activities.

UNIT–V:

The Environmental Protection Act - The water Act - The Air (Prevention & Control of pollution Act.) - Motor Act - Wild life Act- Case Studies: EIA for infrastructure projects – Dams – Highways – Multi-Storey Buildings -Metros rail, Water Supply and Drainage Projects – Waste water treatment plants, STP.

TEXT BOOKS:

1. Environmental Impact Assessment, Larry Canter, McGraw-Hill Publications, New Delhi, 2020.
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications, 2012.

REFERENCE BOOKS:

1. Environmental Impact Analysis Handbook, John G. Rau and David C Hooten, McGraw Hill Book Company, 1990.
2. Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Handbook of Environmental Impact Assessment Vol. I & II, Judith Petts, Blackwell Science, 1999.
4. Concepts in Environmental Impact Analysis, Shukla, S.K. and Srivastava, P.R., Common Wealth Publishers, New Delhi, 1992.
5. Environmental Engineering, Gerard Kiely, McGraw Hill Publications, 1996.

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20CE41012 – GIS and Remote Sensing
(Professional Elective – IV)

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE21001- Surveying and Geomatics

Course objectives: Develop ability to

1. Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images.
2. Know the concepts of Geographical Information System (GIS), GIS Data and its types, coordinate systems.
3. Understand vector data model and Raster data Model.
4. Understand the various spatial data input methods, spatial data editing and spatial analysis using GIS.
5. Understand Topology generation and various applications of RS & GIS.

Course Outcomes: At the end of the course, student would be able to

CO1. Describe different concepts and terms used in Remote Sensing and its data.

CO2. Describe GIS Data types, GIS operations and data process in different coordinate systems of GIS interface.

CO3. Describe the geographic data in Vector Data Model & Raster Data Model.

CO4. Prepare spatial data with different methods of input and editing, perform spatial data analysis.

CO5. Apply topology for processing the data; understand the applicability of RS and GIS for various applications.

UNIT–I:

Remote Sensing: Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites. Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation.

UNIT–II:

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis.

C**oordinate Systems: Geographic Coordinate System**: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters-Commonly used Map Projections - Projected coordinate Systems.

UNIT–III:

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure.

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data.

UNIT–IV:

Data Input: Metadata, Conversion of Existing data, Creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing.

Spatial Analysis: Buffer Analysis-Variations in Buffering, Applications of buffering, Overlay Analysis-Feature type and overlay, Vector Overlay methods, Network Analysis-Impedance, Shortest path analysis, closest facility, Concepts of Proximity analysis, Neighborhood operations.

UNIT–V:

Topology: Editing and Error Rectification, Types of topology, Topological Relationships.

GIS Applications: GIS based road network planning, Mineral mapping using GIS, Hazard's zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications, other applications.

TEXT BOOKS:

1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 3rd Edition, 2020.
2. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, Wiley Publishers, 7th Edition, 2015.

REFERENCE BOOKS:

1. Introduction to Geographic Information System, Kang-Tsung Chang, McGraw Hill Education, 9th Edition, 2020.
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3rd Edition, 2010.
3. Advanced Surveying: Total Station, GPS, GIS & Remote Sensing by Satheesh Gopi, R. Sathi Kumar, N. Madhu, Pearson Education, 2nd Edition, 2018.
4. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy, B. S. Publications, 4th Edition, 2012.

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20EE41072 – Energy Conservation and Management
(Open Elective – II)

B. Tech. CE IV Year, I Sem

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Understand different basic terms related to Indian Energy Scenario.
2. Understand the importance of energy conservation.
3. Understand different acts and policies related to energy conservation.
4. Understand about energy management and types of audits.
5. Understand basic types of management schemes in energy conservation.

Course Outcomes (COs): At the end of the course, student would be able to

CO1: Explain the significance of energy in India.

CO2: Explain the importance of energy conservation.

CO3: Explain different acts and policies of energy conservation.

CO4: Prepare energy audit report.

CO5: Evaluate the energy saving and conservation in different electrical utilities.

UNIT-I

General aspects of energy: Introduction – Types of Energy – Primary and Secondary, Commercial and Non-Commercial, Renewable and Non-Renewable – Global Primary Reserves and Commercial Energy Production - Energy Scenario – Sector Wise Energy Production and Consumption in India – Energy Needs of Growing Economy – Energy Security.

UNIT-II

Energy Conservation and Its Importance: Energy Conservation – Definition – Benefits – Identification of Energy Conservation Opportunities – Technical and Economic Feasibility – Classification of Energy Conservation Measures: Low Cost-High Return, Medium Cost-Medium Return, High Cost-High Return.

UNIT-III

Energy Conservation Act and Its Policies: Introduction – Salient Features of Energy Conservation Act (EC Act),2001 – Schemes of BEE Under the EC Act-2001 – Electricity Act, 2003 – Integrated Energy Policy – National Action Plan on Climate Change (NAPCC).

UNIT-IV

Energy Management and Audit: Definition and Objectives of Energy Management – Need for Energy Audit – Types of Energy Audit and Approach – Understanding Energy Costs – Benchmarking – Energy Performance – Matching Energy Usage to Requirement – Maximizing

System Efficiencies – Optimizing Input Energy Requirements – Fuel and Energy Substitution.

UNIT-V

Energy Action Planning, Management, Monitoring and Targeting: Steps Involved in Energy Action Planning – Financial Analysis Techniques – Cash Flow – Sensitivity and Risk Analysis – Financing Options – Energy Performance Contracting and Role of Energy Service Companies (ESCOs) – Developing a Typical ESCO Contract – Project Management – Project Development Cycle (PDC) – Project Planning Techniques – Monitoring and Targeting – Setting up M&T – Key Elements of M&T System.

TEXT BOOKS:

1. "Energy Management – Conservation and Audits", Anil Kumar, Om Prakash, Prashant Singh Chauhan and, Samsher Gautam, CRC Press, 2020
2. "Energy Management Handbook", Wayne C. Turner and Steve Doty, Fairmont Press; Distributed by CRC Press/Taylor & Francis.

REFERENCE BOOKS:

1. "General Aspects of Energy Management and Energy Audit", Guide Book for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency.
2. "Handbook of Energy Audits", Albert Thumann, Terry Niehus, William J. Younger, Fairmont Press, Inc.

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20ME41073– Digital Fabrication
(Open Elective-II)

B. Tech. CE IV Year, I Sem
Pre-requisites: None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Introduce basics of geometric modelling of physical objects,
2. Convert digital data to obtain physical components by metal subtraction and addition processes.

Course Outcomes: Upon completion of this course, a student will be able to

CO 1: Select an appropriate geometric modelling scheme required for manufacturing

CO2: Interpret machining operations required in subtractive manufacturing

CO3: Compare additive manufacturing methods and comprehend on the process to be adopted

CO4: Illustrate the robotic applications in manufacturing and assembly

CO5: Select an appropriate polymer by comparing properties and manufacturing requirements

Unit I:

Geometric modelling-2D, 2 ½ D, 3D Modelling; Solid representations-CSG, Boundary representations, VOXEL representations; Overview of digital manufacturing processes

Unit II:

Subtractive Manufacturing –Introduction to G codes and M codes; Operations on CNC Lathe-Turning and facing; operations on CNC Mill-Planing, grooving and drilling; Introduction to simple CNC Program (Demonstration only);

Unit III:

Additive Manufacturing- Stereo lithography, Selective Laser Sintering, Fused Deposition Modelling; Conversion of Geometric model to .stl for 3D printing (Demonstration only)

Unit IV:

Robotic manipulations: Cutting- Laser Cutting, Plasma Cutting, Water jet cutting; bending; folding; stacking; weaving; stitching, Bio printing, Food Printing;

Unit-V:

Introduction to Engineering polymers- acetals (polyoxymethylenes), ABS, (Acrilonitrile-Butadiene-Suyrene), polycarbonates, polyphenylene ethers and oxides, polyamides (nylons); and thermoplastic polyesthers.

Text books:

1. Digital Fabrication, Philip F. Yuan, Neil Leach, Tonji University press.
2. Digital Fabrication in Architecture, Luca Caneparo, Engineering and Construction, Springer

Reference Books:

1. Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing, Gibson, I, Rosen, D W., and Stucker, B., Springer, 2010.
2. Rapid Prototyping – Laser Based and Other Technologies, Venu vinod, PK., Ma, W., Kluwer, 2004.
3. Fundamentals of electronic materials and devices, Safa O Kasap, Mc Graw Hill, 3rd ed.

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20EC41074– Principles of Communication Systems
(Open Elective - II)

B. Tech. CE IV Year, I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Note: Only Block Diagram Approach with Qualitative Treatment of the topics is required. Detailed mathematical treatment is not required.

Course Objectives: Develop ability to

1. Introduce the students to modulation and various analog and digital modulation schemes.
2. They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.

Course Outcomes: At the end of the course, the student would be able to

CO1. Distinguish various types of modulations.

CO2. Explain different communication modules and their implementation.

CO3. Distinguish various wireless and cellular, mobile and telephone communication systems

UNIT - I:

Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

UNIT - II:

Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, AM Radio, FM Radio, Transmitters and Receivers

UNIT - III:

Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.

Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT - IV:

Satellite Communication: Satellite Orbits, Satellite communication systems, Satellite subsystems, Ground Stations, Satellite Applications, Global Positioning systems.

Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT - V:

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, WCDMA.

Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

TEXT BOOKS:

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
2. Kennedy, Davis, Electronic Communications Systems, 4e, TMH, 1999

REFERENCE BOOKS:

1. Tarmo Anttalainen, Introduction to Telecommunications Network Engineering, Artech House
2. Theodore Rappaport, Wireless Communications-Principles and practice, Prentice Hall, 2002.
3. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
4. Wayne Tomasi, Introduction to data communications and networking, Pearson Education, 2005

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20CS41075-Knowledge Management
(Open Elective II)

B. Tech. CE IV Year, I Sem

Prerequisites: None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Understand Knowledge Management Systems for access and coordination of Knowledge assets.
2. Understand technologies namely intranet, group-wares, weblog, instant messaging, content management systems and email in both individual and organizational contexts.
3. Use case studies, research methods of Knowledge organization.
4. Understand and implement various knowledge capturing techniques.
5. Test the captured knowledge and to deploy the knowledge.

Course Outcomes: At the end of the course, student would be able to:

CO1. Evaluate and Implement Knowledge Management Systems to facilitate individual and group work.

CO2. Develop a thorough review of Knowledge Management Concepts, both historical and speculative.

CO3. Originate and distribute research on a Knowledge Management System topic.

CO4. Analyze and design KM processes and Systems.

CO5. Apply Knowledge Management objectives in projects across diverse fields.

UNIT-I:

Knowledge management: KM Myths –KM Life Cycle-Understanding Knowledge-Knowledge, Intelligence-Experience-Common Sense-Cognition and KM-Types of Knowledge-Expert Knowledge-Human Thinking and Learning.

UNIT-II:

Knowledge management system life cycle: Challenges in Building KM Systems – Conventional KM System Life Cycle (KMSLS) – Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture.

UNIT-III:

Capturing knowledge: Evaluating the Expert – Developing a Relation Ship with the Experts – Fuzzy Reasoning and Quality of Knowledge – Knowledge Capturing Techniques , Brain Storming – Protocol Analysis – Consensus Decision Making – Report Grid – Concept

Mapping – Black Boarding.

UNIT-IV:

Knowledge codification: Modes of Knowledge Conversion – Codification Tools and Procedures – Knowledge Developers Skill Sets – System Testing and Deployment – Knowledge Testing - Approaches to Logical Testing, User Acceptance Testing – KM Systems Deployment Issues – User Training – Post Implementation.

UNIT-V:

Knowledge transfer and sharing: Transfer Methods - and Role of the Internet – Knowledge Transfer in the e-World – KM System Tools – Neural Network – Association Rules – Classification Trees – Data Mining and Business Intelligence – Decision Making Architecture – Data Management – Knowledge Management Protocols – Managing Knowledge Workers.

TEXT BOOKS:

1. Elias.M.Awad & Hassan.M.Ghaziri–"Knowledge Management" Pearson Edition.

REFERENCE BOOKS:

1. Guus Schreiber, Hans Akkermans, AnjoAnjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, "Knowledge Engineering and Management", Universities Press, 2001.
2. C.W.Holsapple, "Handbooks On Knowledge Management", International Handbooks on Information Systems, Vol 1and 2 , 2003.

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20MB41076 – Supply Chain Management
(Open Elective – II)

B. Tech. CE IV Year, I Sem

Pre-Requisites: None.

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to:

1. Distinguish the different functional areas in businesses management; understand the cross functional integrations and map supply chains of various business sectors.
2. Identify different types of distribution/ modes of transport/ network design.
3. Analyze the operational issues in SCM.
4. Recognize the drivers of supply chain.
5. Interpret the importance of relationships with suppliers and customers.

Course Outcomes: At the end of the course, the student would be able to

CO 1: Understand the role of an Engineer as well as Manager in Supply chain management

CO 2: Appreciate the importance of logistics in integrating different functional areas.

CO 3: Integrate operations with functional areas.

CO 4: Visualize the role of logistics and distribution as supply chain drivers

CO 5: Understand the importance of supplier and customer relationship management.

UNIT - I: Introduction to Supply Chain Management

Understanding the Supply Chain, Supply Chain Performance: Achieving Strategic Fit and Scope including: Customer and Supply Chain Uncertainty, Competitive and Supply Chain Strategies, Product development strategy, Marketing and sales strategy, Supply chain strategy, Scope of strategic fit; Supply Chain Drivers and Metrics.

UNIT - II: Logistics Management

Designing distribution networks and applications to e-Business, Network design in the Supply Chain, Designing global supply chain, network design, 3 PL, 4 PL, Transportation in supply chain management.

UNIT - III: Planning and managing inventories

Managing Economies of Scale in a Supply Chain: Cycle Inventory, Managing Uncertainty in a Supply Chain: Safety Inventory, Determining the Optimal Level of Product Availability, Demand Forecasting in a Supply Chain, Aggregate Planning in a Supply Chain, Sales and Operations

Planning: Planning Supply and Demand in a Supply Chain, Coordination in a Supply Chain. E-Procurement, Global alliances.

UNIT - IV: Managing Cross-Functional Drivers in a Supply Chain

Importance of sourcing decisions in Supply Chain Management, Price and Revenue management, role of Information Technology in a Supply Chain, Sustainability and the Supply Chain. Customer Relationship management.

UNIT - V: Logistics and supply chain relationships

Identifying logistics performance indicators- channel structure- economics of distribution-channel relationships- logistics service alliance. Managing global logistics and global supply chains: Logistics in a global economy- Views of global logistics- global operating levels interlinked global economy. Global supply chain, Supply chain management in Global environment Global strategy- Global purchasing- Global logistics- Global alliances- Issues and Challenges in global supply chain management.

TEXT BOOKS:

1. Sunil Chopra, Peter Meindle, D.V Kalra, Supply Chain Management 6/e, Pearson.
2. Donald J. Bowersox and David J. Closs, Logistics Management: The Integrated Supply Chain Process, TMH, 2006.

REFERENCE BOOKS:

1. The Toyota Way Paperback by Jeffrey Liker.

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20CE41L01 – STAAD Lab

B. Tech. CE IV Year, I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):
20CE31001-Design of Reinforced Concrete Structures

Course objectives: Develop ability to analyze and design of

1. Beams.
2. 2D and 3D frames.
3. Multistory building frames under different load combinations.
4. Commercial complex under different load conditions.
5. Industrial Building

Course Outcomes: At the end of the course, student would be able to

CO1. Analyse a continuous beam using suitable software package.

CO2. Analyse Portal frames (2D and 3D) using suitable software package.

CO3. Analyse and design a multi storey building under different load combinations.

CO4. Analyse and design a commercial complex under different load conditions.

CO5. Analyse and design of Industrial building.

LIST OF EXPERIMENTS

Analyse:

1. Continuous beam- Calculate SFD, BMD and Elastic curve.
2. 2D and 3D frame- Calculating SFD, BMD.
3. Multi Storey buildings for Live and Dead loads.
4. Multi Storey buildings by considering different load combinations (Gravity and Lateral loads).

Analyse and Design:

5. Multi Storey buildings for gravity loads.
6. Multi Storey buildings for Wind loads.
7. Multi Storey buildings for Seismic loads.
8. Commercial Complex.
9. Industrial Building.
10. Introduction to Dynamic Analysis (Time History Analysis).

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20CE41L02- Pavement Analysis and Design Lab

B.Tech. CE IV Year, I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):
20CE31002- Transportation Engineering
20CE41002- Pavement Analysis and Design

Course objectives: Develop ability to

1. Create and annotate 3D project models in highway construction and design.
2. Create and analyze Digital terrain data base
3. Work with software in integration with google earth
4. Create and design best alignment
5. Design and analyze road junction.

Course Outcomes: At the end of the course, student would be able to

CO1. Create design alternatives to achieve the ideal road system and then automate the design detailing process, saving time and money.

CO2. Create and analyze horizontal and vertical alignment of a road.

CO3. Determine volumetric quantity of Earthwork extraction.

CO4. Design super elevation.

CO5. Design the road junction.

LIST OF EXPERIMENTS

1. Introduction to MX Roads-String Modelling
2. Survey data input and import
3. String names and drawing styles, point selection methods
4. Surface checker and editing data- surface analysis
5. String creation and editing
6. Alignment creation
   a. Horizontal alignment
   b. Vertical alignment
7. Design of rule based super elevation
8. Junction design
9. Earth work calculation
10. Pavement design -final drawings

20CE41013-Project Seminar

B.Tech. CE IV Year, I Sem
Prerequisite(s): None

L	T	P/D	C
-	-	2/-	1

There shall be a project seminar presentation in Fourth year first semester, for which, the student shall collect the information on a specialized topic, prepare a technical report, submit it and present the same before a departmental committee. It shall be evaluated by the departmental committee, consisting of Head of the Department, seminar supervisor and a senior professor. The report shall be evaluated for 100 marks as CIE. There shall be no SEE for the project seminar.

20CE41014-Mini Project

B.Tech. CE IV Year, I Sem
Prerequisite(s): None

L	T	P/D	C
-	-	4/-	2

There shall be a Mini Project, which the student shall carryout immediately after Third year second semester examinations and pursue it during summer vacation. Mini Project shall be submitted in a report form, duly approved by the departmental internal evaluation committee, and presented before the examination committee in Fourth year first semester. It shall be evaluated for 100 marks as SEE. The examination committee consists of an external examiner, Head of the Department, supervisor of the mini project and a senior faculty member of the department. There shall be no internal marks (CIE) for Mini Project.

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20CE42001 – Construction Technology and Project Management

B. Tech. CE IV Year, II Sem

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course objectives: Develop ability to

1. Apply the fundamental concepts of planning and coordination techniques, organization of project team in construction.
2. Look into the various stages of construction activities and their planning techniques.
3. Organize the various resources to achieve the project completion in stipulated time.
4. Understand various methods of records and documentation that construction projects should maintain.
5. In understanding the fundamental rights of an employer and employee.

Course Outcomes: At the end of the course, student would be able to

CO1. Handle project planning and scheduling.

CO2. Identify the methods of managing the project and achieving the targets as planned.

CO3. Insights into planning and scheduling of various resources involved in the projects.

CO4. Classify the various contracts, and the bidding process involved in the construction projects.

CO5. The various fundamental rights of the employer and employee, basic safety measures in the industry.

UNIT -I:

Project feasibility reports, Introduction to tender, Tender notice, Types of tenders, Tender documents, Earnest money deposit, Security deposit, Contract agreement, Introduction to management information system, Management process – Roles, Management theories, Decision making: tools and techniques – Organizational structure. Human resource management - motivation performance- leadership.

UNIT-II:

Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications. Preliminary Planning- Collection of Data- Contract Planning – Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.

UNIT-III:

Resource Planning - planning for manpower, materials, costs, equipment. Labour -Scheduling**.** Forms of scheduling - Resource allocation, budget and budgetary control methods

UNIT-IV:

Contract - types of contracts, Contractor's estimation and bidding process, contract document, specification, important conditions of contract – tender and tender document - Deposits by the contractor – Arbitration, negotiation – M Book - Muster roll - stores. Principles of accounting, accounting process.

UNIT-V:

Construction contract status report, Balance sheet, working capital, Risk and its identification process, Insurance in construction industry, Safety and its evaluation, Safety and health management system, Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes. Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act - other labour laws.

TEXT BOOKS:

1. Construction project management theory and practice, Kumar Neeraj Jha, 2nd edition, Pearson, 2015.
2. Construction Technology, Subir k Sarkar, Subhajit Saraswati, Oxford University Press, 2009.

REFERENCE BOOKS:

1. Construction Planning and Management, P.S. Ghalot, D.M. Dhir, New Age International Pvt. Ltd., 2014.
2. Construction Management and Planning, B. Sengupta and H. Guha, McGraw Hill Education, 2015.
3. Construction planning, Equipment and methods, R. Peurifoy, Schexnayder, Shapira, McGraw Hill Education, 2013.
4. Construction Project Management, K.K. Chitkara, McGraw Hill Education, 2014.
5. Project Planning and Control with PERT and CPM, B.C. Punmia, Laxmi Publications, 2016.
6. Occupational health and safety in construction project management, Helen Lingard, Steve Rowlinson, Spon Press, 2005.

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20CE42002 – Elements of Earthquake Engineering
(Professional Elective – V)

B. Tech. CE IV Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE31001- Design of Reinforced Concrete Structures

Course objectives: Develop ability to

1. Know basic concepts of Earthquake Engineering.
2. Understand Engineering seismology
3. Describe the basic concepts of Earthquake Resistant Design
4. Correlate the IS codal proportions of Earthquake Resistant design
5. Explain about Earthquake resistant Masonry buildings

Course Outcomes: At the end of the course, student would be able to

CO1. Articulate the basic concepts of Earthquake Engineering.

CO2. Explain and discuss degree of freedom systems subjected to free and forced vibrations

CO3. Explain the basic concepts of earthquake resistant design of RC structures.

CO4. Comprehend the concept of earthquake resistant RC design

CO5. Recommend measures for design of Masonry building.

UNIT–I:
Origin of earthquakes, Engineering geology, seismicity of the world, faults, propagation of earthquake waves, quantification of earthquake (magnitude, energy, intensity of earthquake), measurements of earthquake (accelerograph, accelogram recording), determination of magnitude, epicentral distance, focal depth, ground motion and their characteristics, factors affecting ground motions, Seismic zones of India.

UNIT–II:
Elements of Vibration: Introduction, Basic concepts of Vibration, Dynamic Loading, Basic definitions (Mass, Stiffness, Natural Period, Natural Frequency, Amplitude, Free vibration, Forced vibration, Damping, Resonance), Types of Vibrations- Free and Forced vibrations, Linear and Non-linear Vibrations, Damped and undamped vibrations, Deterministic and random vibrations, Longitudinal, Transverse and Torsional vibrations, Degree of Freedom, Simple Harmonic motion, Consequences of Vibration, Vibration control in the Design of Structures.

UNIT–III:
Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral

force method.

UNIT–IV:

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings - Seismic methods of analysis- IS code-based methods for seismic design - Vertical irregularities - Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear. Introduction to ductile detailing.

UNIT–V:

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

TEXT BOOKS:

1. Earthquake Resistant Design of Structures by S. K. Duggal, Oxford University press, 2013.
2. Earthquake Resistant Design of Structures by Pankaj Agarwal and Manish Shrikhande, Shree Hari Publications, 2017.

REFERENCE BOOKS:

1. Earthquake Resistant Engineering Structures by C. A. Brebbia, WIT press, 2011.
2. Earthquake Resistant Engineering Structures: Design, Build and Retrofit by Mohiuddin Ali Khan, Elsevier Science & Technology, 2012.
3. Earthquakes by Bruce A Bolt, Freeman and company, New York, 2004.
4. Earthquake resistant design and risk reduction by Dowrick, D. J., John Wiley& Sons publications, 2009.

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20CE42003 – Soil Reinforcement and Geosynthetics
(Professional Elective – V)

B. Tech. CE IV Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE32005- Foundation Engineering

Course objectives: Develop ability to

1. Understand the geosynthetics and its properties
2. Classify the methods to improve bearing capacity
3. Design and check the stability of retaining wall
4. Categorize various function of geosynthetics
5. Apply concepts to design of PVD's

Course Outcomes: At the end of the course, student would be able to

CO1. Differentiate various geosynthetic materials.

CO2. Identify proper material as reinforcement.

CO3. Design the reinforced retaining walls.

CO4. Choose geosynthetics materials for various functions

CO5. Explain the pre-consolidation techniques using geosynthetic materials

UNIT–I:

An overview of geosynthetics: Classification of geosynthetics, functions and applications, properties of geotextiles, geogrids and geomembranes.

UNIT–II:

Soil reinforcement: mechanism, improvement of bearing capacity, embankments on soft ground, soil nailing.

UNIT–III:

Geogrid reinforced soil walls, advantages over conventional retaining walls, construction aspects, internal and external stability.

UNIT–IV:

Geosynthetics for highways, roadway reinforcement, applications as separation, filtration, drainage, reinforcement, moisture barrier, membrane encapsulation. Landfills: geosynthetic applications for landfill liners, covers and other components.

UNIT–V:

Dewatering systems: sand drains, prefabricated vertical drains (PVD), French drains.

TEXT BOOKS:

1. Designing with geosynthetics, Koerner R.M – Prentice Hall, 6nd edition (2012).
2. Engineering with geosynthetics, G.V Rao, & G.V.S.S Raju, Tata-McGraw Hill publication, New Delhi (2004).

REFERENCE BOOKS:

1. Engineering Principles of ground modification, Hausmann, M. R, McGraw Hill publication, 2013.
2. Ground control and improvement, Xanthakos, Abreimson and Bruce John wiley & sons 1994.
3. Ground Improvement, M. P. Moseley and K. Krisch 2nd edition, Taylor and Francis (2006)
4. Earth reinforcement and soil structures, Jones C. J. F. P., Butterworths, London (1985)
5. Introduction to soil reinforcement & Geosynthetics, G. L Siva Kumar Babu, University Press. 2013.

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20CE42004 – Pavement Maintenance and Management System
(Professional Elective – V)

B. Tech. CE IV Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE41002- Pavement Analysis and Design

Course objectives: Develop ability to

1. Understand the need for pavement maintenance and types of maintenance
2. Classify the various pavement evaluation techniques
3. Gain knowledge of PMS and its components.
4. Categorize PMMS components and analyze them.
5. Understand the PMS implementation steps.

Course Outcomes: At the end of the course, student would be able to

CO1. Explain the need for pavement maintenance and types of maintenance

CO2. Categorize various pavement evaluation techniques

CO3. Apply PMS strategies to make an appropriate decision.

CO4. Prioritize a suitable PMMS strategy

CO5. Identify PMS implementation steps.

UNIT–I:

Pavement Maintenance: Need for pavement maintenance, methods of maintenance for flexible and rigid pavement layers; WBM, Bituminous and Cement Concrete pavements. IRC guidelines.

UNIT–II:

Pavement Inventories and Evaluation: Serviceability Concepts; Visual Rating; Pavement Serviceability Index; Roughness Measurements; Distress Modes – Cracking, Rutting etc; Pavement Deflection – Different Methods, Skid Resistance, Roughness, Safety – Aspects; Inventory System – Assessment of Deficiencies

UNIT–III:

Pavement Management System (PMS): Components of PMS and their activities; Major steps in implementing PMS; Inputs; Design construction and maintenance; Rehabilitation and Feedback systems; Evaluating alternate strategies and Decision criteria based on Structural section, Material type, Construction policy, maintenance policy, Overlay and seal coat;

UNIT–IV:

Pavement Maintenance Management: Components of maintenance management and related activities-Network and project level analysis- Budgeting; Prioritization Techniques and Formulation of Maintenance Strategies, Pavement Preservation. Pavement Life Cycle Cost Analysis (LCCA): Cost Components, Methods of LCCA-Components involved, Brief Description.

UNIT–V:

PMS Implementation: Major steps in implementing PMS – pavement construction management & pavement maintenance management – information's, research needs – cost and benefit of pavement management – future directions and need for innovations in pavement management.

TEXT BOOKS:

1. Pavement Maintenance and Management, Esam Hewayde , Firas Jaber and Faiq M S Al-Zwainy , Lulu Press, 2020.
2. Pavement Evaluation, Maintenance & Management System, R. Srinivasa Kumar, Orient Blackswan, 2014.

REFERENCE BOOKS:

1. Pavement Management for Airports, Roads, and Parking Lots, M.Y. Shahin, Springer Publisher, 2006.
2. Pavement Management Systems, Ralph C.G. Haas and W. Ronald Hudson, McGraw-Hill Inc., US,1978

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20CE42005– Climate Change and Adaptation
(Professional Elective – V)

B. Tech. CE IV Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course objectives: Develop ability to

1. Understand the importance of Ozone layer in the atmosphere.
2. Comprehend composition of atmosphere.
3. Understand impacts of climate change on ecosystem.
4. Understand initiatives taken by different countries to reduce emission of greenhouse gases.
5. Know measures to mitigate greenhouse gases.

Course Outcomes: At the end of the course, student would be able to

CO1. Define greenhouse gases and their influence on global warming.

CO2. Explain atmospheric structure along with its physical and chemical characteristics.

CO3. Explain causes and impacts of climate change on various sectors.

CO4. Explain initiatives taken by countries to reduce global warming.

CO5. Suggest mitigation measures to reduce global warming and climate change.

UNIT–I:

Earth's Climate System: Role of ozone in environment - Ozone layer – Ozone depleting gases – The Hydrological cycle – Green House Effect – Radioactive effects of Greenhouse gases – Green House Gases and Global Warming – Material Cycles.

UNIT–II:

Atmosphere and Its Components: Importance of Atmosphere – Composition of the atmosphere — Physical and chemical characteristics of Atmosphere – Vertical structure of the atmosphere — Temperature profile of the atmosphere — Atmospheric stability — Lapse rates – Temperature inversion – Effects of inversion on pollution dispersion—Classification of pollution & pollutants.

UNIT–III:

Impacts of Climate change: Causes of Climate change: Changes of Temperature in the environment – Melting of ice pole – sea level rise – Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for different regions –

Uncertainties in the projected impacts of Climate Change – Risk of Irreversible Changes.

UNIT–IV:

Observed changes and its Causes: Climate change – Earth Summit Initiatives–Carbon credits & CDM – Intergovernmental Panel on Climate change – The Montreal Protocol – Initiatives in India-Kyoto Protocol– UNFCCC – IPCC – Global Climate Models (GCM) – Paris Convention – Climate Sensitivity and Feedbacks – Evidences of Changes in Climate and Environment- on a Global scale and in India.

UNIT–V:

Climate change and mitigation measures: National Environmental policy act(NEPA) – Mitigation Efforts in India and Adaptation funding– Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry – Carbon sequestration – Carbon capture and storage (CCS) –Examples of future clean technology — Biodiesel – Natural Compost – Eco-friendly plastic – Alternate Energy – Hydrogen – Bio-fules – Solar Energy – Wind – Hydroelectric Power – Waste (MSW & Bio-waste, Biomedical, Industrial waste) – International and Regional cooperation–Methods of collection, Transportation of solid waste – E waste.

TEXT BOOKS:

1. Climate Change: An Indian Perspective (Environment and Development), Dr. Sushil Kumar Dash, Cambridge University Press India Pvt Ltd, 2007.
2. Adaptation and mitigation of climate change – Scientific Technical Analysis, Cambridge University Press, Cambridge, 2006.

REFERENCE BOOKS:

1. Atmospheric Science, J.M. Wallace and P.V Hobbs, Elsevier/ Academic Press, 2006.
2. “Climate Change and Climate Variability on Hydrological Regimes”, Jan C. Van Dam, Cambridge University Press, 2003.
3. Text book ofEnvironmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
4. http://www.ipcc.ch/

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20CE42006 – Hydropower Engineering
(Professional Elective – V)

B. Tech. CE IV Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CE32001 – Hydrology and Water resources Engineering
20CE41006 – Irrigation Engineering and Hydraulic structures

Course objectives: Develop ability to

1. Acquire the knowledge of preparing flow duration curves and power duration curves.
2. Understand performance factors of Hydro turbines.
3. Comprehend the hydraulics of turbines, cavitation problems and remedies.
4. Understand the design criteria of penstocks.
5. Evaluate the need for gates and surge tanks.

Course Outcomes: At the end of the course, student would be able to

CO1. Analyze stream flow and estimate hydropower potential.

CO2. Determine electrical load on hydro turbines.

CO3. Identify types of hydropower plants and apply the concepts of turbine hydraulics to solve real-time problems.

CO4. Design water conveyance systems for a hydropower plant.

CO5. Prepare layout of a hydropower plant and explain the design, operation and maintenance aspects of it.

UNIT–I:
Stream flow analysis, Hydrograph, Mass curve, Runoff estimation methods, Estimation of hydropower potential, flow duration curves, power duration curves, pondage and storage.

UNIT–II:
Electrical load on hydro turbines, load curves, load duration curves, Performance factors.

UNIT–III:
Types of hydropower plants, Storage power plant, Runoff River plant, Pumped storage plant, two units and three-unit arrangements, Reversible pump turbines, types of turbines, hydraulics of turbines, cavitation in turbines, efficiency of pumped storage plants.

UNIT–IV:
Intakes, losses in intakes, air entrainment at intake, inlet aeration, Water conveyance systems, fore bay, canals, Tunnels and Penstocks, classification of penstocks, design criteria of penstock,

economical diameter of penstock, Anchor blocks, Conduit valves, type of valves, bends and manifolds.

UNIT–V:

Water hammer, resonance in penstocks, channel surges, Gates, Surge tanks, Power house layout, lighting and ventilation, variations in design of power house, underground power house, structural design of power house.

TEXT BOOKS:

1. Irrigation, Water Power & Water Resources Engineering, Dr. K.R. Arora, Standard Publishers, 2014.
2. Water Power Engineering, M.M. Dandekar and K.N. Sharma, Vikas Publishers, 2016.

REFERENCE BOOKS:

1. A Text book of Water Power Engineering, R.K. Sharma and T.K. Sharma, S. Chand & Company, 2008
2. Irrigation Engineering and Hydraulic Structures, S.K. Garg, Khanna Publishers, 2014.
3. Hydro-electric and Pumped Storage Plants, M.G. Jog, New Age International Publishers, 2009.

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20EE42082-Micro-Electro-Mechanical Systems

(Open Elective-III)

B. Tech. CE IV Year, II Sem

L	T	P/D	C
3	-	-/-	3

Pre-requisites: None

Course Objectives:

1. To introduce to basics of Micro-electro-mechanical systems
2. To understand properties of materials involved in MEMS
3. To pertain fabrication methods involved in MEMS manufacturing
4. To apply the concepts for various applications

Course Outcomes: Upon completion of the course, the student will be able to

CO1. Elucidate basic concepts involved in MEMS technologies

CO2. Realize the properties of various materials involved in MEMS technologies

CO3. Apply the concepts and technologies involved in designing of MEMS

CO4. Relate different manufacturing processes involved in fabrication of MEMS

CO5. Recognize micro sensors, micro actuators and their applications in various fields.

UNIT I

Introduction to MEMS: What is MEMS, Historical Background, classification, Micro-engineering, importance of micro-engineering. Technological advancements in MEMS, advantages and disadvantages of MEMS.

UNIT II

MEMS materials: Materials used in MEMS. Material properties: electrical, mechanical, thermal, chemical, biological, optical and processing. Reliability issues of materials

UNIT III

Designing of MEMS: Design and analysis process for MEMS. Initial design process, structured design process. Commonly used design flow, structured design flow. Design flow for MEMS cad design. Design and verification flow for integrated MEMS.

UNIT IV

MEMS fabrication Techniques: Photolithography, materials for micromachining, bulk micromachining Surface micromachining, High aspect-ration-micromachining, assembly and system integration.

UNIT V

MEMS structures and devices: Mechanical sensors, mechanical actuators, micro-fluidic devices, optical/photonic micro-systems, biological transducers.

TEXT BOOKS:

1. Adams TM, Layton RA., *"Introductory MEMS: Fabrication and applications",* 2010.
2. Tobergte DR, Curtis S., *"An Introduction to Micro-electro-mechanical Systems Engineering"* Second Edition. vol. 53. 2013.

REFERENCE BOOKS:

1. Kreith F, Kreider JF., *"The MEMS Handbook*‖ CRC Press 2002.
2. Reza Ghodssi, Pinyen Lin, *"MEMS Materials and Processes Handbook"* Springer 2013
3. Gad-el-Hak M, *"MEMS applications"* 2nd edition, CRC press 2006.

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20ME42083-Principles of Automobile Engineering
(Open Elective-III)

B. Tech. CE IV Year, II Sem

L	T	P/D	C
3	-	-/-	3

Pre-requisites: None

Course Objectives: Develop ability to,

1. Introduction to Engineering analysis of the automobiles and their sub systems.
2. Applications of engineering principles to automotive design.
3. Improves ability to understand the different types of engines and automobile bodies.
4. Familiarization with the automotive industry and its terminology.
5. Develops an idea of utilization of resources duly reducing emission levels for achieving eco-friendly environment.

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

CO1: Demonstrate the basic lay-out of an automobile.

CO2: Distinguish between SI and CI engine's fuel system and cooling systems.

CO3: Classify the principles of fuel ignition systems.

CO4: Infer and select transmission system of an automobile

CO5: Differentiate the steering systems

UNIT – I:

Introduction: History of Automobiles, Classification of Automobiles. Chassis and body building, Engine Terminology, Classification of Engines

UNIT-II:

Fuel System: spark Ignition Engines-Fuel tank, fuel filter, fuel pump, air cleaner/filter, carburetor types, injection of petrol engines. Compression Ignition engines, Fuel Injection System- air & solid injection system, Pressure charging of engines, super charging and turbo charging

Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System, Radiators, Cooling Fan - water pump, thermostat, evaporating cooling, pressure sealed cooling, antifreeze solutions.

UNIT-III:

Ignition System: Function of an ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, Battery ignition system

UNIT-IV:

Transmission System: Clutch principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, gear boxes, types. Propeller shaft, Hotch Kiss drive, Torque tube drive, universal joint, differential, live and dead axles, wheels and tyres.

Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder, tandem master cylinder, Requirement of brake fluid, Pneumatic and vacuum brakes.

UNIT-V:

Steering System: Types of steering mechanism, Ackerman steering mechanism, Davis steering mechanism.

TEXT BOOKS:

1. Kirpal Singh, Automobile Engineering, Vol.1 and 2, Standard Publishers, New Delhi, 2003.
2. A Text Book of Automobile Engineering by R K Rajput. Laxmi Publications.

REFERENCE BOOKS:

1. Automotive Engines / Srinivasan
2. A Text Book of Automobile Engineering By Khalil U Siddiqui New Age International
3. Automobile Engineering / William H Crouse
4. A Text Book Automobile Engineering–Manzoor,. Nawazish Mehdi & .Yosuf Ali, Frontline Publications.

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20EC42084 - Biomedical Instrumentation
(Open Elective- III)

B.Tech. CE IV Year, II Sem

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Note: No detailed mathematical treatment is required and only elementary treatment is sufficient.

Course Objectives: Develop ability to

1. Learn the basics of human physiology
2. Understand the basics of bio-medical transducers and recorders.
3. Understand the applications of measuring, recording and monitoring instruments.
4. Understand the concepts of various medical instruments and supporting system

Course Outcomes: At the end of the course, student would be able to

CO 1: Explain the functioning of different human physiological systems.

CO 2: Explain the operations of transducers and recorders used for bio-medical applications.

CO 3: Explain the principles of medical imaging systems.

CO 4: Explain the principles of monitoring instruments used for bio-medical application

CO 5: Explain the need for health supporting systems

UNIT I: Human Physiology

Introduction to generalized medical instrumentation system, components of instrumentation system, physiological system of human body, cardiovascular system. Respiratory system, Nervous system, generation of bioelectric potentials, Action potential, resting potential, Neuronal communication.

UNIT II: Bio- Potential Electrodes, Transducers and Recorders

The electrode – electrolyte interface, Polarization, Ag/Agcl Electrodes, Body surface electrodes, Internal Electrodes. Transducers in general, Pressure Transducers, Temperature transducers, pulse sensors, Basic recording systems

UNIT III: Medical Imaging Systems

Basics of medical imaging systems, block diagrams and applications of - X-ray machine, Computer Tomography, Magnetic Resonance Imaging systems, Ultrasonic Imaging systems.

UNIT IV: Monitoring Systems

Basic principles of -Stethoscope, BP measuring Instrument, Electrocardiography(ECG),

Electroencephalography(EEG) and Electromyography(EMG) recorders,

UNIT V: Supporting Systems

Basic principles of Pacemaker system, Transcutaneous Electrical Nerve stimulation (TENS), surgical diathermy, Heart lung machine, Hemo Dialysis, Lithotripsy.

TEXT BOOKS:

1. Cromwell, "Bio-Medical Instruments and Measurements", Prentice Hall of India, 1990.

2. Dr.Arumugam, "Bio-Medical Instrumentation", Anuradha Agencies, 1994.

REFERENCE BOOKS:

1. Prof. Venkataram. S. K, "Bio-Medical Electronics & Instrumentation", Galgotia Publications, 2000.

2. John. Can. Brown, "Introduction to Bio Medical Equipment Technology", Pearson Education of ASIA, 2001.

3. Khandpur.R.S, "Hand book of Bio-Medical Instrumentation", Tata McGraw –Hill, 1987

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20CS42085-Database Systems
(Open Elective III)

B.Tech. CE IV Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the basic concepts and the applications of database systems.
2. Master the basics of SQL and construct queries using SQL.
3. Apply relational database design principles.
4. Understands the basic issues of transaction processing and concurrency control.
5. Know the needs of database storage structures and access techniques.

Course Outcomes: At the end of the course, student would be able to

CO1. Demonstrate the basic elements of a relational database management system.

CO2. Design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.

CO3. Apply normalization for the development of application software.

CO4. Implement Transaction and Query processing techniques for data storage and retrieval.

CO5. Implement data storage structures and access through special databases.

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators, History of Database Systems.

Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

UNIT - II

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

Relational Algebra: Express Preliminaries, Relational Algebra.

Basic Structure of SQL Queries, Set Operations, Null Values, Additional Basic Operations, Aggregate Functions, Nested Sub Queries, Views, Joins.

UNIT - III

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies.

Normal Forms – INF, 2NF, 3NF, BCNF, Multi valued dependencies – 4NF,5NF.

UNIT - IV

Transaction Management: Transactions, Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation and consistency, Serializability.

Concurrency Control: Lock–Based Protocols, Multiple Granularity, deadlock handling Timestamp-Based Protocols, Validation-Based Protocols, Recovery Systems.

UNIT - V

Indexing and Hashing: Basic Concepts, Ordered Indices, B+ Tree Index Files, B Tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

Special Data bases: Data analysis, data mining, data warehousing, spatial and geographical, multimedia database, mobility and personal database, distributed information system. World Wide Web, OLAP

TEXT BOOKS:

1. Database System Concepts, Abraham Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education (India) Private Limited, 6th edition.

REFERENCE BOOKS:

1. Database Systems, 6th edition, R Elmasri, Shamkant B.Navathe, Pearson Education.
2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning.
3. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition.
4. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
5. Introduction to Database Systems, C. J. Date, Pearson Education.

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20MB42086 – Entrepreneurship

(Open Elective – III)

B.Tech. CE IV Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the mindset of the entrepreneurs.
2. Analyze the financial aspects of establishing an enterprise.
3. Learn entrepreneurial activities and determine strategies for launching.
4. Identify the challenges of entrepreneurship and develop an idea on the entrepreneurial framework.
5. Apply strategic perspectives in entrepreneurship.

Course Outcomes: At the end of the course, student would be able to

CO1: Explore and identify the entrepreneurial traits.

CO2: Identify various funding agencies and role of IPR.

CO3: Imagine and identify opportunities to launch new ventures.

CO4: Address entrepreneurial challenges.

CO5: Develop strategies for bringing stability and growth in business.

UNIT-I:

Introduction to entrepreneurship: meaning, importance, entrepreneurship characteristics, women entrepreneurs, classifications of entrepreneurs, myths of entrepreneurship, qualities of entrepreneurship, competencies, attitude function and nature of forms of entrepreneurship.

UNIT-II:

Promotion and financial aspects of entrepreneurship: Idea generation- opportunities- SWOT analysis, patents and trademark, intellectual property rights, source of capital, debt capital, seed capital, venture capital- informal agencies in financing entrepreneurs. Government grants and subsidies, types of investors and private offerings.

UNIT-III:

Launching entrepreneurial ventures: opportunities identification- entrepreneurial imagination and creativities – the nature of the creativity process innovation and entrepreneurial- methods to initiate venture creating, new ventures-acquiring and established entrepreneurial venture, franchising hybrid-disadvantage of franchising.

UNIT-IV:

Legal challenges of entrepreneurship: Intellectual property protection patents, copy rights-trademarks and trade secret. Avoiding pitfalls-formulation of the entrepreneurial plan-the challenges of new venture startups-poor financial understanding-critical factors for new venture development, the evaluation process, feasibility criteria approach.

UNIT-V:

Strategic perspectives in entrepreneurship: Strategic planning-strategic actions-strategic positioning-business stabilization-building the adoptive firms-understanding the growth stage unique managerial concern of growing ventures.

TEXT BOOKS:

1. D F Kuratko and T V Rao "Entrepreneurship A South Asian Perspective "Cengage Learning, 1/e, 2012.
2. Vasanth Desai "Small Scale industries and entrepreneurship" Himalaya Publishing 2012.

REFERENCE BOOKS:

1. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
2. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013.

20CE42007 – Technical Seminar

B.Tech. CE IV Year, II Sem

Prerequisite(s): None

L	T	P/D	C
-	-	2/-	1

There shall be a technical seminar presentation in Fourth year second semester, for which, the student shall collect the information on a specialized topic, prepare a technical report, submit it and present the same before a departmental committee. It shall be evaluated by the departmental committee, consisting of Head of the Department, seminar supervisor and a senior professor. The technical seminar report shall be evaluated for 100 marks as CIE. There shall be no SEE for the technical seminar.

20CE42008– Project

B.Tech. CE IV Year, II Sem

Prerequisite(s): None

L	T	P/D	C
-	-	20/-	10

There shall be a project, which the student shall carryout in final year second semester. There shall be three reviews, one at the end of the fourth week, another at the end of the ninth week and third at the end of the fourteenth week. The reviews shall be conducted and evaluated by an internal project review committee. The committee shall consist of Head of the Department, the supervisor allocated for the project, and two Professors /Assoc-Professors of the department. Each review shall be evaluated for thirty (30) marks and average of all three reviews shall constitute CIE of thirty (30) marks. Project carried out shall be submitted in a dissertation form, and a presentation of the same shall be made before a final examination committee consisting of Head of the Department, the supervisor and an external examiner, appointed by the chief superintendent of examinations, selected from a panel of examiners suggested by the chairperson, BoS, which evaluates it for seventy (70) marks.