ACADEMIC REGULATIONS,

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 the AY 2018-19)

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY

AN AUTONOMOUS INSTITUTION

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

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

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

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ACADEMIC REGULATIONS 2018

For CBCS Based B.Tech PROGRAMMES

(Effective for the students admitted into FIRST year from the Academic Year **2018-19**)

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 2018-19, in the following Branches of Engineering

S. No.	***Branch***
I.	Civil Engineering
II.	Computer Science and Engineering
III.	Electrical and Electronics Engineering
IV.	Electronics and Communication Engineering
V.	Information Technology
VI.	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 (soon after securing admission), failing which student shall forfeit seat in B.Tech program. Each 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)** and **Credit Based Semester System (CBSS)** 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) Courses or Drawing Periods (D).
- No Credits for mandatory courses.
- Other student activities (co-curricular and extra-curricular), namely, NCC, NSS, NSO, Study Tour, Guest Lecture etc. and identified Mandatory Courses, if any, shall not carry credits.

3.2.3 **Course Classification:**

All courses offered for the B.Tech programme are broadly classified as: (a) Foundation Courses (FnC), (b) Core Courses (CoC), and (c) Elective Courses (EℓC).

- Foundation Courses (FnC) are further categorized as : (i) HSMC (Humanities and Social Sciences including Management Courses), (ii) BSC (Basic Science Courses), and (iii) ESC (Engineering Science Courses);
- Core Courses (CoC) and Elective Courses (EℓC) are categorized as PS (Professional Courses), which are further subdivided as – (i) PCC (Professional/ Departmental Core) Courses, (ii) PE (Professional/ Departmental Electives), (iii) OE (Open Electives); (iv) Technical Seminar, (v) Mini project and (vi) Project Work (PW) and (vii) Internship;
- Mandatory course(s) (MC – Non credit oriented)

S.No	Broad Course Classification	Course Group/Category	Course Description
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-Humanities and Social sciences including Management Courses	Includes courses related to humanities, Social Sciences and Management
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 courses related 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	Project Work	B.Tech Project
8		Internship/Mini-Project/ Technical Seminar	Internship/Mini- Project/Technical Seminar

4 Course Registration

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

4.2 A Student may be permitted to Register for Course(s) of his CHOICE with a typical total of 20 Credits per Semester (Minimum being 16 C and Maximum being 24 C, permitted deviation being ± 20%), based on his PROGRESS and SGPA/ CGPA, and study of the 'PRE-REQUISITES' as indicated for various Course(s), in the Department Course Structure and Syllabus contents. However, a MINIMUM of 16 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

4.3 A student must register for all the course(s) in a semester as specified in the program structure, before registering for any extra course(s), from the program structure, subject to **a maximum of four** (4) **more credits** with the approval of the faculty advisor.

4.4 If any theory 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 course(s)' to reach the Maximum Permissible Limit of 24 Credits (above the typical 20 Credit norm) must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/ Counselor**.**

4.6 Academic section of the college invites 'Registration Forms' from students a priori (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'.

4.7 A student can apply for registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his faculty 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).

4.8 If the student submits ambiguous choices or multiple options or erroneous entries - during registration for the course(s) under a given / specified course(s) Group/ Category, namely, core elective with laboratory, professional elective and open elective as listed in the programme structure, Faculty Advisor shall rectify such errors and advise the student accordingly.

4.9 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 the course(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.

4.10 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.

4.11 Open electives: The students have 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.

4.12 Professional electives: The students have 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) opts 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'**.

5.4 If more entries for registration of a course(s) come into picture then the Head of the Department concerned shall decide whether or not to offer such a course(s) 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 (excluding attendance in mandatory course(s) such as Environmental Science, Constitution of India, Intellectual Property Rights, Professional Ethics and Gender Sensitization lab) registered for in that semester.

6.2 A student shall acquire a minimum of 75% attendance in each mandatory course. If he fails to acquire a minimum of 75% attendance in mandatory course(s), such student is deemed to have failed in that mandatory course(s) and shall re-register for such course(s) as and when offered next. Condonation of attendance is not allowed in mandatory course(s).

6.3 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on valid medical grounds, or participation in sports, games, NCC, NSS, other co-curricular and extra-curricular activities, recognized for the purpose, and the participation having prior approval of the competent authority. Such condonation shall be based on the student's representation with supporting evidence.

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

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

6.6 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 that 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.

6.7 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 requirements 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(s).

7.2 Academic requirements in respect of Internship, Mini-Project, Technical Seminar, Project and mandatory non-credit course(s) are as follows:

7.2.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Internship, if the student secures not less than 40% of the total marks allocated for the course. The student is deemed to have failed, if he does not submit a report on his Internship or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule or secures less than 40% of marks in Internship evaluation.

7.2.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Mini Project, if the student secures not less than 40% of the total marks allocated for the course(s). The student is deemed to have failed, if he does not submit a report on his Mini Project or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule or secures less than 40% of marks in Mini Project evaluation.

7.2.3 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Technical Seminar, if the student secures not less than 40% of the total marks allocated for the course(s). The student is deemed to have failed, if he does not submit a report on his Technical Seminar or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule or secures less than 40% of marks in Technical Seminar evaluation.

7.2.4 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Project, if the student secures not less than 40% of the total marks allocated for the course(s). The student is deemed to have failed, if he does not submit a report on his Project or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule or secures less than 40% of marks in Project evaluation.

Note: He may reappear once for each of the above evaluations (mentioned in 7.2.1 to 7.2.4), when 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.

7.2.4.1 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) in addition to satisfying the attendance requirements mentioned in section 6.2.

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

7.2.4.3 If a student fails in mandatory / non-credit course(s), he shall re-register for that course(s) as and when offered next.

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 to Second year First semester	(i) Regular course of study of First year Second semester. (ii) Must have secured at least 50% (20 out of 40 credits) 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 (even if the student registers for less than 40 credits, student must still secure a minimum of 20 credits).
3.	Second year First semester to Second year Second semester	Regular course of study of Second year First semester.
4	Second year Second semester to Third year First semester	(i) Regular course of study of Second year Second semester. (ii) Must have secured at least 60% (48 out of 80 credits) 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 (even if the student registers for less than 80 credits, student must still secure a minimum of 48 credits).
5	Third year first semester to Third year second semester	Regular course of study of Third year First semester.
6	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% (72 out of 120 credits) 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 (even if the student registers for less than 120 credits, student must still secure a minimum of 72 credits).
7	Fourth year First semester to Fourth 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)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 of IV year II semester.

7.5 Students who fail to earn 160 credits as per the Programme Structure, and as indicated above, within 8 academic years from the date of commencement of their I Year shall forfeit their seats in B.Tech Programme and their admissions shall stand cancelled.

7.6 A student detained due to shortage of attendance in any semester, may be re-admitted into that semester, as and when offered, with the Academic Regulations of the batch into which he gets readmitted. However, no grade allotments or SGPA/ CGPA calculations shall be done for the corresponding semester in which he got detained.

7.7 A student detained due to lack of credits in any year, may be readmitted in the next year, after fulfillment of the Academic Requirements, with the Academic Regulations of the batch into which he gets readmitted.

7.8 A student eligible to appear in the Semester End Examination in any course(s), but absent at 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).

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, Technical seminar, Project, Mini-Project, Internship 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/Technical seminar shall be evaluated based on 100% CIE (Continuous Internal Evaluation)

8.1.3 Mini-project shall be evaluated based on 100% SEE (Semester End Examination)

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 theory course(s).

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(s). 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(s). 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 questions of Part B.

8.2.5 **Absence in mid-term examination(s):**

- If any student is absent in one mid-term examination for any course(s) on any valid reasons certified by the Head of the Department concerned, one written test shall be conducted on all units by the college in each course(s) at the end of the semester.
- If any student is absent in both mid-term examinations for any course(s) on any valid reasons certified by the Head of the Department concerned, only one written test for 25 marks shall be conducted on all units by the college in each course at the end of the semester, and the marks secured out of 25 shall be divided by two, shall be awarded against the said mid-term examination(s).
- A prescribed fee shall be payable by the student for appearing in the above mentioned written test.

8.2.6 For laboratory / practicals / drawing course(s), there shall be a Continuous Internal Evaluation (CIE) during the semester for 30 marks, and 70 marks are assigned for laboratory / practical Semester End Examination (SEE). 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. The external examiner shall be appointed by the Chief Superintendent of Examinations of the college as per the recommendation of the Chairperson, Board of Studies of the department concerned. The panel of the external examiners shall be provided by the Chairperson, BoS at the commencement of the semester during the meeting of the BoS

Absence in laboratory/practical internal examinations:

- If any student is absent in one laboratory internal examination for any laboratory course for any valid reasons certified by the Head of the Department concerned, one test shall be conducted for 15 marks covering all experiments of that laboratory course, by the college at the end of the semester.
- If any student is absent in both the laboratory internal examinations for any valid reasons certified by the Head of the Department concerned, only one test shall be conducted covering all experiments and the marks secured out of 15 marks shall

be divided by two, which shall be awarded against the said lab internal examinations.

8.2.7 For the course having design and / or drawing (such as Engineering Graphics), the distribution shall be 30 marks for CIE (15 marks for day-to-day work, and 15 marks for internal tests) and 70 marks for SEE (question paper pattern shall be same as for theory examinations). There shall be two internal examinations in a semester and the average of the two shall be considered for the award of marks for internal examinations.

8.2.7.1 If any student is absent in the internal examination in design and / or drawing (such as Engineering Graphics) for any valid reasons certified by the Head of the Department concerned, one internal examination shall be conducted for 15 marks on all experiments of that laboratory / practical course(s), by the college at the end of the semester.

8.2.8 **Internship, Mini-Project, Technical Seminar and Project**

8.2.8.1 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 of four weeks. Internship carried out shall be submitted in a report form, 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, 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.

8.2.8.2 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.

8.2.8.3 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, 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.

8.2.8.4 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.

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. 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:

% of Marks 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 secured earlier in those course(s) shall remain the same.

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 secured earlier in those course(s) shall remain the same.

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 or above)** in that course.

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

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

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 **two decimal places**. CGPA is thus computed from the First year second semester onwards at the end of each semester as per the formula

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

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 registered course(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.Tech Programme) ≥ 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.TECH Programme) ≥ 6.50 but < 8.00, shall be placed in 'FIRST CLASS'.

12.2.4 Students with final CGPA (at the end of the B.TECH Programme) ≥ 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.Tech Programme) ≥ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

12.3 A student with final CGPA (at the end of the B.Tech Programme) < 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

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

14. Transitory Regulations

14.1 **General**

14.1.1 A Student who has discontinued for any reason, or has been detained for want of attendance as specified in section 6 or NOT promoted due to lack of required credits as specified in section 7, may be considered eligible for readmission to the same semester in which he got detained for want of attendance or promotion to the next year of study after securing the required number of credits, as detailed in sections 14.2 through 14.4 as the case may be.

14.2 **For students detained due to shortage of attendance**:

14.2.1. A Student who has been detained in FIRST year of R13/R15 Regulations of JNTUH due to lack of attendance, shall be permitted to join FIRST year FIRST Semester of AR18 Regulations of GCET and is required to complete the study of B.Tech programme within the stipulated period of eight academic years from the date of first admission in FIRST Year. The AR18 Academic Regulations of GCET are applicable to the student from the year and semester of readmission onwards.

14.2.2. A student who has been detained in any semester of SECOND, THIRD and FOURTH years of R13/R15 regulations of JNTUH for want of attendance shall be permitted to join the corresponding semester of AR18 regulations of GCET and is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in FIRST Year. The AR18 Academic Regulations of GCET are applicable to the student from the year and semester of readmission onwards.

14.2.3. A student who has been detained in any semester of FIRST, SECOND, THIRD or FOURTH years of AR16 regulations of GCET for want of attendance shall be permitted to join the corresponding semester of AR18 regulations of GCET and is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in FIRST Year. The AR18 Academic Regulations of GCET are applicable to the student from the year and semester of readmission onwards.

14.3 **For students NOT promoted due to shortage of credits**:

14.3.1. A student of R13/R15 Regulations of JNTUH who has been detained due to lack of credits shall be promoted to the next semester under AR18 Regulations of GCET only after acquiring the required credits as per the corresponding regulations of his first admission. For subsequent promotions, the rule specified in section 14.4.4 shall be applicable. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission in FIRST year. The AR18 Academic Regulations of GCET are applicable to a student from the year of readmission onwards.

14.3.2. A student of AR16 Regulations of GCET who has been detained due to lack of credits shall be promoted to the next semester under AR18 Regulations of GCET only after acquiring the required credits as per AR16 regulations. For subsequent promotions, the rule specified in section 14.4.4 shall be applicable. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission in FIRST year. The AR18 Academic Regulations of GCET are applicable to the student from the year of readmission onwards.

14.4. **For all students readmitted under AR18 Regulations of GCET**:

14.4.1 A student who has failed in any course(s) under any regulation has to pass those course(s) in the same regulations.

14.4.2 If a student readmitted into AR18 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 with course(s) he has studied under his previous regulations, that particular course(s) shall be substituted for by another course(s) by the college (see also section 14.4.3).

14.4.3 If a student taking readmission as per the provisions of section 14.1.1 had not studied in his previous semesters, any course(s) which is/are prescribed for study under AR18 Regulations (in any of the semester(s) preceding the semester of re-admission), he shall pass all such course(s) to meet the academic requirements of AR18 Regulations. One or more of these course(s) may be offered as substitute course(s), as per section 14.4.2. Other course(s) not offered as substitute course(s) shall constitute **Additional Course(s)**, which the student must pass to meet the academic requirements for the award of the degree. *Method of* e*valuation of additional courses shall be the same as the one detailed in section 8*. The college may conduct remedial classes and internal examinations for the benefit of the student. The Academic Regulations of GCET, AR18, under which a student has been readmitted, shall be applicable to the student from that semester.

14.4.4 **Promotion Rule for students initially admitted into R13/R15 Regulations of JNTUH or AR16 Regulations of GCET and re-admitted into AR18 Regulations of GCET**

- To be eligible for promotion from FIRST year to SECOND year, a student must secure a minimum of 50% of the total credits assigned to all the courses he had studied, including substitute courses but excluding Additional Courses, from all the examinations conducted, whether the student takes the examinations or not.
- To be eligible for promotion from SECOND year to THIRD year and THIRD year to FOURTH year, a student must secure a minimum of 60% of the total credits assigned to all the courses he had studied, including substitute courses but excluding Additional Courses, from all the examinations conducted, whether the student takes the examinations or not.
- For this purpose, if the number of credits secured so arrived at is not an integer, the fractional component shall be ignored if it is less than 0.5; else, it shall be rounded off to the next higher integer (e.g. 50.4 is taken as 50 and 50.5 is taken as 51).

14.4.5 The total number of credits that a student acquires for the award of degree, shall be the sum of all credits secured in all the regulations of his study including AR18 Regulations. Credits earned by the student in additional course(s), shall be considered only for award of B.Tech degree, but shall not be considered for calculating SGPA/CGPA.

15. Student transfers

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

15.2 The student seeking transfer from various other universities/institutions, if failed in any course(s) in his earlier regulations, has to pass equivalent courses as prescribed by JNTUH and also pass the courses of GCET which the student has not studied at the earlier institution. Further, even if the student had passed some of the courses at the earlier institutions, if the same courses are prescribed in different semesters of AR18

regulations of GCET, the student has to study and pass those courses in GCET in spite of the fact that those courses are repeated.

15.3 The transferred students from other universities/institutions shall be provided one chance to write the internal examinations in the failed courses and/or courses not studied as per the clearance (equivalence) letter issued by JNTUH.

16. Scope

i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".
ii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.
iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.
iv) 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.
v) B.Tech (Regular) program is B.Tech 4 year degree program to which students are admitted to FIRST year
vi) 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.
vii) The terms "mid-term" and "internal" are used interchangeably.

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

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 intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that 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.

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

ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME) FROM THE AY 2019-20

1. Eligibility for award of B. Tech. Degree (LES)

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.

2. 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.

3. 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

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech (LES).

5. Promotion rule

S. No.	Promotion	Conditions to be fulfilled
i.	Second year first semester to Second year second semester	Regular course of study of Second year first semester.
ii.	Second year second semester to Third year first semester	(i) Regular course of study of Second year second semester. (ii) Must have secured at least 60% (24 out of 40 credits) 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 (even if the student registers less than 40 credits student must still secure a minimum of 24 credits).
iii.	Third year first semester to Third year second semester	Regular course of study of Third year first semester.
iv.	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% (48 out of 80 credits) 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 (even if the student registers less than 80 credits student must still secure a minimum of 48 credits).
v.	Fourth year first semester to Fourth 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).

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

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 intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that 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., Telengana-501301

B.Tech. CIVIL ENGINEERING

AR 18 STRUCTURE FOR UNDERGRADUATE PROGRAM

S. No.	Category	Credits as per AR18	Credits as per AICTE Model Curriculum
1	**Humanities and Social Sciences including Management Courses**	**12.5**	12
2	**Basic Sciences Courses**	**23**	26
3	**Engineering Sciences Courses** including workshop, drawing, basics of electrical/mechanical/computer etc.	**24.5**	29
4	**Professional Core Courses**	**61**	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	**15**	12
8	**Mandatory Courses** (Induction Program, Indian Constitution, Environmental Science, Professional Ethics)	(non-credit)	(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

Geethanjali College of Engineering and Technology (Autonomous)
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SCHEME OF INSTRUCTION AND EXAMINATION

B.TECH. CIVIL ENGINEERING (CE)

ACADEMIC REGULATIONS - AR 18 WITH EFFECTIVE FROM A.Y. 2018-19

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	18PH1101	Engineering Physics	BSC	3	1	-	30	70	100	4
2	18MA1101	Mathematics – I	BSC	3	1	-	30	70	100	4
3	18CS1101	Programming for Problem Solving	ESC	2	-	-	30	70	100	2
4	18ME1101	Engineering Mechanics - I	ESC	3	-	-	30	70	100	3
5	18ME1102	Engineering Graphics	ESC	1	-	4	30	70	100	3
6	18PH11L1	Engineering Physics Lab	BSC	-	-	3	30	70	100	1.5
7	18CS11L1	Programming for Problem Solving Lab	ESC	-	-	2	30	70	100	1
8	18ME11L1	Engineering Workshop	ESC	-	-	3	30	70	100	1.5
9	MC	Induction Program	MC	-	-	-	-	-	-	-
		Total		**12**	**2**	**12**	**240**	**560**	**800**	**20**
		Total Periods Per Week		**26**						

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	18EN1201	English	HSMC	3	-	-	30	70	100	3
2	18MA1201	Mathematics – II	BSC	3	1	-	30	70	100	4
3	18CH1201	Engineering Chemistry	BSC	3	1	-	30	70	100	4
4	18CS1201	Data Structures	ESC	2	-	-	30	70	100	2
5	18ME1201	Engineering Mechanics - II	ESC	3	-	-	30	70	100	3
6	18EN12L1	English Language and Communication Skills Lab	HSMC	-	-	3	30	70	100	1.5
7	18CH12L1	Engineering Chemistry Lab	BSC	-	-	3	30	70	100	1.5
8	18CS12L1	Data Structures Lab	ESC	-	-	2	30	70	100	1
9	18MC1201	Indian Constitution	MC	3	-	-	-	-	-	-
Total				**17**	**2**	**8**	**240**	**560**	**800**	**20**
Total Periods Per Week				**27**						

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	18CE2101	Surveying	PCC	3	-	-	30	70	100	3
2	18CE2102	Strength of Materials -I	PCC	3	1	-	30	70	100	4
3	18CE2103	Fluid Mechanics	PCC	3	1	-	30	70	100	4
4	18CE2104	Building Materials, Construction and Planning	PCC	3	-	-	30	70	100	3
5	18EE2101	Basic Electrical Engineering	ESC	3	-	-	30	70	100	3
6	18CE21L1	Surveying Lab	PCC	-	-	2	30	70	100	1
7	18CE21L2	Strength of Materials Lab	PCC	-	-	2	30	70	100	1
8	18EE21L1	Basic Electrical Engineering Lab	ESC	-	-	2	30	70	100	1
Total				**15**	**2**	**6**	**240**	**560**	**800**	**20**
Total Periods Per Week				**23**						

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	18MA2201	Computational Mathematics	BSC	3	-	-	30	70	100	3
2	18CE2201	Engineering Geology	ESC	3	-	-	30	70	100	3
3	18CE2202	Strength of Materials - II	PCC	3	1	-	30	70	100	4
4	18CE2203	Hydraulics and Hydraulic Machinery	PCC	3	1	-	30	70	100	4
5	18MB2202	Engineering Economics and Accounting	HSMC	3	-	-	30	70	100	3
6	18MA22L1	Computational Mathematics Lab	BSC	-	-	2	30	70	100	1
7	18CE22L1	Engineering Geology Lab	ESC	-	-	2	30	70	100	1
8	18CE22L2	Hydraulics and Hydraulic Machinery Lab	PCC	-	-	2	30	70	100	1
9	18CH2201	Environmental Science	MC	3	-	-	-	-	-	-
Total				**18**	**2**	**6**	**240**	**560**	**800**	**20**
Total Periods Per Week				**26**						

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.

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	18CE3101	Structural Analysis	PCC	3	1	-	30	70	100	4
2	18CE3102	Concrete Technology	PCC	3	-	-	30	70	100	3
3	18CE3103	Geotechnical Engineering	PCC	3	-	-	30	70	100	3
4	18CE3104	Engineering Hydrology	PCC	3	-	-	30	70	100	3
5		**Open Elective I**	OEC	3	-	-	30	70	100	3
	18EE3122	Industrial Safety and Hazards (EEE)								
	18ME3123	Nano Materials and Technology (ME)								
	18EC3124	Electronic Measuring Instruments (ECE)								
	18CS3125	JAVA Programming (CSE)								
	18MB3126	Intellectual Property Rights (MBA)								
6	18CE31L1	Computer Aided Drafting of Buildings Lab	PCC	-	-	2	30	70	100	1
7	18CE31L2	Concrete Technology Lab	PCC	-	-	2	30	70	100	1
8	18CE31L3	Geotechnical Engineering Lab	PCC	-	-	2	30	70	100	1
9	18CE3105	Internship	PROJ – I	-	-	-	100	-	100	2
Total				**15**	**1**	**6**	**340**	**560**	**900**	**21**
Total Periods Per Week				**22**						

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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	18CE3201	Design of Reinforced Concrete Structures	PCC	3	1	-	30	70	100	4
2	18CE3202	Transportation Engineering	PCC	3	-	-	30	70	100	3
3	**Professional Elective – I**		PEC	3	-	-	30	70	100	3
	18CE3203	Advanced Structural Analysis								
	18CE3204	Foundation Engineering								
	18CE3205	Groundwater Development and Management								
	18CE3206	Air Pollution and Control								
	18CE3207	Disaster Mitigation and Management								
4	**Professional Elective – II**		PEC	3	-	-	30	70	100	3
	18CE3208	Green Buildings								
	18CE3209	Construction Engineering and Management								
	18CE3210	Irrigation Engineering								
	18CE3211	Remote Sensing and GIS								
	18CE3212	Advanced Concrete Technology								
5	**Open Elective – II**		OEC	3	-	-	30	70	100	3
	18EE3232	Energy Conservation and Management (EEE)								
	18ME3233	Digital Fabrication (ME)								
	18EC3234	Principles of Communication Systems (ECE)								
	18CS3235	Knowledge Management (CSE)								
	18MB3236	Supply Chain Management (MBA)								
6	18CE32L1	Structural Drafting Lab	PCC	-	-	2	30	70	100	1
7	18CE32L2	Transportation Engineering Lab	PCC	-	-	2	30	70	100	1
8	18EN32L1	Advanced English Communication Skills Lab	HSMC	-	-	2	30	70	100	1
9	18MB3203	Professional Ethics	MC	3	-	-	-	-	-	-
		Total		**18**	**1**	**6**	**240**	**560**	**800**	**19**
		Total Periods Per Week		**25**						

Note: Students have to undertake a Mini-Project during the summer vacation which shall be evaluated as SEE during Forth year First semester. There is no internal evaluation for this Mini-Project.

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	18CE4101	Design of Steel Structures	PCC	3	-	-	30	70	100	3
2	18CE4102	Environmental Engineering	PCC	3	-	-	30	70	100	3
3	18MB4101	Operations Research	HSMC	3	-	-	30	70	100	3
4	**Professional Elective – III**		PEC	3	-	-	30	70	100	3
	18CE4103	Pavement Analysis and Design								
	18CE4104	Finite Element Methods for Civil Engineering								
	18CE4105	Ground Improvement Techniques								
	18CE4106	Hydropower Engineering								
	18CE4107	Climate Change and Adaptation								
5	**Professional Elective – IV**		PEC	3	-	-	30	70	100	3
	18CE4108	Advanced Structural Design								
	18CE4109	Traffic Engineering								
	18CE4110	Prestressed Concrete Structures								
	18CE4111	Earth Retaining Structures								
	18CE4112	Solid Waste Management								
6	18CE41L1	Structural Analysis and Design Lab	PCC	-	-	2	30	70	100	1
7	18CE41L2	Environmental Engineering Lab	PCC	-	-	2	30	70	100	1
8	18MB41L1	Operations Research Lab	HSMC	-	-	2	30	70	100	1
9	18CE4113	Mini-Project	PROJ-M	-	-	-	-	100	100	2
			Total	**15**	**-**	**6**	**240**	**660**	**900**	**20**
			Total Periods Per Week	**21**						

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	18CE4201	Estimation and Costing	PCC	3	-	-	30	70	100	3
2	**Professional Elective – V**		PEC	3	-	-	30	70	100	3
	18CE4202	Railways and Airport Engineering								
	18CE4203	Industrial Wastewater Management								
	18CE4204	Soil Dynamics and Machine Foundation								
	18CE4205	Rehabilitation and Retrofitting of Structures								
	18CE4206	Elements of Earthquake Engineering								
3	**Open Elective – III**		OEC	3	-	-	30	70	100	3
	18EE4242	Micro-Electro-Mechanical Systems (EEE)								
	18ME4243	Principles of Automobile Engineering (ME)								
	18EC4244	Biomedical Instrumentation (ECE)								
	18CS4245	Database Systems (CSE)								
	18MB4246	Entrepreneurship (MBA)								
4	18CE4207	Technical Seminar	PROJ -TS	-	-	2	100	--	100	1
5	18CE4208	Major 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
21	Global Warming and Climate Change (CE)	18CE2221/18CE3121/18CE3221
22	Industrial Safety and Hazards (EEE)	18EE2222/18EE3122/18EE3222
23	Nano Materials and Technology (ME)	18ME2223/18ME3123/18ME3223
24	Electronic Measuring Instruments (ECE)	18EC2224/18EC3124/18EC3224
25	JAVA Programming (CSE)	18CS2225/18CS3125/18CS3225
26	Intellectual Property Rights (MBA)	18MB2226/18MB3126/18MB3226

Open Elective II

S. No.	Course Title	Course Code
31	Building Technology (CE)	18CE3231/18CE4131
32	Energy Conservation and Management (EEE)	18EE3232/18EE4132
33	Digital Fabrication (ME)	18ME3233/18ME4133
34	Principles of Communication Systems (ECE)	18EC3234/18EC4134
35	Knowledge Management (CSE)	18CS3235/18CS4135
36	Supply Chain Management (MBA)	18MB3236/18MB4136

Open Elective III

S. No.	Course Title	Course Code
41	Disaster Management (CE)	18CE4241
42	Micro-Electro-Mechanical Systems (EEE)	18EE4242
43	Principles of Automobile Engineering (ME)	18ME4243
44	Biomedical Instrumentation (ECE)	18EC4244
45	Database Systems (CSE)	18CS4245
46	Entrepreneurship (MBA)	18MB4246

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18PH1101- Engineering Physics

B.Tech. - CE - I Year I Semester

L	T	P/D	C
3	1	-	4

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the concepts of laws of motion and conservation of momentum and energy.
2. Distinguish different types of Harmonic Oscillations.
3. Understand the propagation of waves in strings and distribution of energy.
4. Understand the concepts of interference and diffraction.
5. Understand the concepts of light amplification, working of various types of lasers, optical fibers and their applications.

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

CO1. Interpret and apply the laws of motion, conservation of momentum and energy.
CO2. Explain difference between electrical and mechanical oscillations.
CO3. Demonstrate the wave propagation and energy distribution in strings.
CO4. Demonstrate the optical phenomena of interference and diffraction.
CO5. Explain phenomena of light amplification process, construction and working of different types of Lasers, Fiber optics and their applications in different fields.

UNIT-I: Introduction to Mechanics

Introduction, Space and Time, Newton's laws of motion, Inertial frames, Mechanics of a particle: Conservation of linear momentum, Conservation of angular momentum, Conservation of energy; Forces in Nature, conservative and non-conservative forces, Central forces and examples, main features of central force , conservative force as a negative gradient of potential energy (F= -grad U), Curl of a conservative force.

UNIT-II: Harmonic Oscillations

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

UNIT III: Waves in one dimension

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-IV: Wave Optics

Huygens's principle, superposition of waves and interference of light by wave front splitting and amplitude splitting, 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-V: Lasers and Fiber Optics

Lasers: 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.

TEXT BOOKS:

1. Engineering Mechanics, - MK Harbola, Cengage Learning, 2nd Edn, 2009.
2. Vibrations and waves in physics - I. G. Main, 3rd Edn, Cambridge University Press, 2018.

REFERENCE BOOKS:

1. Optics – Ajoy Ghatak, McGraw Hill Education, 2012.
2. The physics of vibrations and waves - H. J. Pain, Wiley, 2006.
3. Principles of Lasers - O. Svelto, 5th Edn, 2010.
4. Introduction to Mechanics - M.K.Verma, Universities Press.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18MA1101 - Mathematics-I

B.Tech. CE - I Year, I Sem.

Prerequisite(s): None.

L	T	P/D	C
3	1	-	4

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 and orthogonal transformations.
3. Identify the methods of solving the differential equations of first order and applications in engineering problems namely, Newton's law of cooling, Natural growth and decay.
4. Solve second and higher order differential equations of various types.
5. Analyze properties of Laplace Transform, Inverse Laplace Transform, convolution theorem and their applications to ordinary differential equations.

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

CO1. Write the matrix representation of a set of linear equations and analyse solution of a system of equations.

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

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

CO4. Apply higher order differential equations to solve engineering problems.

CO5. Solve Ordinary differential equations of second and higher order using Laplace Transform techniques.

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 forms by Orthogonal Transformation.

UNIT-III: First Order Ordinary Differential Equations

Exact, linear and Bernoulli's equations; Applications: Newton's law of cooling, Law of Natural Growth and Decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT-IV: Ordinary Differential Equations of Higher Order

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 ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-V: Laplace Transforms

Definition of Laplace transform, domain of the function and Kernel for the Laplace transforms. 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-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-Applications to ordinary differential equations.

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.

2. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill, New Delhi.

3. Engineering Mathematics, Paras Ram, 2nd Edition, CBS Publishers.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CS1101 - Programming for Problem Solving

B.Tech. CE - I Year, I Sem.

L	T	P/D	C
2	-	-	2

Pre-requisite(s): None.

Course Objectives: Develop ability to

1. Solve problems by developing algorithms to solve problems using Raptor tool.
2. Understand the concepts of variables, constants, basic data types and input and output statement in a C programming language.
3. Understand the use of sequential, selection and repetition control statements into the algorithms implemented using C programming language.
4. Understand of structured design by implementing programs with functions and passing of parameters to solve more complex problems.
5. Understand the concepts related to arrays, strings and pointers and also with dynamic memory allocation in the context of C programming language.

Course Outcomes: After completion of the course, student would be able to

CO1. Demonstrate problem solving skills by developing algorithms to solve problems using Raptor tool.

CO2. Incorporate the concept of variables, constants, basic data types and input and output statement in a C language program.

CO3. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.

CO4. Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.

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

UNIT – I

Basics of Computers

Logic Building: Flow chart, Algorithm, Pseudo code. Introduction to Raptor Programming Tool

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 etc.., C program examples. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions.

UNIT - II

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

Repetition statements (loops) - while, for, do-while statements with Raptor Tool, and 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, Standard functions, Scope, Storage classes - auto, register, static, extern, scope rules, 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, array applications, two – dimensional arrays, multidimensional arrays, C program examples.

Strings – Concepts, C Strings, String Input / Output functions, string manipulation functions, arrays of strings, string / data conversion, 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 BOOK(S):

1. Computer Science: A Structured Programming Approach Using C, B.A. Forouzan and R.F. Gilberg, 3rd Edition, Thompson Learning, 2007 Reprint.

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., Telengana-501301
18ME1101– Engineering Mechanics - I

B.Tech. CE - I Year, I Sem.

L	T	P/D	C
3	-	-	3

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. Accurately draw free body diagrams to determine various forces acting externally on a body to solve the problems when the body is under equilibrium condition.
3. Apply equilibrium equations to solve problems comprising frictional forces.
4. Determine centroid and centre of masses for discrete particles.
5. Determine moment of inertia for standard sections and composite bodies.

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.

CO3. Apply concepts of equilibrium to analyse systems that include frictional forces.

CO4. Calculate centroids and centres of mass for discrete particles.

CO5. Calculate moments of Inertia for standard sections and composite sections.

UNIT-I: Introduction to Engineering Mechanics

Types of force Systems, Basic concepts, Particle System of Forces, Coplanar Concurrent Forces. Resultants of force system: Introduction, Parallelogram Law, force and components, Components in Space, Moment of Forces and principles of moments, Varignon's theorem and its Application, Couples and Resultant of Force System.

UNIT-II: Equilibrium of force system

Introduction, equilibrium in 2-D & 3-D; Rigid Body equilibrium, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

UNIT-III: Friction

Introduction, Theory of friction, Types of friction, Limiting friction, Angle of friction, Laws of Friction, cone of friction, Static and Dynamic Friction; Motion of Bodies, Block friction, ladder friction, wedge friction.

UNIT-IV: Centroids and Center of Gravity

Introduction, Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. Theorem of Pappus.

UNIT-V: Moments of Inertia

Area moment of inertia: Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, Mass moment of inertia of composite bodies.

TEXT BOOKS:

1. Engineering Mechanics, Ferdinand. L. Singer, Harper – Collins publishers, New Delhi. (1998).
2. Engineering Mechanics, S.S. Bhavikatti and J.G. Rajasekharappa, New Age International, India (2012).

REFERENCE BOOKS:

1. Engineering Mechanics, Timoshenko & Young, McGraw Hill, India (2007).
2. Engineering Mechanics, A.K. Tayal, Umesh Publications, New Delhi (2010).
3. Engineering Mechanics, R.S. Khurmi, S. Chand & Company Limited, New Delhi (2009).
4. Engineering Mechanics, K.L Kumar, Tata McGraw Hill, New Delhi (2009).
5. Engineering Mechanics, Irving. H. Shames, Prentice-Hall, India (1999).

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18ME1102 - Engineering Graphics

B Tech. CE - I Year, I Sem.

L	T	P/D	C
1	-	4	3

Pre-requisite(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 and development of surfaces.
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, the student will be able to

CO1. Draw various curves and scales in engineering drawing practice.
CO2. Draw orthographic projections of points, lines and planes.
CO3. Draw orthographic projections of solids and sections.
CO4. Draw Isometric Views to Orthographic Views and Vice-versa and development of surfaces of objects.
CO5. Apply basic AutoCAD commands for engineered 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 and Hypocycloid, Scales – Plain and Diagonal.

UNIT - II: Orthographic Projections: Principles of Orthographic Projections Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.

UNIT - III: Projections of Regular Solids, Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone, Sphere.

UNIT - IV: Development of Surfaces of Right Regular Solids: Prism, Cylinder, Pyramid and Cone.

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. Isometric Projection of Spherical Parts.

UNIT - V: Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

Introduction to CAD: (For Internal Evaluation Weightage 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 McAgrawal/ 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.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18PH11L1 - Engineering Physics Laboratory

B.Tech. - CE- I Year, I Sem.

L	T	P/D	C
-	-	3	1.5

Pre-requisite(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:

1. Melde's experiment:

To determine the frequency of a vibrating bar or turning fork using Melde's arrangement.

2. Torsional Pendulum

To determine the rigidity modulus of the material of the given wire using torsional pendulum.

3. Sonometer:

To determine the frequency of AC source using sonometer and electromagnet

4. Newton's rings:

To determine the radius of curvature of the plano convex lens by forming Newton's rings.

5. Diffraction grating:

To determine the number of lines per inch of the grating.

6. Dispersive power:

To determine the dispersive power of prism by using spectrometer.

7. Coupled Oscillator:

To determine the spring constant by single coupled oscillator.

8. LCR Circuit:

To determine resonant frequency and quality factor of LCR circuit.

9. LASER:

To study the characteristics of LASER sources.

10. Optical fibre:

To determine the bending losses of Optical fibres.

11. Optical fibre:

To determine the Numerical aperture of a given fibre.

Note: Any 8 experiments are to be performed

Geethanjali College of Engineering and Technology (Autonomous)
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18CS11L1 - Programming for Problem Solving Lab

B.Tech. CE - I Year, I Sem.

L	T	P/D	C
-	-	2	1

Pre-requisite(s): None.

Course Objectives: Develop ability to

1. Solve problems by developing algorithms to solve problems using Raptor tool.
2. Understand the concepts of variables, constants, basic data types and input and output statement in a C programming language.
3. Understand the use of sequential, selection and repetition control statements into the algorithms implemented using C programming language.
4. Understand of structured design by implementing programs with functions and passing of parameters to solve more complex problems.
5. Understand the concepts related to arrays, strings and pointers and also with dynamic memory allocation in the context of C programming language.

Course Outcomes: After completion of the course, student would be able to

CO1. Demonstrate problem solving skills by developing algorithms to solve problems using Raptor tool.

CO2. Incorporate the concept of variables, constants, basic data types and input and output statement in a C language program.

CO3. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.

CO4. Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.

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

LIST OF EXPERIMENTS	
1	Introduction to RAPTOR Tool Draw Flow chart using RAPTOR for, Read a number and Display the same number Read and Display the student details Read two numbers from user and calculate addition and subtraction of those numbers Read two numbers from user at the time of execution and calculate multiplication and division of those numbers Find the square of a given number (take the number from the user) Calculate the value of Y from the equation $y = x^2 + 2x + 3$ (read the value of X from user)

2	Draw Flow chart using RAPTOR for, Calculate the area of a Circle Calculate the area of a Square Calculate the area of a Rectangle Interchange two numbers Find the sum of square of two numbers Convert Centigrade to Fahrenheit Convert Radius to Degrees Display the roots of Quadratic Equation
3	Draw Flow chart using RAPTOR for, Check the given number is Positive or Negative Check the given number is even or odd Display whether a person is eligible for vote or not Calculate the Largest of two numbers Check the given year is leap year or not Check whether two numbers are equal or not Find the largest value among three given numbers
4	Draw Flow chart using RAPTOR for, Calculate and display the grade of a student < 30 % - Fail Between 31 and 50 – C grade Between 51 to 60 – B grade Between 61 to 75 – A grade Greater than 75 - distinction Find the quadratic roots of an equation (real or imaginary) Check the given number is multiple of 2, 4 and 8
5	Draw Flow chart using RAPTOR for, Display n numbers using looping Calculate the sum of n natural numbers Display the even numbers below n Calculate sum of even numbers and odd numbers from 1 to n (n value supplied by the user)
6	Write a C program to display student details Write a C program to perform arithmetic operations Write a C program to implement increment and decrement operators Write a C program to implement conditional operator Write a C program to implement bit wise operator
7	Write a C program to calculate the biggest of given two numbers Write a C Program to print the result depending on the following < 30 % - Fail Between 31 and 50 – C grade Between 51 to 60 – B grade Between 61 to 75 – A grade Write a C Program to implement arithmetic calculator using switch case
8	Write a C program to find sum of n natural numbers Write a C program to find individual digits of the given number Write a C program to find factorial of a given number
9	Write a C program to display the prime numbers below n (where n value is given by user) A Fibonacci sequence is defined as follows: the first and second terms in the

	sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence. Write a C program to find the quadratic roots of an equations Write a c program to calculate sum of the following geometric equation Sum=$1+x+x^2+x^3+\ldots..+x^n$
10	Write a C program to find the given number is palindrome or not Write a C program to find GCD and LCM of two given numbers using functions Write a C program to find the factorial of a given number using recursive function Write a C program to generate the fibonacci series using recursive function
11	Write a C program to find largest and smallest numbers in a list of array elements using functions Write a C program to sort the given list of elements in ascending order using functions. 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 array Using variable length array.
12	Find the duplicate elements in the list of sorted array Write a C program that uses functions to perform the Addition of Two Matrices Write a C program that uses functions to perform the Multiplication of Two Matrices
13	Write a C program to find weather a given string is palindrome or not. Write a C program to insert characters at a given location in a given string. Write a C program to delete characters from a given string and position Write a C program to print the number of vowels and consonants using Strings.
14	Write a C program to convert Roman number to Decimal Number. Write a C program to find the 2's Compliment of a given string Write a C program to Reverse a String by Passing it to function C Program to Input a String with at least one Number, Print the Square of all the Numbers in a String
15	Write a C program to swap two integers using following methods call by value call by reference Write a C program to find sum of even and odd numbers using functions and pointers
16	Write a C program to find Largest Number Using Dynamic Memory Allocation. Write a C program to return multiples values from a function using pointers

Geethanjali College of Engineering and Technology (Autonomous)
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18ME11L1 - Engineering Workshop

B.Tech. CE - I Year, I Sem.

L	T	P/D	C
-	-	3	1.5

Prerequisite(s): None.

Course Objectives: Develop ability to

1. Develop a right attitude, team working, precision and safety at work place.
2. Gain a good basic working knowledge required for the production of various engineering products.
3. Provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
4. Know the labour involved, required tools, machinery or equipment with necessary time required in actual working in different trades.
5. Identify and use of marking tools, hand tools, measuring equipment and to work with prescribed tolerances.

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

CO1. Recognize dignity of labour and workshop regulations.

CO2. Study and practice on hand, power tools and their operations.

CO3. Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, and welding.

CO4. Identify and apply suitable tools for different trades of engineering processes including drilling, material removing, measuring, chiseling.

CO5. Perform various basic house wiring techniques.

A) Trades for Exercises:

At least two exercises from each trade:

a. **Carpentry**: T-lap joint, cross lap joint, mortise and tenon joint, Bridle joint, Corner lap joint.

b. **Fitting**: Square joint, V joint, half round joint, dovetail joint, L-Fitting.

c. **Tin-Smithy**: Tray, cylinder, hopper, funnel, Open scoop.

d. **Black Smithy**: Simple exercises such as upsetting, drawing down, punching, bending, swaging and fullering.

e. **House-wiring**: Wiring for two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.

f. **Foundry**: Preparation of sand mould using Single Piece pattern, Preparation of sand mould using Split pattern.

g. **Welding Practice**- Single butt joint, Corner Joint, T-filled Joint, Lap Joint.

B) Trades for Demonstration:

a. Plumbing

b. Machine Shop

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Engineering Workshop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd.
2. Workshop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, Vikas publishers
4. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18EN1201 - English

B.Tech. CE - I Year, II Sem.

Prerequisite(s): None.

L	T	P/D	C
3	-	-	3

Course Objectives: Develop ability to

1. Improve the language proficiency in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Equip themselves to study the academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
3. Develop Study Skills and Communication Skills in formal and informal situations.
4. Speak proficiently and listen effectively.

Course Outcomes: At the end of course, the 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: The Raman Effect' from the prescribed text book 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: 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: Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures-Use of Phrases and Clause in Sentences-Importance of Proper Punctuation-Techniques for writing precisely–Paragraph writing–Types, Structures and Features of a Paragraph-Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT-II: 'Ancient Architecture in India' from the prescribed text book 'English for Engineers' Published by Cambridge University Press.

Vocabulary Building: Synonyms and Antonyms.

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

Reading: Improving Comprehension Skills – Techniques for Good Comprehension.

Writing: Format of a Formal Letter- Writing Formal Letters, Letter of Complaint, Letter of Requisition, Job Application with Resume.

UNIT-III: 'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading-Skimming and Scanning.

Writing: Nature and Style of Sensible Writing -Abstract writing..

UNIT-IV: 'What Should You Be Eating' from the prescribed text book 'English for Engineers' Published by Cambridge University Press.

Vocabulary Building: Standard Abbreviations in English.

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension-Intensive Reading and Extensive Reading.

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

UNIT-V: How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: Technical Vocabulary and their usage.

Grammar: Active and Passive voice.

Reading: Reading Comprehension-Exercises for Practice.

Writing: Technical Reports-Introduction–Characteristics of Report– Categories of Reports-Formats-Structure of Reports (Manuscript Format)-Types of Reports- Writing a Report.

TEXT BOOK(S):

1. English for Engineers, Sudarshana, N.P. and Savitha, C. Cambridge University Press.

REFERENCE BOOKS:

1. Practical English Usage, Swan, M. Oxford University Press.
2. Communication Skills, Kumar, S and Lata P. Oxford University Press.
3. Remedial English Grammar, Wood, F.T. Macmillan.
4. On Writing Well Zinsser, William Harper, Resource Book.
5. Study Writing, Hamp-Lyons, Cambridge University Press.
6. Exercises in Spoken English. Parts I–III . CIEFL, Hyderabad. Oxford University.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18MA1201 - Mathematics-II

B.Tech. CE - I Year, II Sem.

L	T	P/D	C
3	1	-	4

Prerequisite(s): 18MA1101-Mathematics –I

Course Objectives: Develop ability to

1. Understand geometrical approach to the mean value theorems, their application to the mathematical problems and evaluate improper integrals using Beta and Gamma functions.
2. Identify the methods of differential calculus to optimize single and multivariable functions.
3. Evaluate multiple integrals and apply the same to solve engineering problems.
4. Explain properties of vector operators. Use vector calculus to determine the length of a curve, area between the surfaces and volume of solids.
5. Apply partial differential equations to solve problems in one dimensional heat and wave equations.

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

CO1. Apply mean value theorem on mathematical problems, evaluate improper integrals, surface areas and volumes of revolutions of curves.

CO2. Apply the methods of differential calculus to optimize single and multivariable functions.

CO3. Evaluate multiple integrals and apply the concepts of same to find the areas and volumes.

CO4. Apply vector operators on scalar and vector point functions to compute length of a curve, area between the surfaces and volume of solids, using vector calculus.

CO5. Apply partial differential equations to solve problems like one dimensional wave equation and one dimensional heat equation that arise in engineering branches.

UNIT-I: Mean value Theorems and Improper Integrals

Mean value theorems: Rolle's Theorem, Lagrange's mean value theorem and Cauchy's mean value theorem with their Geometrical Interpretation and applications,. Taylor's Series.

Definition of Improper Integral: Beta and Gamma functions and their applications.

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

UNIT-II: Multivariable calculus (Partial Differentiation and applications)

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 multipliers.

UNIT-III: Multivariable Calculus (Integration)

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 and (Cartesian to Spherical and Cylindrical to polar coordinates) triple integrals.

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

UNIT-IV: Vector Calculus

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

Vector Integration : Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

UNIT-V: Partial Differential Equations

Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation, Method of separation of variables for second order equations –Applications of Partial differential equations- one dimensional wave equation and one dimensional heat equation.

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.
2. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill New Delhi.
3. Engineering Mathematics, Paras Ram, 2nd Edition, CBS Publishers.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CH1201- Engineering Chemistry

B. Tech. CE - I Year, II Sem.

L	T	P/D	C
3	1	-	4

Prerequisite(s): None.

Course objectives: Develop ability to

1. Bring adaptability to the concepts of chemistry and to impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
2. Solve the problem of hardness and acquire the knowledge of various water treatment methods.
3. Acquire the knowledge of electrochemistry and corrosion which are essential for engineers to understand the problem of corrosion in industry.
4. Impart the knowledge of reaction mechanisms and synthetic aspects useful for understanding reaction pathways.
5. Acquire the knowledge on various spectroscopic techniques and apply them for medical and other fields.

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

CO1. Explain atomic, molecular and electronic changes.

CO2. Explain hardness of water and its treatment methods.

CO3. Explain the principles and concepts of electrochemistry. Understand the problem of corrosion in industry.

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

CO5. Apply required skills of various spectroscopic techniques in medical and other fields.

UNIT – I: Molecular structure and Theories of Bonding

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

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

Electro chemical 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 molecules of industrial importance

Reaction Mechanisms

Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff's and anti Markownikoff'sadditions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff 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.

Polymers

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

Principles of spectroscopy, selection rules and applications of electronic spectroscopy. vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

TEXT BOOKS:

1. Text book of Engineering Chemistry by Dr.A. Jayashree, Wiley publication, New-Delhi, 2018.
2. Engineering Chemistry by Dr. Thirumala Chary and Dr. E. Laxminarayana, Scitech publications, 2018.

REFERENCE BOOKS:

1. Selected topics in Inorganic Chemistry by Wahid U. Malik, G.D. Tuli and R.D Madan. S. Chand Publications, 17th Edition.
2. Elements of Physical Chemistry, by P.W. Atkins 4th Edition.
3. Fundamentals of Molecular Spectroscopy, by C.N. Ban well, 4th Edition.
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E. Schore, 5th Edition.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CS1201 - Data Structures

B.Tech. CE - I Year, II Sem.

L	T	P/D	C
2	-	-	2

Prerequisite(s): 18CS1101-Programming for Problem Solving

Course Objectives: Develop ability to

1. Introduce the structure, union, and enumerated types
2. Introduce to linear lists, implementation using arrays and linked list.
3. Understand the classical approaches to sorting arrays: selection sort, bubble 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. Introduction to Non-linear data structures.

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

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

CO2. Understand the time and space complexity. Ability to implement linear lists.

CO3. Write programs that sort data using selection, bubble, 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. Define basic non-linear list terminologies.

UNIT – I

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.

Command line arguments, Preprocessor commands.

UNIT – II

Basic concept of order of complexity through the example programs

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

UNIT - III

Sorting - Selection sort, bubble 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.

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

Basic Non-Linear Data Structures: Introduction, Definition and terminology of Trees, Graphs.

TEXT BOOK(S):

1. Computer Science: A Structured Programming Approach Using C, B.A. Forouzan and R.F. Gilberg, Thompson Learning, 3rd Edition, 2007 Reprint.

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., Telengana-501301
18ME1201 – Engineering Mechanics - II

B.Tech. CE. I Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None.

Course Objectives: Develop ability to

1. Understand connection of forces in trusses and in general frame structures.
2. Understand the principles of dynamics to engineering problems.
3. Understand principles of kinematics and kinetics of particles.
4. Understand the concepts of work energy principle.
5. Understand the concepts of mechanical vibrations.

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

CO1. Calculate and analyse the forces in members and structures by the method of joints and method of sections.

CO2. Apply the principles of dynamics to solve various engineering problems.

CO3. Apply the principles of kinematics, kinetics to find the solutions of various problems in straight and curvilinear motions.

CO4. Apply the concepts of work energy principle associated with dynamics to solve engineering problems.

CO5. Apply the concepts of mechanical vibrations associated with dynamics to solve engineering problems.

UNIT-I: Analysis of structures

Introduction, Elements of trusses, Types of Trusses, Assumptions for truss analysis, construction of trusses, Analysis of trusses - method of joints, method of sections.

UNIT-II: Kinematics of a particle

Review of particle dynamics- Rectilinear motion, Plane curvilinear motion (rectangular, path, and polar coordinates), Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work- kinetic energy, power, potential energy.

UNIT-III: Kinetics of particles

Introduction, Kinetics of Rigid Bodies -Basic terms, general principles in dynamics, Types of motion, D'Alembert's principle and its applications in plane motion and connected bodies

UNIT-IV: Work Energy Method

Introduction, Work Energy principle and its application in plane motion of connected bodies, Work energy equation for translation, Interpretation and computation of work, work energy applied to particle motion.

UNIT-V: Mechanical Vibrations

Introduction, Definitions and concepts, Simple Harmonic Motion, Free vibration, Simple Pendulum, Compound Pendulum, Torsion Pendulum, Free Vibrations with Damping General case.

TEXT BOOKS:

1. Engineering Mechanics, Ferdinand. L. Singer, Harper – Collins publishers, New Delhi, (1998).
2. Engineering Mechanics, S.S. Bhavikatti & J.G. Rajasekharappa, New Age International, India, (2012).

REFERENCE BOOKS:

1. Engineering Mechanics, Timoshenko & Young, McGraw Hill, India (2007).
2. Engineering Mechanics, A.K. Tayal, Umesh Publications, New Delhi (2010).
3. Engineering Mechanics, R.S. Khurmi,S. Chand & Company Limited, New Delhi, (2009).
4. Engineering Mechanics, K.L Kumar, Tata McGraw Hill, New Delhi (2009).
5. Engineering Mechanics, Irving. H. Shames, Prentice-Hall, India (1999).

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18EN12L1 - English Language and Communication Skills Lab

B.Tech. CE - I Year, II Sem.

L	T	P/D	C
-	-	3	1.5

Prerequisite(s): None**.**

Course Objectives: Develop ability to

1. Facilitate computer-assisted multi-media 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 course, the 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 Skill-Its importance–Purpose-Process-Types-Barriers to Listening.

Practice: Introduction to Phonetics –Speech Sounds –Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place-Spoken vs. Written language. Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues Greetings– Taking Leave– making request and seeking permission. Introducing oneself and others.

Module-II CALL Lab:

Understand: Structure of Syllables–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: Telephone Etiquette.

Descriptions- Places, Objects, Events and Process.

Module-III CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence 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: 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 (2 practice exercises).

Practice: Making a Short Speech– Extempore (2 practice exercises).

Module-V CALL Lab:

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

Practice: Listening Comprehension Tests (2 practice exercises).

ICS Lab:

Understand: General Interview Skills. Practice: Mock Interview Skills.

TEXT BOOKS:

1. Speaking English Effectively 2nd Edition by Krishna Mohan & N. P Singh, Mac Millan Publishers, 2011.
2. ELCS Lab Manual by Faculty, Department of English, GCET.

REFERENCE BOOKS:

1. How to Prepare for Interviews by Shashi Kumar. V & Dhamija P. V.
2. English Pronunciation in Use, Hancock. M, Cambridge University Press.
3. English Language Communication Skills Lab Manual Cum Workbook by Cengage Learning India, 2013.
4. Creative Writing Skills by Ashraf Rizvi.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CH12L1 - Engineering Chemistry Lab

B. Tech. CE - I Year, II Sem.
Prerequisite(s): None.

L	T	P/D	C
-	-	3	1.5

Course objectives: Develop ability to

1. Estimate the hardness content in water to 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 and viscosity.
4. Know the synthesis of most effective drug molecules.
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.
CO2. Use instrumental methods like Potentiometry and Conductometry.
CO3. Determine physical properties like surface tension, adsorption, acid value and viscosity.
CO4. Use techniques which are fundamental in the synthesis of Aspirin, Paracetemol etc.
CO5. Estimate rate constant of a reaction from concentration – time relationships.

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 an 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 and Paracetemol.

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., Telengana-501301
18CS12L1 - Data Structures Lab

B.Tech. CE - I Year, II Sem.

L	T	P/D	C
-	-	2	1

Pre-requisite(s): None.

Course Objectives: Develop ability to

1. Introduce the structure, union, and enumerated types
2. Introduce to linear lists, implementation using arrays and linked list.
3. Understand the classical approaches to sorting arrays: selection sort, bubble 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. Introduction to Non-linear data structures.

Course Outcomes: After completion of the course, student would be able to

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

CO2. Understand the time and space complexity. Ability to implement linear lists.

CO3. Write programs that sort data using selection, bubble, 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. Define basic non-linear list terminologies.

Week No	Name of the program
1	Write a C program to implement complex structures for the following operations. i) Addition of two Complex numbers ii) Multiplication of two Complex Numbers
2	a) Write a C program to implement arrays of structures? b) Write a C program to implement bit fields in C?
3	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.
4	Write a C program to implement singly linked list for the following operations. a) Insertion b)Deletion c)Search
5	a) Write a C program to sort the elements using Selection sort b) Write a C program to sort the elements using Bubble sort.

6	a) Write a C program to sort the elements using Insertion sort b) Write a C program to search an element in a list of elements using linear search. If the element found display the position, otherwise print "element not present".
7	Write a C program to search an element in a list of elements using Binary search. If the element found display the position, otherwise print "element not present".
8	Write a C program convert infix to postfix notation and postfix evaluation using stack.
9	Write a C program implement Queue using arrays for the following operations. i) Enqueue ii) Dequeue iii) Peek iv) Display
10	Write a C program open a new file and implement the following I/O functions. i) fprintf(), fscanf() ii) getw(), putw() iii) getc(), putc()
11	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.
12	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., Telengana-501301

18MC1201 Indian Constitution

(Mandatory Course)

B. Tech. CE I Year, II Sem

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

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand the need for constitution
2. Appreciate the fundamental duties and rights of the citizens of India
3. Explain the role of constitution in a democratic society
4. Describe the Directive Principles of State Policy and their significance
5. List the key features of the constitution, Union Government, and State Governments.

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

CO1. Create awareness about the constitutional values and objectives written in the Indian Constitution.

CO2. List the fundamental rights and fundamental duties of Indian citizens.

CO3. Identify the division of legislative, executive and financial powers between the union and the state governments.

CO4. Understand the working of Indian democracy, its institutions and processes at the local, state and union levels.

CO5. Explain the functions and responsibilities of Election commission of India and Union Public Service Commission.

Unit - 1: Introduction to Indian Constitution

Meaning of the term Constitution, Preamble of the Constitution, Constituent Assembly, The Salient Features of Indian Constitution

Unit - 2: Fundamental Rights of citizen

Fundamental Rights of citizen, Fundamental Duties of citizen, The Directive Principles of State Policy

Unit - 3: Union Government

Union Government , Union Legislature (Parliament) , Lok Sabha and Rajya Sabha (with Powers and Functions) , Union Executive , President of India (with Powers and Functions) , Prime Minister of India (with Powers and Functions) , Union Judiciary (Supreme Court) , Jurisdiction of the Supreme Court.

Unit - 4: State Government

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

Unit - 5: Local Self Government

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

TEXT BOOKS:

1. The Constitution of India, P.M. Bakshi, Universal Law Publishing Co.,
2. Introduction to the Constitution of India, Dr. Durga Das Basu, LexisNexis Publishers.
3. Indian Constitution at work, NCERT.

REFERENCE BOOKS:

1. Constitution of India, M. Laxmikanth, Cengage Publications.
2. The Indian Constitutio, Granville Austin, Oxford India Paperback Edition.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE2101 – Surveying

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, compass and plane table.
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.
5. Understand curves, methods of curve setting and study modern techniques in surveying using Total Station, Global Positioning System (GPS), 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 trignometric levelling and tacheometric surveying.

CO4. Compute areas and volumes of regular and irregular field boundaries and determine the capacity of a reservoir.

CO5. Design simple and compound curves and understand the applications of Total Station, GPS, Remote sensing and GIS.

UNIT – I:

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

Chain Surveying: Measurement of distance, chain surveying principles, selection of stations, offsets, field book, chain surveying instruments, Tape corrections.

Compass Surveying: Measurement of directions and angles, types of compass, meridians and bearings, magnetic declination, dip, local attraction, traversing with a chain and compass, plotting of traverse.

Plane Table Surveying: Principle and instruments used in plane table surveying.

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 and uses of contours, contours of natural features, Direct & Indirect methods of contouring – interpolation and sketching of contours.

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, Trignometrical levelling when base is accessible and inaccessible.

Traversing: Methods of Traversing, Traverse computations and adjustments, Gale's traverse table, 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 Areas and Volumes: Area from field notes, computation of areas along irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter. Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

UNIT - V:

Curves: Types of curves and their necessity, elements of a curve, design and setting out – simple and compound curves.

Modern Surveying Methods: Total Station – Introduction, Principle of working, uses, advantages and comparison with conventional surveying. Electromagnetic wave theory – Electromagnetic distance measuring system -Electronic Theodolite – Introduction, Principle of working & EDM instruments, uses and advantages. Introduction to remote sensing – Photogrammetric surveying aerial Photogrammetry – Global Positioning System - Component of GPS – Space segment, control segment and user segment, reference systems, satellite orbits, GPS observations, Applications of GPS. Introduction to Geographic information system (GIS).

TEXT BOOKS:

1. Surveying and Levelling, R. Subramanian, Oxford University Press India, 2014.
2. Surveying (Volume – 1 & 2), S K Duggal, McGraw Hill Education, 2013.

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, 2012.
4. Surveying (Volume – 1, 2 & 3), B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2016.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE2102 – Strength of Materials - I

B. Tech. CE II Year, I Sem

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

Prerequisite(s): 18ME1101 Engineering Mechanics - I

Course objectives: Develop ability to

1. Understand basic concepts 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 and compute bending stresses.
3. Understand computation of dimensions for the most efficient section of beams based on the distribution of shear and flexural stresses across cross section of beams.
4. Understand theory of torsion and stresses developed in shafts, springs and their practical applications.
5. Understand various methods for evaluation of deformations of beams and frames.

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 stresses in shear and bending in the cross section of beams subjected to transverse loading and plot shear stress and bending stress distribution across the cross section of beams.

CO4. Design circular shafts and springs.

CO5. Determine slopes and deflections in determinate beams subjected to different types of loading by different methods.

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 the 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 – Relation between Shear force, Bending moment and rate of loading at a section of a beam – Shear force and Bending moment diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads, 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 and circular sections (Solid and Hollow), 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:

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations : T/J = q/r = Nθ/L – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts.

Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial load – springs in series and parallel – deflections of Carriage or leaf springs.

UNIT - V:

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 methods for determination of slope and deflection for cantilever and simply supported beams subjected to point loads, uniformly distributed load and uniformly varying load – Mohr's theorems – Moment area method – Application to simple cases including overhanging beams Conjugate Beam Method-Concept of conjugate beam method – Difference between a real beam and a conjugate beam – Deflections of determinate beams with constant and different moments of inertia.

TEXT BOOKS:

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

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.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE2103 – Fluid Mechanics

B. Tech. CE II Year, I Sem

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

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand fluid properties, hydrostatic law and its application in pressure measurement using manometers and pressure gauges; forces on different 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. Pressure gauges, Manometers: Differential and Micro Manometers.

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, Flow-net analysis.

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 and 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 between parallel plates, Flow through long tubes, Flow through inclined tubes, water hammer.

UNIT - V:

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

TEXT BOOK(S):

1. Hydraulics and Fluid Mechanics including Hydraulic Machines, Dr. P.N. Modi and Dr. S.M. Seth, Standard Book House, 20th Edition, 2015.

REFERENCE BOOKS:

1. Fluid Mechanics, A.K. Jain, Khanna Publishers, 2014.
2. Fluid Mechanics, Frank. M. White, McGraw-Hill Education, 2015.
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, 2016.
5. Engineering Fluid Mechanics, K.L. Kumar, S Chand, 2014.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE2104 – Building Materials, Construction and Planning

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 and applications of different building materials such as stones, bricks, cement, timber, aluminum, glass, paints, varnishes, plastics, mortar and concrete.
2. Study various building components such as foundations, lintels, staircases, flooring and roofs.
3. Understand the construction practices and techniques in civil works.
4. Understand building services such as plumbing, ventilation, air conditioning, acoustics and fire protection.
5. Understand building bye-laws based on National Building Code of India and local municipality regulations for planning and construction of a building.

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

CO1. Explain the manufacturing process, properties and usage of various building materials like bricks, stones, ceramics, fly ash bricks and other new building materials.

CO2. Explain manufacturing process, properties/ tests on cements, admixtures, aluminum, wood, glass, paints, plastics, FRP materials, etc.,

CO3. Select suitable type of building components like lintels, floors, roofs, foundations, doors, windows, mortars, masonry and finishing's.

CO4. Select suitable type of formwork and; identify building services like plumbing, ventilation, fire and acoustics.

CO5. Explain Green Building construction methods and other emerging building materials; Prepare building plans as per bye laws based on principles of planning.

UNIT – I:

Building stones: Classification of stones and quarrying – Uses of stones as building materials – Characteristics of good building stones –Important types of building stones – Properties – Structural requirements – Dressing and polishing of stones.

Bricks: Composition of brick-earth – Manufacturing process of bricks – Characteristics of good building bricks – Classification and testing of bricks – Introduction to light weight bricks – Special types of bricks and their uses – Fly ash bricks and their manufacture – Ceramics.

UNIT - II:

Cement and Admixture: Ingredients of cement – Flow diagram of manufacturing process of cement- Types of cement, their properties and uses – Field and laboratory tests on cement based on IS specifications – Admixtures – Mineral & chemical admixtures – Uses of admixtures.

Timber, Aluminum, Glass, Paints and Plastics: Timber – Structure – Types and properties – Seasoning and its importance – Defects in timber – Alternate materials for timber – Galvanized Iron/ Fibre-reinforced glass – Steel and Aluminum – Paints, Varnishes and Distempers: Constituents of Paints – Types of Paints and application – Types of Varnishes and application – Types of distemper and application – Plastics – Rubber – Asbestos - Graphene.

UNIT - III:

Building Components: Lintels, Arches and its Geometrical forms, walls, vaults, Vertical transportation in buildings - Stair cases, Lifts, ramps, escalators, Flooring – Components of a floor, Types of floors - Stone flooring, concrete flooring and Terrazzo flooring – Types of Roofs – Flat, Curved and Trussed Roofs – Foundations and Types – Damp proofing – Joinery – Doors-Windows – Materials and Types.

Mortars, Masonry and Finishing's: Mortars: Lime and Cement Mortars, Preparation, setting and curing. Manufacturing methods of mortar; Brick masonry – Types – Bonds; Stone masonry – Types; Composite masonry – Brick-stone composite; – Concrete masonry and reinforced brick masonry. Finishers: Plastering, Pointing, Painting, and Claddings – Types – Tiles: Characteristics of good tile, manufacturing of tiles and types of tiles.

UNIT - IV:

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

Building Services: Plumbing services: Water Distribution, Sanitary lines and fittings – Ventilations: Functional Requirements, Systems of ventilations – Air conditioning - Essentials and Types – Acoustics – Characteristics – Absorption – Acoustic design – Fire protection – Fire Hazards - Classification of fire resistance materials and construction.

UNIT - V:

Emerging Building Materials: Energy conservation in buildings, Recycled materials, local materials, sustainable materials and industrial waste products as a means of sustainable development, eco-friendly, Glass, FRP, composites, geotextiles and smart materials.

Building Planning: General aspects to consider for planning, classification of buildings, relevant building by-laws and regulations (National Building Code of India and Municipality) – Selection of site for building construction – Principles of planning - Orientation of Building and its different elements – Provision of rainwater harvesting - Introduction to Green building.

TEXT BOOKS:

1. Building Materials and Construction, P.C. Varghese, Prentice Hall India Learning Pvt Ltd., 2015.
2. Building Construction, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publication, 2016.

REFERENCE BOOKS:

1. Building Materials, S.K. Duggal, New Age, 2012.
2. G.C. Sahu and Joygopal Jena, Building Materials and Construction, McGraw Hill Education, 2015.
3. Engineering Materials and Building Construction, Rangwala, Charotar, 2015.
4. A Text book of Building Materials and Construction, S.P. Arora and S.P. Bindra, Dhanpat Rai Publications, 2014.
5. Alternative Building Materials and Technologies, K.S.Jagadish, B.V. Venkatarama Reddy and K.S. NanjundaRao, New Age International Pvt. Ltd, 2009.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18EE2101 – Basic Electrical Engineering

B. Tech. CE II Year, I Sem

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

Prerequisite(s): 18PH1101 Engineering Physics

Course objectives: Develop ability to

1. Introduce the concepts of electrical circuits and its components
2. Understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. Study and understand the different types of DC/AC machines and Transformers.
4. Import the knowledge of various electrical installations.
5. Introduce the concept of power, power factor and its improvement.

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

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

CO2. Analyze and solve AC electrical circuits using network laws and theorems.

CO3. Analyze basic Electric and Magnetic circuits.

CO4. Study the working principles of Electrical Machines.

CO5. Introduce components of Low Voltage Electrical Installations

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 R- L-C circuit.

Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III: Transformers

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV: Electrical Machines

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor.

Construction and working of synchronous generators.

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. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. "Basic Electrical Engineering", D.C. Kulshreshtha, McGraw Hill, 2009.

REFERENCE BOOKS:

1. Fundamentals of Electrical Engineering", L.S. Bobrow, Oxford University Press, 2011
2. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE21L1 – Surveying 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 use of chain surveying in calculating the area and finding the obstructed length.
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.

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

CO1. Use the chain for surveying a given area and plot the same.

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.

LIST OF EXERCISES:

1. Chain Surveying:
   a. Determination of area and plotting.
   b. Chaining across obstacles.
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.
    g. Setting out works for buildings and pipe lines.
7. Finding position of stations using G.P.S.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE21L2 – Strength 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 deflection 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 by 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, support reactions, shear force and bending moment 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 Aluminum 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 shear 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 the given specimen by conducting deflection test on continuous beam.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18EE21L1 – 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. Calculate, measure and know the relation between basic electrical parameters.
4. Analyze the performance characteristics of DC
5. Analyze the performance characteristics AC electrical machines

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

CO1. Get an exposure to basic electrical laws.

CO2. Obtain the response of different types of electrical circuits to different excitations.

CO3. Measure, calculate and relate the basic electrical parameters.

CO4. Obtain the basic characteristics of DC machines.

CO5. Obtain the basic characteristics of transformers and other AC electrical machines.

LIST OF EXPERIMENTS:

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit

11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

Note: Any 10 experiments from the above are to be conducted

Geethanjali College of Engineering and Technology (Autonomous)
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18MA2201 – Computational Mathematics

B. Tech. CE II Year, II Sem

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

Prerequisite(s): 18MA1101-Mathematics –I

Course Objectives: Develop ability to

1. To approximate a polynomial/curve to satisfy the given set of data.
2. To evaluate differentiation/integration for a given set of data using numerical techniques.
3. To compute approximate zeros of an algebraic/transcendental / system of equations using suitable numerical methods.
4. Apply various numerical techniques to compute approximate solution of a given ordinary differential equations with initial condition.
5. To apply the different methods to fit a curve for the set of data using method of least squares.

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

CO1. Estimate a polynomial/curve to satisfy the given set of data.

CO2. Apply various numerical techniques to evaluate differentiation/integration for a given set of data.

CO3. Apply suitable numerical methods to find the approximate root / solution of algebraic / transcendental equations.

CO4. Solve a given ordinary differential equations with the initial condition using suitable numerical techniques.

CO5. Estimate a curve for the set of data using method of least squares arise in engineering branches.

UNIT – I: Interpolation

Introduction-Errors in polynomial Interpolation - Finite Differences - Forward Differences - Backward Differences - Central Differences - Symbolic relations and separation of symbols – Difference equation - Differences of a polynomial - Newton's formulae for interpolation - interpolation with unevenly spaced points - Lagrange's interpolation formula.

UNIT – II: Numerical Differentiation, Integration

Numerical differentiation: Newton's forward and backward difference derivatives, Numerical integration – General quadrature formula, Trapezoidal rule, Simpson's $1/3^{rd}$and $3/8^{th}$ Rule.

UNIT – III: **Root Finding Methods and Solution of System of Equations**

Solution of Algebraic and Transcendental Equations and Linear system of equations, Introduction – Graphical interpretation of solution of equations, The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method, Solving system of non-homogeneous equations by L-U Decomposition method (Crout's Method), Jacobi's and Gauss Seidel Iteration method.

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

Numerical solution of Ordinary Differential equations: Solution by Taylor's series method – Picard's method of successive Approximation- single step methods-Euler's method-Euler's modified method, Runge - Kutta fourth order method.

UNIT-V: Curve Fitting: Fitting of a straight line - Second degree curve –exponential curve - power curve by method of least squares.

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.
2. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.
3. A Text book of Higher Engineering Mathematics, Bali N P and Manish Goyal, Lakshmi Publications.

Geethanjali College of Engineering and Technology (Autonomous)
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18CE2201 – Engineering Geology

B. Tech. CE II Year, II Sem

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

Prerequisite(s): None

Course objectives: Develop ability to

1. Understand weathering process of rocks.
2. Understand engineering properties of minerals and rocks.
3. Understand nature of geological structures and their importance in civil works.
4. Understand concepts 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, soil behavior and groundwater conditions in civil engineering constructions.

CO4. Categorize geophysical methods to study of subsurface layers with respect earthquake occurrences.

CO5. Recommend tunneling sites and selection of 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 failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.

Weathering of rocks: Weathering and different types of Weathering - Its effect over the properties of rocks. Importance of weathering with reference to Dams, Reservoirs and Tunnels. Weathering of common rock like “Granite”.

UNIT - II:

Mineralogy: Definition of Mineral, Importance of study of minerals, Different methods of study of minerals, Advantages of study of minerals by physical properties. Identification of minerals by their physical properties. Study of physical properties of following common Rock-Forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economic minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

Petrology: Definition of Rock - Geological classification of major rocks- Igneous, Sedimentary and Metamorphic rocks. Dykes and Sills. Common structures and Textures of Igneous, Sedimentary and Metamorphic rocks and their distinguished features. Megascopic and Microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT - III:

Structural Geology: Indian stratigraphy and geological time scale, Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints – important types. Their importance insitu and drift soils common types of soils, their origin and occurrence in India. Stabilization of soils, Ground water: Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

UNIT - IV:

Earthquakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides - their causes and effect; measures to be taken to prevent their occurrence. Importance of study of groundwater, earthquakes and landslides.

Importance of Geophysical Studies: Principles of geophysical study by Gravity methods, Magnetic methods, Electrical methods, Seismic methods, Radiometric methods and Geothermal method. Special importance of Electrical resistivity methods and seismic refraction methods. Improvement of competence of sites by grouting, etc. Fundamental aspects of Rock mechanics and Environmental Geology.

UNIT - V:

Geology of Dams, 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. Geological factors influencing water tightness and life of reservoirs.

Geology of Tunnels: Purposes of tunnelling, Effects of Tunnelling on the ground-Role of Geological Considerations (i.e. lithological, structural and ground water) in tunnelling, over break and lining in tunnels.

TEXT BOOKS:

1. Textbook of Engineering Geology, N. Chennakesavulu, Laxmi Publications, 2018.
2. Engineering Geology, D.Venkat Reddy, Vikas Publishing House Pvt Ltd, 2015.

REFERENCE BOOKS:

1. Engineering Geology for Civil Engineers, P.C. Varghese, Prentice Hall India Learning Private Limited, 2012.
2. Principles of Engineering Geology, K.V.G.K Gokhale, B.S publications, 2013.
3. Engineering and General Geology, Parbin Singh, S.K. Kataria & Sons, 2013.
4. Engineering Geology, S.K. Duggal, H.K. Pandey & N. Rawal, McGraw Hill Education, 2014.
5. Engineering Geology, Subinoy Gangopadhyay, Oxford University Press India, 2013.
6. Seismotectonic Atlas of India, Geological Survey of India, 2005.

Geethanjali College of Engineering and Technology (Autonomous)
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18CE2202 – Strength of Materials - II

B. Tech. CE II Year, II Sem

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

Prerequisite(s): 18CE2102 Strength of Materials - I

Course objectives: Develop ability to

1. Understand Principal stresses in structural members.
2. Understanding the behavior of columns subjected to axial and eccentric loading.
3. Understand direct and bending stresses action on chimneys, retaining walls and dams.
4. Grasp knowledge on propped cantilevers and fixed beams.
5. Understand continuous beam analysis using Clapeyron's theorem of three moments.

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

CO1. Determine principal stresses using analytical and graphical methods.

CO2. Analyze columns and struts.

CO3. Calculate stresses induced in members subjected to combined axial load and bending moment to evaluate stresses in dams, retaining walls and chimneys.

CO4. Analyze propped cantilevers and fixed beams.

CO5. Analyze continuous beams using Clapeyron's theorem of three moments.

UNIT – I :

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.

UNIT - II :

Columns and Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Buckling load – Crushing load – Euler's theorem for long columns – Assumptions – Derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine-Gordon's formula – Long columns subjected to

eccentric loading – Secant formula – Empirical formula – Straight line formula – Prof. Perry's formula.

Beam Columns: Laterally loaded struts – subjected to uniformly distributed and concentrated loads – Maximum bending moment and stress due to transverse and lateral loading.

UNIT - III :

Direct and Bending Stresses: Stresses under the combined action of direct loading and bending moment – Core of a Section – Determination of stresses in the case of chimneys, retaining walls and dams – Conditions for stability – Stresses due to direct loading and bending moment about both axis.

Introduction to Structures of Indeterminacy: Equilibrium and compatibility equations - types of supports and reactions, types of joints and equilibrium equations, Static and kinematic indeterminacies of beams, rigid and pin jointed frames. Merits of indeterminate structures over determinate structures.

UNIT - IV :

Propped Cantilever And Fixed Beams: Types of props – Elastic and Rigid props, Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - Shear force and Bending moment diagrams for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams; effect of sinking of support, effect of rotation of a support.

UNIT - V :

Continuous beams : Clapeyron's theorem of three moments

Continuous beams Analysis of continuous beams with constant and variable moments of inertia with simply supported ends, one or both ends fixed-continuous beams with overhangs. Effects of sinking of supports – Elastic curve.

TEXT BOOKS:

1. Strength of Materials, B.S. Basavarajaiah and P Mahadevappa, Universities Press, 3rd edition, 2010.
2. Basic Structural Analysis, C.S.Reddy, McGraw Hill Education, 3rd edition, 2017.

REFERENCE BOOKS:

1. Mechanics of Materials, Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf and David F. Mazurek, McGraw-Hill Education, 2014.
2. Strength of Materials, R.Subramanian, Oxford University Press, 2010.
3. Strength of Materials, U.C. Jindal, Pearson Education, 2012.
4. Strength of Materials, D.S PrakashRao, Universities Press.
5. Strength of Materials, S.S. Rattan, McGraw Hill Education, 2011.

Geethanjali College of Engineering and Technology (Autonomous)
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18CE2203 – Hydraulics and Hydraulic Machinery

B. Tech. CE II Year, II Sem

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

Prerequisite(s): 18CE2103 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 Manning'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 Channel Flow: Types of flows - Types of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's, and Bazin formulae for uniform flow – Stickler's formula for Manning's 'n' – 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., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles – direct step method for surface profiles – Rapidly varied flow, hydraulic jump, energy dissipation – Surges and 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 – model and prototype relations. Distorted and non-distorted models – Scale Effect.

UNIT - III:

Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines.

UNIT - IV:

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

UNIT - V:

Centrifugal Pumps: Pump installation details-classification-work done- Manometric head-minimum starting speed-losses and efficiencies-specific speed multistage pumps-pumps in parallel- performance of pumps-characteristic curves- Net Positive Suction Head (NPSH)-cavitation.

Reciprocating Pumps: Basics, types, air vessels, slip.

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

TEXT BOOKS:

1. Hydraulics and Fluid Mechanics including Hydraulic Machines, Dr. P.N. Modi and Dr. S.M. Seth, Standard Book House, 20th Edition, 2015.
2. Flow in Open Channels, K. Subramanya, McGraw Hill Education, 2016.

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, 2013.
4. Fluid Mechanics, Frank.M. White, McGraw-Hill Education, 2015.
5. Fluid Mechanics, A.K. Jain, Khanna Publishers, 2016.

Geethanjali College of Engineering and Technology (Autonomous)
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18MB2202 – Engineering Economics and Accounting

B. Tech. CE II Year, II 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., Telengana-501301
18MA22L1 – Computational Mathematics Lab

B. Tech. CE II Year, II Sem

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

Prerequisite(s): 18CS1101 – Programming for Problem Solving

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. Obtain the solution of a system of non-homogeneous equations using different methods: L-U decomposition and Gauss-seidel method.
4. To compute approximate zeros of an algebraic/transcendental equations using Bisection method.
5. Solve first order ordinary differential equations using numerical techniques.

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

CO1. Determine the values of y corresponding to any value of $x = x_i$ between x_0 and x_n.

CO2. Apply Numerical integration techniques to find approximate area.

CO3. Determine the solution of system of non-homogeneous equations using various methods.

CO4. Apply suitable numerical methods to find the approximate root / solution of algebraic / transcendental equations.

CO5. Find the numerical solutions for a given first order initial value problem using various methods.

S No.	List of Experiments
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 Lagrange's interpolation).
3.	Program to evaluate definite integral using trapezoidal rule, Simpson's 1/3rd rule and 3/8th rule.
4.	Program to find the solution of given system of linear equations using L-U decomposition method.

5.	Program to find the solution of given system of equations using Gauss-seidel iteration method.
6.	Program to find the root of algebraic / transcendental equations by using Bisection method.
7.	Program to solve a given differential equation using modified Euler's method.
8.	Program to solve a given differential equation using Runge-Kutta fourth order method.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE22L1 – Engineering Geology Lab

B. Tech. CE II 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 structure, texture and minerology.
3. Study various structural models of rocks and understand the concept of folds, faults and unconformities.
4. Understand Structural Geological problems.
5. Understand the operation of electrical resistivity meter in studying the behaviour of rocks, soils 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 minerals and rocks based on microscopic characters.

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 tilted beds, faults, unconformities, etc.
5. Measurement of strike and dip of joints in granites using clinometer compass.
6. Study of Structural Geological problems.
7. Study of Structural Geological models.
8. Study of geological and geotechnical maps of Telangana, Andhra Pradesh and India.
9. Measurement of Electrical resistivity of rocks, soils and groundwater using Electrical resistivity meter.

LAB EXAMINATION PATTERN

1. Description and identification of SIX minerals.
2. Description and identification of SIX rocks (including igneous, sedimentary and metamorphic rocks).
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.
5. Microscopic identification of rocks.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE22L2 – Hydraulics and Hydraulic Machinery Lab

B. Tech. CE II Year, II Sem

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

Prerequisite(s): 18CE2103 Fluid Mechanics

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 in 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 and major losses 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. Performance test on Pelton wheel.
10. Performance test on Francis turbine.
11. Performance test on Kaplan turbine.
12. Performance characteristics of a single stage/ multi-stage centrifugal pump.
13. Performance characteristics of a reciprocating pump.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CH2201 – Environmental Science

B. Tech. CE II Year, II 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, 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, Biogeochemical cycles, Bioaccumulation, Biomagnification, Field visits.

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: Wastewater 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, Anubha Kaushik, C P Kaushik, New Age International Publishers, Fourth Edition
2. Text book of Environmental studies for undergraduate courses, Erach Bharachu, University Grants Commission, Second Edition

REFERENCE BOOKS:

1. Environmental Studies by R. Rajagopalan, Oxford University Press, Third Edition
2. Environmental Science by Daniel B. Botkin & Edward A. Keller,
   Wiley India edition.
3. Text book of Environmental Science and Technology, Dr. M Anji Reddy, BS Publication, 2007 Edition.
4. Environmental Science: towards sustainable future, Richard T Wright PHL Learning private Ltd. New Delhi, 2008 edition.

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

18CE3101 – Structural Analysis

B.Tech. CE III Year, I Sem

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

Prerequisite(s): 18CE2202 – Strength of Materials-II

Course objectives: Develop ability to

1. Draw the Influence Line Diagrams and analyse the structures for moving loads.
2. Analyse the structures by Moment Distribution Method.
3. Analyse the structures by Slope deflection method and Kani's method.
4. Use the arches in structures.
5. Analyse the structures by energy theorems.

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

CO 1: Apply Influence Line Diagrams in the analysis of structural members.

CO 2: Analyse indeterminate structures by moment distribution method.

CO 3: Analyse indeterminate structures by Slope Deflection method and Kani's method.

CO 4: Analyse three and two-hinged arches.

CO 5: Apply strain energy theorems in the analysis of indeterminate structures.

UNIT – I:

Moving loads and Influence lines: Influence Line Diagram (ILD) for reaction, shear force and bending moment at a section of simply supported and over hanging beams, maximum end shear, maximum shear at a section, maximum bending moment at a section, absolute maximum bending moment.

ILD for Bridge truss members: Types of bridge trusses, ILD for top chord members, bottom chord members, vertical members and diagonal members.

UNIT – II:

Moment Distribution Method: Basic propositions, distribution theorem, relative stiffness, application to continuous beams including settlement of supports, portal frames 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.

Kani's Method: Expressions for final moments, application of rotation contribution method to continuous beams and non sway portal frame up to two storeys.

UNIT – IV:

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 semi circular arches and parabolic arches, reaction locus for two hinged arches.

UNIT – V:

Energy Theorems: Strain Energy stored due to axial load, bending moment, shear force work done by a force, law of reciprocal theorem, Betti's law, first theorem of Castiglione's and its application second theorem of Castiglione and its application to analysis of trusses and frames, principle of least work.

TEXT BOOKS:

1) Structural Analysis – Vol I & II, S.S. Bhavikatti, Vikas Publishing House Pvt. Ltd, 4th edition, 2013.
2) Analysis of Structures - Vol –I & II, V.N.Vazirani, M.M. Ratwani and Dr. S.K. Duggal, Khanna Publishers, 2016.

REFERENCE BOOKS:

1) Theory of Structures, S. Ramamrutham, Dhanpat Rai Publication, 2014.
2) Structural Analysis, Devdas Menon, Narosa Publishing House, 2010.
3) Theory of Structures- Vol- I & II, G.S.Pandit, S.P.Gupta and R Gupta, McGraw Hill Education, 2017.
4) Structural Analysis, R.C.Hibbeler, Pearson Education, 2017
5) Basic Structural Analysis, C.S.Reddy, McGraw Hill Education, 2017.
6) Mechanics of Structures- Vol – I and II, H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd, 2016.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE3102 – Concrete Technology

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

III Year. B.Tech. CE– I Semester.
Prerequisite(s):
18CE2104- Building Materials, Construction and Planning.

Course Objectives: Develop ability to

1. Understand properties of various types of cements.
2. Understand properties of various types of aggregates.
3. Understand usage of admixtures in concrete.
4. Understand design of concrete mixes of requisite strength.
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 the various engineering properties and usage of cement.

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

CO 3: Assess the workability of fresh concrete under various environments.

CO 4: Determine the strength properties of hardened concrete.

CO 5: Design the desirable concrete mix and 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..

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.

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.

UNIT–V:

Mix Design: Factors governing selection of mix proportions, Durability of concrete – Statistical Quality Control of concrete, Acceptance criteria, various methods of proportioning,BIS method.

Special Concrete: Introduction to light weight concrete, Cellular concrete, No-fines concrete, High density 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, 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 2386(Part 1): 1963 Methods of test for aggregates for Concrete.
3. IS 10262: 2019 Guidelines for Concrete Mix Proportioning.
4. IS 456: 2000 Plain and Reinforced Concrete – Code of practice.
5. IS 516 – 2006 Methods of Tests for Strength of Concrete.
6. IS 13311(Part 1): 1992 Methods of Non – destructive testing of Concrete: Part 1 - Ultrasonic Pulse Velocity and Part 2 – Rebound hammer.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE3103 – Geotechnical Engineering

III Year. B.Tech. CE– I Semester.

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

Prerequisite(s):
18CE2103 Fluid Mechanics
18CE2201 Engineering Geology

Course objectives: Develop ability to

1. Understand properties of soil and to determine the behavior of soil under various conditions and loads.
2. Understand the permeability test of soil
3. Understand the stresses in the soil.
4. Understand consolidation principles and properties.
5. Understand shear strength of soil by different laboratory test.

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 and geostatic stress of soil using various methods.
CO3. Determine the stresses due to applied load and perform compaction tests.
CO4. Distinguish and estimate various types of settlement in soil
CO5. Calculate the shear strength of various 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-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability — In-situ permeability tests (Pumping in and Pumping out test),Permeability of layered soils

Effective Stress and Seepage through Soils: Total, neutral and effective stress – principle of effective stress , Seepage through soils – quick sand condition, Flow nets: Characteristics and Uses.

UNIT–III

Stress Distribution in Soils: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, 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: Types of compressibility – 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 – preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

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UNIT-V

Shear Strength of Soils: Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests 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, 2009.

REFERENCE BOOKS:

1. Soil Mechanics in Engineering practice, Karl Terzaghi, Warren Press, 2010.
2. Soil Mechanics and Foundation Engineering, VNS Murthy, CBS Publishers and Distributors, 2009.
3. Principles of Geotechnical Engineering, BrajaM.Das, Cengage Learning Publishers, 2015.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE3104 – Engineering Hydrology

B. Tech. CE III Year, I Sem

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

Prerequisite(s):
18CE2203 Hydraulics and 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

Stream Flow Measurements – Stage Measurement – Measurement of Velocity – Discharge Measurements - Stage-Discharge relationship. 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. Gumbels method – Safety factor.

Flood routing – Concepts of flood routing, hydraulic and hydrologic routing, Reservoir routing – Modified Pul's and Goodrich Method, Channel routing - Muskingum method – Flood control.

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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, 2017.
2. A Textbook of Hydrology, Dr. P. Jaya Rami Reddy, Laxmi Publications, 2016.

REFERENCE BOOKS:

1. Applied Hydrology, Ven T Chow, David R Maidment and Larry W Mays, McGraw Hill Education, 2014.
2. Introduction to Hydrology, W. Viessman and G Lewis, Pearson Education India, 2015.
3. Engineering Hydrology, CSP Ojha, P. Bhunya, R.Berndtsson, Oxford University Press, 2010.
4. Irrigation and Water Power Engineering, B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2019.
5. Hydrology: Principles, Analysis and Design, H.M.Raghunath, New Age International, 2018.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18EE3122 – Industrial Safety And Hazards
(Open Elective – I)

B. Tech. CE III Year, I Sem

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

Prerequisite(s): None

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 of lessen those hazards.
4. Apply basic Federal and State Safety Rules to the workplace.

Course Outcomes (COs):

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 equipments.

CO4. Understand the effects of momentum and buoyancy.

CO5. Understand 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 equipments-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, vapors, 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 BOOKS:

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”, Vol.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.

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

18ME3123– Nanomaterials and Technology

(Open Elective - I)

B. Tech. CE III Year, I Sem

Pre-requisites: 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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18EC3124 – Electronic Measuring Instruments
(Open Elective - I)

B. Tech. CE III Year, I Sem

Prerequisite: Nil

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 this course, the student would be able to

1. Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
2. Measure various physical parameters by appropriately selecting the transducers.
3. Use various types of signal generators, signal analyzers for generating and analyzing various real time 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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18CS3125– Java Programming
(Open Elective I)

B. Tech. CE III Year, I Sem

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

Prerequisite(s):

18CS1101-Programming for Problem Solving

Course Objectives: Develop ability to

1. Understand the basic concepts of object oriented programming.
2. Identify control statements and write simple java program.
3. Demonstrate interfaces, inner classes and create a package.
4. Evaluate errors, exceptions and inter thread communication.
5. Implement connectivity with database and use file streams.

Course Outcomes (COs): After completion of the course, student would be able to

CO1. Apply the concepts of OOPs in problem solving.

CO2. Examine control statements and develop a real time application.

CO3. Identify classes, objects, members of a class and relationships among them needed for a specific problem.

CO4. Use Java standard class library with necessary exception handling mechanisms in constructing computer applications.

CO5. Develop java programs using multi-threading, files and database concepts and their connectivity.

UNIT - I:

OOP Concepts - Data abstraction, Encapsulation, Inheritance, Types of Inheritance and benefits of inheritance, Polymorphism, Classes and Objects, Procedural and Object oriented programming paradigms.

Java Programming – Introduction, History of Java, Comments, Naming Conventions and Data types, Variables, Constants, Scope and life time of variables.

UNIT – II:

Operators, Operator hierarchy, Expressions, Type conversion and casting, Enumerated types, Control statements in JAVA, Simple java programs, Console input and output, Formatting output, Constructors, Methods, Parameter passing, Static fields and Methods, Access control, this keyword, Overloading methods and Constructors, Recursion, Garbage collection, Building strings, Exploring string class.

UNIT – III:

Interfaces - Interfaces vs. Abstract classes, Defining an interface, Implementing interfaces, Accessing implementations through interface references, Extending interface.

Inner classes - Uses of inner classes, Local inner classes, Anonymous inner classes, Static inner classes, examples.

Packages - Definition, Creating and Accessing a package, Understanding CLASSPATH, Importing packages.

UNIT – IV:

Exception handling – Dealing with errors, Benefits of exception handling, Classification of Exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multi-Threading - Differences between multiple processes and multiple threads, Thread states, Creating threads, Interrupting threads, Thread priorities, Synchronizing threads, Inter thread communication.

UNIT – V:

Files: streams – Byte streams, Character streams, Text input/ Output, Binary input/ output Random access files operations, File management using File class.

Connecting to Database - JDBC Type 1 to 4 drivers, Connecting to a data base, Querying a data base and Processing the results, Updating data with JDBC.

TEXT BOOK(S)

1. Java fundamentals- A comprehensive Introduction, Herbert Scheldt and Dale Skrien, TMH, 1st Edition, 2013.

REFERENCE BOOK(S)

1. Core Java 2–Volume1, Cay S. Horstmann and Gary Cornell.
2. Java for Programmers, PJ. Dietel and H.M Deitel Pearson education.
3. Object Oriented Programming through Java. P.Radha Krishna. Universities Press.
4. Thinking in Java, Bruce Eckel, and Pearson Education.

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18MB3126 – Intellectual Property Rights
(Open Elective – I)

B. Tech. CE III Year, I Sem

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

Prerequisite(s): None.

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 (COs): At the end of the course, the 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.

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18CE31L1– Computer Aided Drafting of Buildings Lab

B.Tech. CE III Year, I Sem

L	T	P/D	C
-	-	2	1

Prerequisite(s):
18CE2104 Building Materials, Construction and Planning

Course objectives: Develop ability to

1. Use the commands of AutoCAD.
2. Prepare the plans, sections and elevations of single-storey building.
3. Prepare the plans, sections and elevations of multi-storey building.
4. Detail the various components of building.
5. Develop the working drawings of various buildings.

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

CO 1: Demonstrate the expertise on the commands of AutoCAD.

CO 2: Develop the plans, sections and elevations of single-storey building.

CO 3: Develop the plans, sections and elevations of multi-storey building.

CO 4: Illustrate various components of building using AutoCAD.

CO 5: Produce working drawings of buildings.

LIST OF EXPERIMENTS

1. Introduction to Computer Aided Drafting.
2. Practice exercises on CAD software.
3. Develop plans of a Single storey building.
4. Develop plans of a Multi- storey building.
5. Develop sections and elevations of a Single storey building
6. Develop sections and elevations of a Multi-storey building
7. Detailing of building components like doors, windows, etc.
8. Exercises on development of working of buildings.

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18CE31L2– Concrete Technology 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 physical and mechanical properties of cement as per IS codes of practice.
2. Understand physical properties of aggregate as per IS codes of practice.
3. Gain practical knowledge on properties of fresh Concrete.
4. Estimate mechanical properties of hardened concrete and self-compacting concrete..
5. Understand the practical applications of Non-destructive tests on concrete.

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

CO 1: Determine the physical properties of cement and aggregates.

CO 2: Determine the workability of normal concrete.

CO 3: Determine the strength properties of concrete by destructive tests.

CO 4: Determine the strength properties of concrete by non-destructive tests.

CO 5: Determine the workability of self-compacting concrete.

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 Aggregate

1. Sieve analysis and Gradation charts.
2. Bulking of fine and coarse aggregates.

III. Test on Fresh Concrete

1. Slump flow test.
2. Compaction factor test.
3. Vee-bee test.
4. Flow table Test.

IV. Test on Hardened Concrete

1. Compression test on cubes and cylinders.
2. Flexure test.
3. Splitting tensile test.
4. Modulus of elasticity.

V. Non Destructive Test of Concrete

1. Rebound Hammer.
2. Ultrasound Pulse Velocity (UPV).

VI. Self-compacting Concrete

1. Slump flow test.
2. V funnel.
3. L Box.

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18CE31L3–Geotechnical Engineering Laboratory

III Year. B.Tech. CE– I Semester.

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
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 test
8. Direct shear test
9. Vane shear test
10. California Bearing Ratio Test (CBR Test)
11. Tri-axial shear test
12. Determination of Coefficient of consolidation

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18CE3105 – Internship

III Year. B.Tech. CE– I Semester.

Prerequisite(s): None

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

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 of four weeks. Internship carried out shall be submitted in a report form, 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, 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.

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18CE3201 – Design of Reinforced Concrete Structures

B. Tech. CE III Year, II Sem

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

Prerequisite(s):
18CE2202- Strength of Materials-II

18CE3102- 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

CO 1: Explain the concept of RC design and apply it to beams.

CO 2: Apply limit state design for beam sections subjected to shear, bond and torsion.

CO 3: Design RC columns.

CO 4: Analyze and design one way and two way RC slabs.

CO 5: 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- 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, 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, design 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, rectangle and circular footings, design concepts of strip and combined footings.

Staircase: Classifications, terminology, design of dog legged staircase.

TEXT BOOKS:

1. Limit state designed of reinforced concrete, P.C.Varghese, Prentice Hall of India, 2008.
2. Design of Reinforced Concrete Structures: IS: 456-2000, N. Krishna Raju, CBS Publishers, 2016.

REFERENCE BOOKS:

1. Reinforced Concrete Design, S. Unnikrishna Pillai & Devdas Menon, 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, 2005.
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.
6. NPTEL Lecture Videos.

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18CE3202- Transportation Engineering

B. Tech. CE III Year, II Sem

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

Prerequisite(s):
18CE2101Surveying

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 about the pavement materials and methods of road construction.
5. Understand the permanent way and its components.

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. Explain the permanent way components and functions.

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 Markings - Design of Traffic Signals – Webster Method.

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 Railway: Permanent way components – Cross Section of Permanent Way – Functions of various Components like Rails, Sleepers and Ballast, Gauge – Creep of Rails – Theories related to Creep – Sleeper density.

TEXT BOOKS:

1. Highway Engineering, S. K. Khanna, C. E. G. Justo, A. Veeraragavan, Nem Chand & Bros Publishers, Revised 10th edition, 2017.
2. Railway Engineering, Satish Chandra & M. M. Agarwal, Oxford University Press, 2016.

REFERENCE BOOKS:

1. Traffic Engineering and Transport Planning, Dr. L. R. Kadiyali, Khanna Publishers, 2011.
2. Traffic and Highway Engineering, Nicholas J. Garber & Lester A. Hoel, Cengage, 2015.
3. A Textbook of Railway Engineering, S.C. Saxena & S.P. Arora, Dhanpat Rai Publishers, 2017.
4. IRC 37-2012: Tentative guidelines for design of flexible pavement.
5. IRC 58-2011: Guidelines for design of plain jointed rigid pavements.
6. IRC 81-1997: Guidelines for design of overlay using Benkalman Beam Deflection Technique.

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18CE3203 – Advanced Structural Analysis
(Professional Elective – I)

B. Tech. CE III Year, II Sem

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

Prerequisite(s):
18CE3101 – Structural Analysis

Course objectives: Develop ability to

1. Understand the concepts of approximate methods in analyzing the frames for various loads.
2. Know the concept and analysis of cables and suspension bridges with three hinged stiffening girder
3. Grasp the procedure for indeterminate beams and frames by flexibility matrix method.
4. Understand the concepts of Stiffness matrix method of analysis for Trusses.
5. Understand the concepts of Stiffness matrix method of analysis for beams and frames

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

CO 1: Apply the approximate method of analysis for multi-storey frames.

CO 2: Perform analysis for cables and suspension bridges.

CO 3: Analyze the indeterminate beams and frames by flexibility matrix method.

CO 4: Analyze the truss structures by Stiffness matrix method.

CO 5: Analyze the indeterminate beams and frames by stiffness matrix method.

UNIT – I:

Approximate Methods: Analysis of frames with vertical loads, Substitute frame method, Analysis of frame with horizontal loads, Portal and Cantilever method.

UNIT – II:

Cables and Suspension Bridges: Equilibrium of loaded Chord, Force polygon, Funicular polygon, Cable carrying uniformly distributed load, Temperature stresses on Cables, Suspension Bridge with three hinged stiffening girder.

UNIT – III:

Flexibility Matrix Method: Description, Flexibility Co-efficient, Steps in the analysis, Application to beams, Frames and Trusses.

UNIT – IV:

Stiffness Matrix Method- Plane Trusses: Global Co-ordinates, Local Co-ordinates, transformation Matrix, Stiffness Matrix in Global co-ordinates, Force in the member, Steps in the Analysis, Applications.

UNIT – V:

Stiffness Matrix method- Beams and Frames: Stiffness Matrix of Beam element, Equivalent Nodal load vector of beam element, Steps in the analysis of beam, Applications.

Stiffness Matrix of frame element in local co-ordinates, Transformation matrix of a frame element, Stiffness Matrix and Nodal force vector in global co-ordinates, steps in the Analysis of frames, Applications.

TEXT BOOKS:

1. Matrix method of Structural Analysis by P. N. Godbole, R. S. Sonparote, S. U. Dhote, PHI Publication, 2014.
2. Theory of Structures Vol I & II, G.S. Pandit, S.P. Gupta and R Gupta, McGraw Hill Education, 2017.

REFERENCE BOOKS:

1. Theory of Structures, S. Ramamrutham, Dhanpat Rai Publication, 2014.
2. Structural Analysis, Devdas Menon, Narosa Publishing House, 2010.
3. Structural Analysis, R.C.Hibbeler, Pearson Education, 2017.
4. Mechanics of Structures Vol – I and II, H.J.Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd, 2016.

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18CE3204 – Foundation Engineering

(Professional Elective – I)

III Year. B.Tech. CE– II Semester.

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

Prerequisite(s):
18CE3103 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 foundations.
5. Understand the principles and design of pile foundation and cassions

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 and design the pile and pile group.

CO5. Justify the need of well foundation and distinguish different wells.

UNIT–I:

Soil Exploration: Purpose – methods of soil exploration – Test pits, boring and sampling methods – penetration tests – plate load test –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, method of slices, Taylor's Stability Number- stability of slopes of earth dams under different conditions.

UNIT – III:

Earth Pressure Theories: Rankine's theory of earth pressure – 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, Skempton's and IS code methods - settlement criteria – allowable bearing pressure based on SPT, N- value and plate load test – allowable settlements of structures.

UNIT V:

Pile Foundations: Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction

Well Foundations: Types – different shapes of wells – components of wells – functions and design criteria – sinking of wells – tilts and shifts.

TEXT BOOKS:

1. Principles of Foundation Engineering, Braja M. Das, Cengage Learning, 2013.
2. Soil Mechanics and Foundation Engineering, V.N.S. Murthy, CBS Publishers, 2015

REFERENCE BOOKS:

1. Foundation Engineering, P.C. Varghese, Prentice Hall India Learning Pvt. Ltd., 2009.
2. Soil Mechanics and Foundation Engineering, Santosh Kumar Garg, Khanna Publishers, 2003.
3. Foundation Analysis and Design ,Joseph Bowles McGraw Hill Education; 5 edition (July 2017)

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18CE3205 – Groundwater Development and Management
(Professional Elective – I)

B. Tech. CE III Year, II Sem

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

Prerequisite(s):
18CE3104 Engineering Hydrology

Course objectives: Develop ability to

1. Understand the occurrence of groundwater and properties of aquifers.
2. Understand the movement of groundwater and derive flow related equations.
3. Derive equations for steady and unsteady flow towards a well in confined and unconfined aquifers.
4. Grasp the knowledge of various investigations carried out to find groundwater levels.
5. Understand the concepts of well construction and sea water intrusion.

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

CO1. Assess different aquifer parameters influencing groundwater occurrence.

CO2. Explain different aquifer parameters influencing groundwater movement.

CO3. Explain well concepts and derive suitable equations to find the flow towards a well in aquifers.

CO4. Identify suitable method for exploration of ground water; explain artificial recharge of groundwater.

CO5. Explain well construction; phenomenon of salt water intrusion in aquifer, its consequences and control measures.

UNIT – I:

Groundwater Occurrence: Groundwater hydrologic cycle, origin of groundwater, rock properties effecting groundwater, vertical distribution of groundwater, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT – II:

Groundwater Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing groundwater flow in three dimensions derivation, groundwater flow equation in polar coordinate system. Groundwater flow contours and their applications.

UNIT – III:

Steady groundwater flow towards a well in confined and unconfined aquifers – Dupuit's and Theim's equations, Assumptions, Formation constants, yield of an open well - Well interface and well tests – Recuperation Test.

Unsteady flow towards a well – Non equilibrium equations – Theis' solution – Jacob and Chow's simplifications, Leaky aquifers – Well Interference.

UNIT – IV:

Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

Artificial Recharge of Groundwater: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Groundwater along with Case studies.

UNIT – V:

Well Construction – Drilling Equipment used for Well Construction – Bore log – Interpretation of Log Data.

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion. Groundwater Basin Management: Concepts of conjunction use, Case studies.

TEXT BOOKS:

1. Groundwater Hydrology, David K. Todd, Larry W. Mays, Wiley India Pvt Ltd, 2015.
2. Groundwater, H.M.Raghunath, New Age International, 2019.

REFERENCE BOOKS:

1. Groundwater Hydrology, Bhagu R. Chahar, McGraw Hill Education, 2017.
2. Groundwater Hydrology, Herman Bouwer, John Wiley & sons, 2013.
3. Elements of Hydrology and Groundwater, R.N.Saxena and D.C.Gupta, PHI learning, 2017.
4. Groundwater Systems: Planning & Management, Robert Willis, William W-G Yeh, Prentice Hall Publishers.
5. Applied Hydrogeology, C.W.Fetter, Pearson, 2014.

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18CE3206 – Air Pollution and Control
(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. Identify major air pollutants, their sources and transport mechanisms.
2. Understand meteorology and plume dispersion concepts.
3. Understand design criteria for different equipment used to control particulate pollutants.
4. Understand methods to control greenhouse gas emissions.
5. Understand air quality management and air pollution act.

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

CO1. Explain various types of air pollutants, their sources and effects.

CO2. Describe meteorological parameters and plume dispersion concepts.

CO3. Select and design appropriate treatment methods to control atmospheric particulate matter.

CO4. Suggest methods to control gaseous emissions like NOx and SOx.

CO5. Analyze air pollutants by proper sampling technique and develop solutions to meet air quality standards set by air pollution control act.

UNIT – I:

Air Pollution: Definitions, scope, significance and episodes, air pollutants – classifications - natural and artificial - primary and secondary air pollutants, point and non- point, line and areal sources of air pollution- stationary and mobile sources. Effects of air pollutants on man, material and vegetation: global effects of air pollution – Greenhouse effect, heat islands, acid rains, ozone holes etc.

UNIT – II:

Meteorology and Plume Dispersion: Properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality - wind rose diagrams. Lapse rates, Pressure Systems, Winds and moisture, plume behavior and plume

Rise Models; Gaussian Model for Plume Dispersion, Application of tall chimney for Pollutant dispersion.

UNIT – III:

Control of Particulate Pollutants: Properties of particulate pollutants, Particle size distribution, Control at Sources, Process Changes, Equipment modifications, Dust removal equipment - Design and operation of settling chambers, cyclone separators, filters, dry and wet scrubbers, Electrostatic precipitators (ESP).

UNIT – IV:

Control of Gaseous Emissions: General Methods of Control of NOx and Sox emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling - Adsorption – Absorption – Combustion and Condensation equipment.

UNIT – V:

Air Quality Management: Monitoring of SPM, SOx; NOx and CO Emission Standards - Air Sampling – Sampling Techniques - High volume air sampler – Stack sampling – Analysis of air pollutants - Air quality and Emission standards - Air pollution control act.

TEXT BOOKS:

1. Air Pollution, M.N. Rao and H.V.N. Rao, McGraw Hill Education, 2017.
2. Air pollution: Its Origin and Control, Kenneth Wark, Cecil F. Warner and Wayne T. Davis, Pearson, 3rd edition.

REFERENCE BOOKS:

1. An Introduction to Air pollution, Dr. R. K. Trivedy, Dr. P. K. Goyal, ABD Publishers, 2018.
2. Text Book of Air Pollution and Its Control, S.C. Bhatia, Atlantic, 2008.
3. Air Pollution, S.K. Agarwal, APH Publishing Corporation, 2013.

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18CE3207 – 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: Meaning and Concept of Natural, human induced 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.

Tropical cyclones: Overview, cyclogenesis, drought monitoring and management.

Geographical based disasters: Earthquakes, Volcanos, Tsunamis, Landslides and avalanches: Overview, causes, types, impacts, zoning and mitigation measures; Tsunami generation;

Case studies related to various hydro meteorological and geographical based disasters.

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, Management of chemical terrorism disasters and biological disasters; 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. Case studies.

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, Sendai Framework.

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. Mrinalini 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 Hyndman, Cengage Learning, 2015.
6. Earth and Atmospheric Disaster Management: Nature and Manmade, Navale Pandharinath & C.K. Rajan, B.S. Publications, Hyderabad, 2009.
7. Disaster Risk Reduction in South Asia, Sahni and Pardeep and Madhavi Malalgoda A, PHI learning Pvt Ltd, 2012.

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18CE3208 – Green Buildings
(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. Impart knowledge on the sustainable construction strategies.
2. Understand green building assessment and LEED certification process.
3. Understand effective energy management systems for a smart building.
4. Learn emerging building materials and their application.
5. Understand green building implementation concepts.

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

CO1. Describe the need for green buildings.

CO2. Explain green building process and assessment.

CO3. Explain various approaches like landscaping, stormwater and energy management for green buildings.

CO4. Explain energy policies, water supply and wastewater strategies, and materials in the field of Civil Engineering construction used for green buildings.

CO5. Explain the implementation of Green buildings and its future scope.

UNIT – I:

Sustainable Construction and Green Building Requirements: Ethics and sustainability – Increased CO_2 trade – Sustainable construction – Major environmental and resource concerns – Green building movement and obstacles – Green building requirements – Perceived use of green building – Relationship between comfort level and performance ability.

UNIT – II:

Green Building Process and Assessment: Conventional versus green building delivery systems – Execution of green building process – Integrated design process – Ecological design – Merits and demerits – Historical perspective – Contemporary and future ecological designs – LEED building assessment standard – LEED certification process – GRIHA rating - International building assessment standards – Building rating system and its future – Case study of a green building.

UNIT – III:

Sustainable landscaping, Energy and Atmosphere: Land and landscape approaches for green buildings – Sustainable landscapes – Enhancing ecosystems – Storm water management – Heat island mitigation – Building energy issues – Building energy design strategies – Building envelope – Active mechanical systems – Electrical power systems – Innovative energy optimization strategies – Smart buildings and energy management systems – Ozone depleting chemicals in HVAC & R and fire suppression.

UNIT – IV:

Building Hydrologic System and Material Loops: Energy policy act of 1992 – High performance building hydrologic strategy - High performance building water supply strategy - High performance building wastewater strategy – Landscaping water efficiency – Green building materials issues and priorities – Difference between green building buildings and green building materials – LCA of building materials and products – Emerging construction materials and products – Design for deconstruction and disassembly – Closing material loops in practice.

UNIT – V:

Green Building Implementation: Site protection planning – Health and safety planning – Construction and demolition – Waste management – Reducing the footprint of construction operations – Essentials of building commissioning – Costs and benefits of building commissioning – Case study for high performance green buildings – The economics of green buildings – Quantifying green building costs – Future directions in green buildings.

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. Marketing Green Building Services: Strategies for success, Jerry Yudelson, Elsevier, 2008.
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/
5. http://cpwd.gov.in/Publication/Guideleines_Sustainable_Habitat.pdf
6. For case studies: http://www.nmsarchitects.com/

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18CE3209 – Construction Engineering and Management
(Professional Elective – II)

B. Tech. CE III Year, II Sem

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

Prerequisite(s):

18CE2104 Building Materials, Construction & Planning

Course Objectives: Develop ability to:

1. Understand how to deal with overall planning, coordination and control of projects.
2. Impart knowledge of construction technology, scheduling, optimizing methods involving the construction of structures.
3. Understand planning, scheduling, budget and administration.
4. Plan and Schedule a civil engineering project by using techniques like CPM, PERT.
5. Analyze the different quality and safety issues involved in construction projects.

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

CO 1: Explain the importance of construction projects, its documents, records and codal provisions.

CO 2: Identify and select suitable equipments for related construction process.

CO 3: Plan resources economically and effectively to complete project within time.

CO 4: Implement latest project planning tools used in Industry.

CO 5: Effectively implement the construction safety as per codal provisions.

UNIT-I:

Construction Technology - Classification of Construction projects, Construction stages, Construction activities- Construction process-Construction scheduling- Construction documents-Construction records- quality- Codes and regulations, Construction Methods.

UNIT-II:

Mechanized Construction-Construction Equipment, Equipment economics, Excavators-Rollers-Dozers-Scrapers-Handling Equipment, Concrete equipment, Hauling Equipment, Cranes Draglines, Clamshells, High Rise Construction Equipments- Scaffoldings, Tower Cranes, lifts, Concrete pumps.

UNIT-III:

Resource Planning - Planning for manpower, materials, costs, equipment. Labour -Scheduling Forms of scheduling - Resource allocation, budget and budgetary control methods.

UNIT-IV:

Functions of Construction Management and its Applications Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization. Principles of Project Planning, Management Information System – Project Planning tools - MS Projects, Primavera. Introduction to Building Information Modelling (BIM) -Benefits of BIM , various components of BIM, Modelling of Structure in BIM.

UNIT-V:

Safety Management in Construction: Essentials of Safety Management, Construction Safety , Accidents in Construction and its Legal and Financial implications . Occupational Health Hazards and Diseases, Codal provisions in Construction Safety and Workers Accommodation , Construction Waste Management.

TEXT BOOKS:

1. Construction Technology, Subir k Sarkar, Subhajit Saraswati, Oxford University Press, 2012.
2. Construction Planning and Management, P.S. Ghalot, D.M. Dhir, New Age International Pvt. Ltd., Second Edition, 2018.

REFERENCE BOOKS:

1. Construction Management and Planning, B. Sengupta and H. Guha, McGraw Hill Education, 2015.
2. Construction planning, Equipment and methods, R. Peurifoy, Schexnayder, Shapira, McGraw Hill Education, Ninth Edition, 2018.
3. Construction Project Management, K.K. Chitkara, McGraw Hill Education, 2014.
4. Project Planning and Control with PERT and CPM, B.C. Punmia, Laxmi Publications, 2016.
5. JhaKumar Neeraj, Construction Project Management ,Theory & Practice ,Pearson Education India,2015

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18CE3210 – Irrigation Engineering
(Professional Elective – II)

B. Tech. CE III Year, II Sem

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

Prerequisite(s): 18CE3104 – Engineering Hydrology

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 Practice, Satya N. Challa Murthy, New Age International Publishers, 2017.

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18CE3211 – Remote Sensing and GIS
(Professional Elective – II)

B. Tech. CE III Year, II Sem

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

Prerequisite(s): 18CE2101 – Surveying

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

CO 1: Describe different concepts and terms used in Remote Sensing and its data.

CO 2: Describe GIS Data types, GIS operations and data process in different coordinate systems of GIS interface.

CO 3: Describe the geographic data in Vector Data Model & Raster Data Model.

CO 4: Prepare spatial data with different methods of input and editing, perform spatial data analysis.

CO 5: 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.

Coordinate 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, Neighbourhood operations.

UNIT-V:

Topology: Editing and Error Rectification, Types of topology, Topological Relationships.

GIS Applications: GIS based road network planning, Mineral mapping using GIS, Hazards 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, 2nd Edition, 2011.
2. Introduction to Geographic Information System, Kang-Tsung Chang, McGraw Hill Education, 2016.

REFERENCE BOOKS:

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W.Kiefer, Wiley Publishers, 7th Edition, 2015.
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.SathiKumar, 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, 2014.

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18CE3212– Advanced Concrete Technology
(Professional Elective – II)

B. Tech. CE III Year, II Sem

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

Prerequisite(s):
18CE3102- Concrete Technology

Course objectives: Develop ability to

1. Understand the durability requirements of concrete.
2. Understand the characteristics of high strength and high performance concrete.
3. Understand the need of special concretes.
4. Understand the components and design the formwork.
5. Understand future developments in concrete industry.

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

CO 1: Describe the durability requirements of concrete and reinforcement corrosion.

CO 2: Explain the characteristics of high strength and high performance concrete.

CO 3: Explain the need of special concretes and geopolymer concrete.

CO 4: Design formwork.

CO 5: Explain the sustainability and future developments in concrete industry.

UNIT–I:

Durability: Durability and Impermeability.

Corrosion: Corrosion of reinforcement in concrete-factors influencing corrosion-damages caused by corrosion-preventive measures in new constructions-Case study

UNIT–II:

High strength concrete: Classification, Microstructure, Manufacturing considerations, selection of mix proportions, properties, advantages, applications.

High performance concrete: Methods for achieving high performance concrete, Requirements for High performance characteristics.

UNIT–III:

Special concretes and concreting materials: Bacterial concrete, experimental investigations, durability characteristics, advantages and disadvantages.

Geopolymer concrete: Mix design, effect of water content in the mix.

UNIT–IV:

Formwork: Materials, structural requirements, connections, specifications, design of formwork, shores, removal of forms and shores, construction loads, failure of formwork.

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UNIT-V:

Future trends in Concrete Technology: Sustainability in concrete industry, enhancement in strength/ductility of concrete, enhancement of durability of concrete structures, developments in rebar technology, smart concrete.

TEXT BOOKS:

1. Concrete Technology, A.R.Santhakumar, Oxford, 2016.
2. Properties of Concrete, A.M. Neville, Pearson Education, 2012.

REFERENCE BOOKS:

1. Concrete Technology, M.S. Shetty, S. Chand, 2018.
2. Concrete Technology, M.L. Gambhir, McGraw Hill Education, 2013.
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.

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18EE3232 – Energy Conservation and Management
(Open Elective – II)

B. Tech. CE III Year, II 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 and Energy Conservation Act.
2. Understand the principles of energy conservation, audit and management.
3. Understand energy conservation in different mechanical utilities.
4. Understand efficient heat and electricity utilization, saving and recovery in different thermal and electrical systems.
5. Understand different basic terms related to Energy economy, Financial Management and to understand the role of Energy Service Companies.

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

CO1. Perform energy accounting and balancing

CO2. Prepare energy audit report for different energy conservation instances.

CO3. Suggest energy saving methodologies.

CO4. Evaluate the energy saving and conservation in different mechanical utilities.

CO5. Evaluate the energy saving and conservation in different electrical utilities.

UNIT-I:

Energy Scenario, Conservation Act and related policies: Energy Scenario of India. Present Nonrenewable Energy Scenario, Present Energy Consumption, Energy security, Energy strategy for the future.

UNIT-II:

Energy Management and Audit

Principles of Energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting – Energy management qualities and functions, language Questionnaire – check list for top management. Definition, energy audit, need, types of energy audit. Energy management (audit) approach – understanding energy costs, Bench marking.

UNIT-III:

Energy Efficient Systems-I

Classification of motors - factors affecting efficiency – Energy conservation in motors – Energy efficient motors.

Lighting and Energy Instruments

Good lighting system design and practice, lighting control, lighting energy audit – energy instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

UNIT-IV:

Energy Efficient Systems-II

Thermal utilities and systems: Boilers – types, combustion in boilers, performances evaluation, analysis of losses, feed water treatment, blow down, energy conservation opportunities.

UNIT-V:

Financial Analysis: Simple Payback, Return on Investment, net present value and internal rate of return, life cycle cost method, Sensitivity analysis, Project-financing options, Energy monitoring and targeting.

TEXT BOOKS:

1. Sonal Desai “Handbook of Energy Audit” McGraw Hill. 2018
2. W.C. Turner “Energy Management Handbook” John Wiley and Sons, A Wiley Inter-science publication.

REFERENCE BOOKS:

1. Albert Thumann “Handbook of Energy Audits”, , 6th Edition, The Fairmont Press
2. Bureau of Energy Efficiency Reference book: Vol No.1, 2, 3 4
3. W.R. Murphy and G. Mckay,“Energy Management”, Butter Worth Publications
4. Energy Manager Training Manual (4 Volumes) available at https://beeindia.gov.in administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004

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18ME3233 – Digital Fabrication

(Open Elective-II)

L	T	P/D	C
3	0	-/-	3

B. Tech. CE III Year, II Sem

Pre-requisites: Nil

Course Objectives: Develop ability to

1. Introduce basics of geometric modeling of physical objects,
2. Convert digital data to obtain physical components by metal subtraction and addition processes.

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

CO 1: Select an appropriate geometric modeling 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 Modeling; 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

Web Source on free on line course:

1. https://www.classcentral.com/course/kadenze-introduction-to-digital-fabrication-and-technical-design-9440
2. https://nptel.ac.in/courses/112102103/13

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

18EC3234 – Principles of Communication Systems

(Open Elective - II)

B. Tech. CE III Year, II Sem

Pre requisite(s): Nil

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

Note: Only Block Diagram Approach with Qualitative Treatment of the topics is required. Detailed mathematical treatment is not required.

Course Objectives:

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

1. Distinguish various types of modulations.
2. Explain different communication modules and their implementation.
3. 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.

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

18CS3235 - Knowledge Management
(Open Elective II)

B. Tech. CE III Year, II Sem
Prerequisites:

18CS1201 - Data Structures

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 BOOK(S)

1. Knowledge Management, Elias.M.Awad & Hassan.M.Ghaziri, Pearson Edition.

REFERENCE BOOK(S)

1. Knowledge Engineering and Management, Guus Schreiber, Hans Akkermans, AnjoAnjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, Universities Press, 2001.
2. Handbooks On Knowledge Management, C.W.Holsapple, International Handbooks on Information Systems, Vol 1 and 2, 2003.

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

18MB3236 – Supply Chain Management

(Open Elective – II)

B. Tech. CE III Year, II 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 BOOK(S):

1. The Toyota Way Paperback by Jeffrey Liker.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE32L1– Structural Drafting Lab

B. Tech. CE III Year, II Sem
Prerequisite(s):
18CE31L1 – Computer Aided Drafting of Buildings Lab

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

Course objectives: Develop ability to

1. Provide hands on experience for structural drafting.
2. Prepare detailing of RCC members as per the IS specifications.
3. Impart detailing concepts of Beams and slabs as per the IS specifications.
4. Impart detailing skills of Columns and Footings as per IS specifications.
5. Draw structural details of staircase.

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

CO 1: Draw reinforcement details of singly reinforced beam.

CO 2: Draw reinforcement details of doubly reinforced and T-beam.

CO 3: Draw reinforcement details of slabs.

CO 4: Draw reinforcement details of columns.

CO 5: Draw reinforcement details of footings and staircase.

LIST OF EXPERIMENTS

Drawing of Reinforcement Details of RC Members

1. Singly reinforced beam
2. Doubly reinforced beam
3. T-beam
4. One-way slab
5. Two-way slab
6. Square column
7. Rectangular column
8. Square footing
9. Rectangular footing
10. Staircase

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE32L2 - Transportation Engineering Lab

B. Tech. CE III Year, II Sem
Prerequisite(s):
18CE2104-Building Materials, Construction and Planning

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

Course objectives: Develop ability to

1. Learn test on aggregate materials used for road constructions.
2. Analyze different tests on bitumen materials along with its specifications.
3. Examine test performed for bitumen mixes.
4. Learn the various methods of carrying out traffic volume studies.
5. Learn the various methods of carrying out speed studies.

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

CO1. Evaluate aggregates used for road construction along with its suitability.

CO2. Determine the stability parameters of bitumen mixes.

CO3. Determine flash and fire point of given bitumen.

CO4. Perform and analyze different methods of traffic volume studies.

CO5. Determine design speed, maximum speed & minimum speed limits of allocation through spot speed.

LIST OF EXPERIMENTS:

I. ROAD 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.

II. BITUMINOUS MATERIALS

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and Fire Point Test.
5. Marshal stability Test.

III. TRAFFIC STUDIES

1. Traffic volume studies
2. Speed studies

Geethanjali College of Engineering and Technology (Autonomous)
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18EN32L1 – Advanced English Communication Skills Lab

B. Tech. CE III Year, II Sem

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

Prerequisite(s):
None

Course objectives: Develop ability to

1. Improve students' fluency in spoken English.
2. Enable them to acquire behavioral skills required for their personal and professional life.
3. Help students develop their vocabulary.
4. Read and comprehend texts and respond appropriately in different socio-cultural contexts.
5. Communicate their ideas.

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

CO1. Acquire vocabulary and use it contextually

CO2. Demonstrate effective Listening and Speaking Skills

CO3. Develop proficiency in academic reading and writing

CO4. Establish employability skills thereby increasing Job prospects

CO5. Communicate confidently in formal and informal contexts

LIST OF ACTIVITIES:

1. Activities on Fundamentals of Inter-Personal Communication and Vocabulary Building:

Responding appropriately and relevantly using the right body language, Discourse skills, Word Roots, One Word Substitutes, Business Vocabulary, Analogy, Collocations and uses of vocabulary, Resilience and Personal Management, Managing stress, time, anger and other emotions, Assertiveness and Culture shock.

2. Reading Skills:

Reading for facts, specific information, Reading between the lines, Negative facts, Inferential Reading, Critical Reading.

3. Activities on Writing:

Writing Process, Gathering Information, Analyzing the content, Formatting, Editing, Resume Writing and C.V preparation, Writing SOP, Letter Writing, email Writing.

4. Activities on Presentation Skills:

Oral Presentations (Individual and Group), Seminars, PPTs and Written Presentations through posters, Projects, Portfolio Writing, Brochures and Reports.

5. Activities on Group Discussion and Interview Skills:

Dynamics of Group Discussions, intervention, summarizing, body language, relevance and organization of ideas and rubrics for evaluation, Pre-Interview Planning, opening strategies, answering strategies, Interview through Tele-Conference and Video Conference and Mock Interviews, Videos of Mock Interviews.

REFERENCE BOOKS :

1. Technical Communication by Meenakshi Raman & Sangeetha Sharma, Oxford University Press, 2009.
2. English Vocabulary in Use series, Cambridge University Press 2008.
3. Communication Skills by Leena Sen , PHI Learning pvt ltd, New Delhi 2009.
4. Communication Skills by Sanjay Kumar and Pushp Lata, 2nd edition, Oxford University Press.

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

18MB3203 – Professional Ethics
(Mandatory Course)

B. Tech. CE III Year, II Sem

Pre Requisites: **None.**

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

Course Objectives: Develop ability to:

1. Imbibe and internalize the Values and Ethical Behavior
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, the 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.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE4101 – Design of Steel Structures

B. Tech. CE IV Year, I Sem

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

Prerequisite(s):
18CE3201 – 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

CO 1: Discuss the properties of structural steel and design bolted and welded connections.

CO 2: Design tension and compression members of structural steel.

CO 3: Design the steel beams.

CO 4: Design the built up steel columns and their supporting systems.

CO 5: Design the welded plate girder.

UNIT–I:

Steel, structural steel, rolled steel sections, loads, design criteria for limit state method, partial safety factors, design strengths, deflection limits, serviceability.

Bolted 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.

UNIT–III:

Plastic Analysis: Behavior of beams in flexure, plastic hinge length, plastic moment, redistribution of moments, classification of cross sections, shape factor, load factor.

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.

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UNIT–IV:

Columns: Rolled steel sections, built-up laced columns.

Column Bases: Types, slab base, introduction to gusset base.

Beam Column connections: Types, design of bolted frames connection and unstiffened seated connection.

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. Design of steel structures, N. Subramanian, Oxford University Press, 2009.
2. Limit State Design of steel structures, S.K. Duggal, McGraw Hill Education, 2017.

REFERENCE BOOKS:

1. Design of steel structures, S.S. Bhavikatti, I.K Int. Publication House, 2014.
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.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE4102 – Environmental Engineering

B. Tech. CE IV Year, I Sem

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

Prerequisite(s):
18CE3104 Engineering Hydrology

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 – Components requirements – Sanitary fittings – Traps – One pipe and two pipe systems of plumbing – Ultimate disposal of sewage – Dilution, Self-purification of rivers, Sewage farming.

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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, Pearson Education 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 Hall India Learning Private Limited, 2013.
4. Water Supply, Waste Disposal and Environmental Engineering, A.K. Chatterjee, Khanna Publishers, 2010.
5. Unit Operations in Environmental Engineering, M.K. Saseetharan, R.Elangovan, New age International, 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 India Pvt. Ltd, 2018.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18MB4101 – Operations Research

B. Tech - CE - IV Year I Semester

Pre-requisites: None

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

Course Objectives: Develop ability to

1. Understand the significance of Operations Research and formulation of LPP models.
2. Understand the Algorithms of Graphical and Simplex Methods.
3. Understand the Transportation and Assignment techniques.
4. Understand the concepts of sequencing and replacement models.
5. Understand the concepts of Game theory and Inventory Control.
6. Students will understand the concepts of queuing theory and DPP.

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

CO1: Describe the importance of Operations Research, Formulate a managerial decision problem into a mathematical model to solve by simplex method;

CO2: Formulate and apply transportation and assignment problems for engineering and managerial situations.

CO3: Apply sequencing and replacement concepts in industry applications

CO4: Apply game theory and inventory concepts in industry applications

CO5: Apply dynamic programming technique and queuing theory in industry applications

UNIT-I:

Introduction: Definition– Characteristics and Phases – Types of models – Scope and applications, limitations.

Linear Programming Problem: Formulation – Graphical solution – Simplex method – Artificial variables techniques: Big M Method, Two–phase method, Duality Principle.

UNIT-II:

Transportation Problem: Finding an initial feasible solution - North West Corner Method, Least Cost Method, Vogel's Approximation Method, Finding the optimal solution, Special cases in Transportation problems - Unbalanced Transportation problem, Degeneracy in Transportation, Profit Maximization in Transportation.

Assignment Problem: Introduction, Hungarian technique of Assignment problems, unbalanced problems, problems with restrictions, Maximization in Assignment problems. Travelling salesman problem

UNIT-III:

Job Sequencing: Introduction – Flow Shop sequencing, n jobs through 2 machines, n jobs through 3 machines, Job shop sequencing, 2 jobs through 'm' machines-graphical model.

Replacement Model: Introduction – Replacement of items that deteriorate with time, when money value is not counted and counted, Replacement of items that fail completely, Group Replacement.

UNIT-IV:

Theory of Games: Introduction –Terminology– Solution of games with saddle points and without saddle points, 2 x 2 games, m x 2 and 2 x n games - graphical method, m x n games, dominance principle.

Inventory Models: Introduction – Concept of EOQ, Single item - Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks, Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

UNIT-V:

Queuing Theory: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Dynamic Programming: Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

TEXT BOOKS:

1. Operations Research-An Introduction, Hamdy, A.Taha, Sixth Edition, Prentice Hall of India Pvt. Ltd., 1997
2. Operations Research, S.D.Sharma, Kedarnath, Ramnath & Co., Meerut, 2009

REFERENCE BOOKS:

1. Operations Research, A. M. Natarajan, P. Balasubramaniam, A. Tamilarasi, Pearson Education,2009
2. Operations Research, V. K. Kapoor, S. Chand Publishers, New Delhi, 2004

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE4103 - Pavement Analysis and Design
(Professional Elective – III)

B.Tech. CE IV Year, I Sem

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

Prerequisite(s):
18CE3202Transportation 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 IRCguidelines.

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 – 2012 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 -2011 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 37-2012: Tentative guidelines for design of flexible pavement.
3. IRC 58-2011: Guidelines for design of plain jointed rigid pavements.
4. IRC 81-1997: Guidelines for design of overlay using Benkalman Beam Deflection Technique.

Geethanjali College of Engineering and Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301
18CE4104 – Finite Element Methods for Civil Engineering
(Professional Elective – III)

B. Tech. CE IV Year, I Sem

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

Prerequisite(s):
18CE3203- Advanced Structural Analysis

Course Objectives: Develop ability to

1. Lean basic principles involved in finite element methods.
2. Analyse the 2D problems using CST elements.
3. Determine the shape functions required for 1D and 2D problems.
4. Illustrate the use of isoparametric elements.
5. Analyse the beams, axi-symmetric and 3D problems.

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

CO 1: Explain the basic concepts analysis of FEM and solve the 1D problems.

CO 2: Analyze 2D problems using FEM.

CO 3: Formulate the shape functions chosen for 1D and 2D problems.

CO 4: Employ isoparametric elements and numerical integration for 1D and 2D problems.

CO 5: Analyse beam, axis- symmetric and 3D elements.

UNIT – I:

Introduction: Concepts of FEM, steps involved, merits and demerits, matrix displacement method vs FEM, element definition: interpolation functions, stress-strain relationship, strain displacement relationship, stiffness matrix and load vector from the energy principles, Raleigh-Ritz method of functional approximation.

One dimensional problem: Stiffness matrix for a two-nodded and three-nodded bar elements and their shape functions, equivalent nodal force vector due to surface and body forces, analysis of 1D structures using 2-noded and 3-noded bar elements.

UNIT – II:

CST element – Two dimensional problems: Plane stress and plane strain problems, stiffness matrix of constraint strain triangle (CST) element, shape functions, equivalent nodal force vector, applications, Introduction to linear strain triangle.

UNIT – III:

Shape functions: Shape functions for 1D elements in Cartesian coordinators of 2-noded and 3-noded elements, methods of constants, Lagrange polynomial, in natural coordinates.

Shape functions for 2D elements: Rectangular elements of Lagrange family, Serendipity family, shape functions of triangular elements in area coordinator.

Introduction to shape functions of 3D element, Conditions which shape functions should satisfy.

UNIT – IV:

Isoparametric elements and numerical integration: Isoparametric concept, isoparametric elements for 1D analysis, isoparametric elements for 2D analysis (Serendipity Family), stiffness matrix for linear isoparametric element, equivalent nodal force vector, numerical integration, applications, convergence and compatibility requirements, Validity of isoparametric elements.

UNIT – V:

Two-nodded beam element stiffness matrix of a beam element from a cubic polynomial, Hermitian polynomials and their properties, equivalent nodal force vector.

Axi-symmetric analysis: Bodies of revolution, axi symmetric modeling, strain displacement relationship, formulation of axi-symmetric solid elements.

Three dimensional FEM: Different 3D elements, strain-displacement relationship, formulation of hexahedral and isoparametric solid element.

TEXT BOOKS:

1. Introduction to finite element method, P.N. Godbole, I.K. International Publishing House Pvt. Ltd., New Delhi, 2013.
2. Introduction to finite elements in engineering by T.R. Chandrupatla and A.D. Belegundu, Prentice Hall, 2011.

REFERENCE BOOKS:

1. The finite element method, O.C. Zienkiewicz, Tata McGraw-Hill Publishing Company, New Delhi, 2007.
2. Finite Element Analysis, C.S. Krishna Murthy, Mc Graw Hill, 1997.
3. Introduction to the Finite Element Method, C.S. Desai and J.F. Abel, Van Nostrand, 2002.

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18CE4105 – Ground Improvement Techniques
(Professional Elective – III)

IV Year. B.Tech. CE– I Semester.

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

Prerequisite(s):
18CE3103 Geotechnical Engineering

Course objectives: Develop ability to

1. Understand 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. Justify the suitable techniques for various problematic soils.

CO3. Compare the available hydraulic modification methods and choose in a given situation.

CO4. Decide shallow and deep stabilization methods.

CO5. Distinguish conventional ground improvement method with modern reinforcing methods.

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, Blasting Vibro compaction, Dynamic Tamping and Compaction piles.

Stabilisation - Method of stabilisation –Mechanical stabilisation, cement , lime , bituminous and Chemical stabilization.

UNIT – III:

Hydraulic Modification: Objectives and techniques, traditional dewatering methods and their choice, Electro-osmosis, Filtration, Drainage and seepage control with Geosynthetics, types of Geosynthetic, Preloading and vertical drains, Electro-kinetic dewatering.

UNIT – IV:

Physical and Chemical Modification: Modification by admixtures, Shotcreting and Guniting Technology, Modification at depth by grouting, Crack Grouting and compaction grouting, Jet grouting, Thermal Modification, Ground freezing.

UNIT – V:

Modification by Inclusions and Confinement: Soil reinforcement, reinforcement with strip, bar, mesh, sheet and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

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, NiharRanjan Patra, Vikaspublishing house, 2012.
3. Earth Reinforcement and Soil Structures, Colin JFP 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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18CE4106 – Hydropower Engineering
(Professional Elective – III)

B. Tech. CE IV Year, I Sem

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

Prerequisite(s):
18CE3210- Irrigation Engineering

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. Analyse 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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18CE4107 – Climate Change and Adaptation
(Professional Elective – III)

B. Tech. CE IV Year, I 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 – Green House Effect – Radioactive effects of Greenhouse gases – The Hydrological cycle – Green House Gases and Global Warming – Carbon Cycle.

UNIT–II:

Atmosphere and Its Components: Importance of Atmosphere – Physical and chemical characteristics of Atmosphere – Vertical structure of the atmosphere – Composition of the atmosphere – Atmospheric stability – Temperature profile of the atmosphere – Lapse rates – Temperature inversion – Effects of inversion on pollution dispersion.

UNIT–III:

Impacts of Climate change: Causes of Climate change: 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 and Carbon credits – CDM – Initiatives in India-Kyoto Protocol – Paris Convention - Intergovernmental Panel on Climate change – Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC – Global Climate Models (GCM) - Evidences of Changes in Climate and Environment- on a Global scale and in India.

UNIT–V:

Climate change and mitigation measures: Clean Development Mechanism – Carbon Trading – Examples of future clean technology – Biodiesel – Natural Compost – Eco-friendly plastic – Alternate Energy – Hydrogen – Bio-fules – Solar Energy – Wind – Hydroelectric Power – 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) – Waste (MSW & Bio-waste, Biomedical, Industrial waste) – International and Regional cooperation.

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. **http://www.ipcc.ch/**

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18CE4108 – Advanced Structural Design
(Professional Elective – IV)

B. Tech. CE IV Year, I Sem

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

Prerequisite(s):
18CE3201 – Design of Reinforced Concrete Structures.

Course Objectives: Develop ability to

1. Analyse and design retaining walls.
2. Design ground level water tanks.
3. Design the embankments.
4. Design the bridges.
5. Design RCC chimneys, bunkers and silos.

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

CO 1: Analyze, design and detail retaining walls.

CO 2: Design ground level water tanks.

CO 3: Design and detailing of embankments.

CO 4: Assess the loads considered on the bridges and design the same.

CO 5: Design the special structures like RCC chimneys, bunkers and silos.

UNIT – I:

Retaining Walls: Classification, forces on retaining walls, stability requirements, proportioning of cantilever walls, design and detailing of cantilever retaining wall, principles of counter fort retaining walls.

UNIT – II:

Water tanks: Design requirements, IS: specifications, design of circular water tank with roof slab/dome resting on ground by approximate method/IS code method (by working stress method), design of rectangular water tank with one-way roof slab resting on ground by approximate method/IS code method (by working stress method).

UNIT – III:

Embankments: Types of earthen dams, stability analysis, embankment for highways and railways, construction aspects of embankments and earthen dams.

UNIT – IV:

Bridges: Design loads, live loads due to vehicles, lane definition, load cases, design of concrete slab bridge, introduction to T- beam Girder Bridge and steel bridges.

UNIT – V:

Design of RCC chimneys, bunkers and silos.

TEXT BOOKS:

1. Advanced Reinforced Concrete Structures, Varghese, Prentice Hall of India Pvt. Ltd, 2005.
2. Essentials of Bridge Engineering, D. Johnson Victor, Oxford Publications, 2015.

REFERENCE BOOKS:

1. Reinforced Concrete Structures Vol.2 by B. C. Punmia, Ashok Kumar Jain and Kumar Jain, Laxmi, Publications, 2015.
2. Reinforced Concrete Design, S.Unnikrishna Pillai & Devdas Menon, McGraw Hill Education, 2017.
3. Advanced Reinforced Concrete Structures, Krishna Raju, CBS Publishers, 2005.
4. Bridge Engineering, S. Ponnuswamy, McGraw Hill Education, 2017.

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18CE4109 - Traffic Engineering
(Professional Elective – IV)

B.Tech. CE IV Year, I Sem

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

Prerequisite(s):
18CE3202Transportation Engineering

Course objectives: Develop ability to

1. Learn the concepts Highway Capacity and Level of Service.
2. Classify the methods of parking and Carry out different Parking Surveys.
3. Understand the design principles of intersections.
4. Understand the principles signal timing design and signal coordination
5. Gain knowledge of Traffic related environmental problems and ITS Principles.

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

CO1. Compute the Capacity and Level of Service of Highway facilities.

CO2. Collect and analyze the data on parking spaces.

CO3. Analyze and design various elements of intersections.

CO4. Design the signal timings and draw Phasing plans.

CO5. Identify environmental issues related to traffic and Remedial measures.

UNIT-I:

Traffic Flow Parameters - Categories of Traffic flow- Analysis of speed, flow and density relationship. Highway Capacity and Level of Service: Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways, Multilane highways as per Indian HCM.

UNIT-II:

Parking Analysis and Traffic Safety: Types of parking facilities – On-street parking and Off-street Parking facilities; Parking studies and analysis- Parking Inventory Study, Parking Usage Study by Patrolling, Questionnaire Survey, Cordon Surveys; Evaluation of parking parameters; Parking accumulation, Parking Load, Parking Turnover, Parking Index, Parking Volume. Traffic Safety -Accident studies and analysis; Causes of accidents - The Road, The vehicle, The road user and the Environment; Engineering, Enforcement and Education measures for the prevention of accidents.

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, Regulation Signal Coordination: Traffic Signals –Types of Signals; Principles of Phasing; Timing Diagram; Design of Isolated Traffic Signal by Webster method, Warrants for signalization. Signal Coordination - Signal Co-ordination methods, Simultaneous, Alternate, Simple progression and Flexible progression Systems.

UNIT-V:

Traffic and Environment: Detrimental effects of Traffic on Environment, Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic. Sustainable Transportation: Sustainable modes, Transit Oriented Development, ITS based benefits for Environment.

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. Principles of Highways Engineering and Traffic Analysis, Fred Mannering & Walter Kilareski, John Wiley & Sons Publication, 2007.
3. Transportation Engineering - An Introduction - C. Jotin Khisty, Pearson India Education services Pvt. Ltd. Publication, 2017.
4. Indian Highway Capacity Manual(Indo-HCM) CSIR Publications- Central Road Research Institute, New Delhi-110025, December 2017.

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18CE4110 – Prestressed Concrete Structures
(Professional Elective – IV)

B. Tech. CE IV Year, I Sem

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

Prerequisite(s):
18CE3201 – Design of Reinforced Concrete Structures.

Course objectives: Develop ability to

1. Summarize basic concepts of Prestressed concrete.
2. Narrate the systems of Prestressing and losses of prestress.
3. Analyse and design prestressed beams.
4. Analyse and design 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

CO 1: Discuss the basic concepts of prestressed concrete.

CO 2: Articulate the systems of prestressing and estimate the losses of prestress.

CO 3: Analyze and design prestressed beams.

CO 4: Perform shear and deflection related analysis and carryout end block design for transfer of prestress.

CO 5: Explain the concepts of post tensioning for precast systems

UNIT – I:

Introduction: Historic development, basic concepts, terminology, materials, concrete, steel, necessity of high grade concrete and steel, advantages of PSC, classification and types, tensioning devices, pre and post tensioning system, assumptions, general principles, analysis of beams with concentric tendon, eccentric tendon, beams with bent tendon.

UNIT – II:

Systems of Pre-Stressing: Classification of members, pre-tensioning methods, 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 tendon, design, lever arm concept.

UNIT – IV:

Shear Analysis: Introduction, basic principle and design for shear.

Deflection: Short term deflection, control of deflections, factors influencing, permissible deflection.

Transfer of Pre-stress: Introduction, end block, mangnel method, Guyon's method, cable at an eccentricity, IS code provisions.

UNIT – V:

Post-tensioning for pre-cast systems: Introduction, Stress distribution in End block, investigation on anchorage zone stresses, anchorage zone reinforcement, Design of Post tensioned Beams.

TEXT BOOKS:

1. Prestressed concrete, N. Krishna Raju, McGraw Hill Education, 2012.
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, 2014
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 for Prestressed Concrete.

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18CE4111– Earth Retaining Structures
(Professional Elective – IV)

IV Year. B.Tech. CE– I Semester.

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

Prerequisite(s):
18CE3204 Foundation Engineering

Course objectives: Develop ability to

1. Understand lateral earth pressure theories and design of retaining walls.
2. Design of cantilever sheet pile wall.
3. Understand 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 without anchors .

CO4. Estimate the forces on a struts in a 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 – concepts and drawbacks –graphical methods.

UNIT–II:

Types of earth retaining structures – classifications – specifications .Retaining walls – types – Design specifications

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: Arching in Soils - Soil Pressures on Braced Walls and stability of vertical cuts, lateral pressures in sand and clay.

UNIT–V:

Introduction - Embankment type, sheet pile cofferdam, braced coffer dam, double wall coffer dam, cellular coffer dam – circular, diaphragm type.

TEXT BOOKS:

1. Foundation Analysis and Design, J. E. Bowels , McGrawHill Education; 5 edition 2017
2. Principles of Foundation Engineering , B.M .Das,Cengage India Private Limited; Eighth edition, 2017

REFERENCE BOOKS:

1. Advanced Foundation Engineering ,V.N.S.Murthy,CBS publishers ,(30 January 2010)
2. Geotechnical Engineering ,ManojDatta and S Gulhati, McGraw Hill Education; 1st edition (1 July 2017)
3. Foundation Engineering , P.C. Varghese, Prentice Hall India Learning Private Limited (2005)

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18CE4112 – Solid Waste Management
(Professional Elective – IV)

B. Tech. CE IV Year, I Sem
Prerequisite(s): None.

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

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 – Landfills reclamation.

UNIT–V:

Hazardous waste Management: Sources and characteristics – Effects on environment – Risk assessment – Disposal of hazardous wastes – Secured landfills – Incineration – Monitoring-Biomedical waste disposal – E-waste management – Nuclear Wastes – Industrial waste management.

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. Solid Waste Engineering, Vesilind PA, Worrell W and Reinhart D, Cengage Learning, 2010.
2. Criteria for Hazardous waste landfills, CPCB guideline, 2000.
3. Standard Handbook of Hazardous Waste Treatment and Disposal, Harry M. Freeman, McGraw Hill Education, 1997.
4. Management of Solid waste in developing countries, Frank Flintoff, WHO regional publications.
5. Central Pollution Control Board (CPCB) guidelines: http://cpcb.nic.in/

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18CE41L1 – Structural Analysis and Design Lab

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

IV Year. B.Tech. CE– I Semester.
Prerequisite(s):
18CE3201–Design of Reinforced Concrete Structures

Course objectives: Develop ability to analyse and design of

1. Beams, 2D and 3D frames.
2. Multistory building frames under different loading combinations.
3. Commercial complex under different loading conditions.
4. Rectangular water tanks.
5. Steel roof trusses.

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

CO1. Analyze a continuous beam using suitable software package.

CO2. Analyze and design a multi-storey building under different load combinations.

CO3. Analyze and design commercial complex under different load combinations.

CO4. Analyze and design water tanks.

CO5. Analyze and design steel roof trusses.

LIST OF EXERCISES:

Analyse:

1. Continuous beam – calculate SFD, BMD and Elastic curve.
2. 2D and 3D frame-calculating SFD and 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 storied building.
6. Commercial complex.
7. Multi-storey building with gravity loads and wind loads.
8. Multi-storey building with gravity loads and seismic loads.
9. Rectangular water tank.
10. Roof trusses.

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18CE41L2 – Environmental Engineering Lab

B. Tech. CE IV Year, I Sem

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

Prerequisite(s):
18CH1201 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

CO1. Select suitable equipment and chemicals required to perform experiments.

CO2. Estimate water characteristics of given samples and compare with IS 10500 specification.

CO3. Analyze the given wastewater samples for various parameters.

CO4. Determine optimum coagulant dosage.

CO5. 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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18MB41L1 – Operations Research Lab

B. Tech. CE IV Year, I Sem

Pre-requisites: None

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

Course Objectives: Develop ability to

1. Students will understand the significance of Operations Research concept and techniques and formulation of LPP models.
2. Students will understand the Algorithms of Graphical and Simplex Methods.
3. Students will understand the Transportation and Assignment techniques.
4. Students will understand the concepts of sequencing and Replacement.
5. Students will understand the concepts of Game theory and Inventory Control.
   Students will understand the concepts of queuing theory and DPP.

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

CO1: Write and execute programs related to managerial decision problem into a mathematical model.

CO2: Write and execute programs related to engineering and managerial situations as Transportation and Assignment problems.

CO3: Write and execute programs related to sequencing and replacement concepts in industry applications

CO4: Write and execute programs related to game theory and inventory concepts in industry applications

CO5: Write and execute programs related to multi-stage applications into a dynamic programming framework and Apply queuing theory concepts in industry applications

LIST OF EXPERIMENTS:

1. Write a program to solve a given graphical linear programming problems using Excel solver/C
2. Write a program to solve a given simplex problems using Excel solver/C
3. Write a program to solve a given transportation problems using Excel solver/C

4. Write a program to solve a given assignment problems using Excel solver/C
5. Write a program to solve a given n job 2 machine Sequencing problem
6. Write a program to solve a given n job 3 machine Sequencing problem
7. Write a program to solve a given n job m machine Sequencing problem
8. Write a program to solve a given replacement problem when money value change with time.
9. Write a program to solve a given group replacement problem.
10. Write a program to solve a given Two-Person Zero-Sum pure and mixed strategy game
11. Write a program to solve a given theory of game problems without saddle point
12. To determine the performance measures for M/M/1 queuing model.
13. To determine the performance measures for M/M/1/N queuing model.
14. To determine the performance measures for M/M/C/∞ queuing model.
15. To determine the performance measures for M/M/C/N queuing model.
16. Write a program to solve a given dynamic programming problem

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18CE4113 – Mini-Project

IV Year. B.Tech. CE– I Semester.

Prerequisite(s): None

L	T	P/D	C
-	-	-/-	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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18CE4201 – Estimation and Costing

B. Tech. CE IV Year, II Sem

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

Prerequisite(s):
18CE2104 Building Materials, Construction & Planning
18CE31L1 Computer Aided Drafting of Buildings Lab
18CE3201 Design of Reinforced Concrete Structures

Course objectives: Develop ability to

1. Gain knowledge on the process of estimations required for various works in construction.
2. Identify the preparation of bar bending schedule for reinforcement works.
3. Study the calculation of earth work quantity for roads and canals.
4. Understand the rate analysis for various items of work and to prepare an abstract estimate.
5. Prepare a contract document .

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

CO 1: Explain various estimation methods and standard principles.

CO 2: Perform detailed estimation of buildings and Reinforcement bar bending.

CO 3: Prepare earthwork quantity for roads and canals.

CO 4: Analyze rates for various items of works in Civil construction.

CO 5: Explain the various types of contracts and 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.

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:

Contracts – Types of contracts – Contract Documents – Conditions of contract.

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 – Building information Modelling (BIM).

TEXT BOOKS:

1. Estimating and Costing, B.N. Dutta, UBS publishers, 2016.
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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18CE4202 - Railways and Airport Engineering
(Professional Elective – V)

B.Tech. CE IV Year, II Sem

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

Prerequisite(s):
18CE3202Transportation Engineering

Course objectives: Develop ability to

1. Understand the principles of Railway Track alignment and methods of engineering surveys.
2. Understand the Geometric Design Elements of a Railway Track.
3. Learn the Principles of signaling and Interlocking.
4. Understand Concepts of planning of airports.
5. Carry out the geometric design of Runway and Taxiway.

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

CO1. Carry out Engineering Surveys for Railway Track alignment.
CO2. Design the Geometric Elements of a railway Track.
CO3. Gain Knowledge of Methods of Track Construction and maintenance.
CO4. Develop Knowledge of planning of airports.
CO5. Design the Geometric elements of runway and Taxiway.

UNIT – I:

Railway Planning, Alignment and surveys: Railway network planning –Factors controlling railway track alignment -Engineering Surveys for Railway track alignment –EIA for Railway Projects.

UNIT – II:

Railway track and its components –Specifications for tracks on Indian Railways, Geometric design of Railway tracks- Introduction, Gradient, Horizontal curves super elevation, widening of gauges on curves, Transition Curves summit, and Valley Curves.

UNIT – III:

Points and crossings, signaling, Interlocking and Track circuiting. Methods of Railway track construction, Introduction to High speed tracks. Railway track maintenance:Conventional and mechanized methods- Introduction to Modern Trends in railway track maintenance.

UNIT – IV:

Introduction – aircraft characteristics and their influence on planning of airports – Airport obstructions and zoning –Component parts of airport and site selection –Terminal area planning – Facilities in terminal area and their planning concepts, aircraft packing configurations.

UNIT – V:

Runway Orientation, Basic Runway Length – corrections. Geometric design of runway and taxiways–Design considerations of exit taxiways. Need for air traffic control – Air Traffic Control Network – Air Traffic Control Aids.

TEXT BOOKS:

1. Railway Engineering, Satish Chandra & M. M. Agarwal, Oxford University Press, 2016.
2. Airport Engineering: Planning, Designand Development of 21st Century Airports,Norman J. Ashford, Saleh Mumayiz, Wiley Publisher, 2011.

REFERENCE BOOKS:

1. A Textbook of Railway Engineering, S.C. Saxena and S.P. Arora, Dhanpat Rai Publishers, 2017.
2. Airport Planning and Design- S.K. Khanna and M.G Arora, Nemchand Bros., 1999.
3. Highway Railway Airport and Harbour Engineering, K.P. Subramanian, Scitech Publications, 2010.
4. Transportation Engineering Vol-II, C. Venkataramaiah, Orient Blakswan Pvt Ltd, 2017.

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18CE4203 – Industrial Wastewater Management
(Professional Elective – V)

B. Tech. CE IV Year, I Sem

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

Prerequisite(s): 18CE4102 – Environmental Engineering.

Course objectives: Develop ability to

1. Distinguish between the quality of domestic and industrial wastewaters.
2. Understand the effect of disposing industrial wastewaters into the environment.
3. Understand collection, conveyance, treatment and disposal of industrial wastewaters.
4. Examine the manufacturing process of various industries and effluents disposed by them.
5. Understand the need for common effluent treatment plants.

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

CO1. Identify various sources of pollution and differentiate between industrial and municipal wastewaters and list its effect on environment.

CO2. Explain preliminary and primary treatment of industrial wastewaters.

CO3. Explain advanced industrial wastewater treatment methods and its disposal.

CO4. Explain manufacturing processes and composition of different industrial wastewaters.

CO5. Design common effluent treatment plants and suggest solutions to overcome their operation and maintenance problems.

UNIT – I:

Sources of Pollution – Physical, Chemical, Organic and Biological properties of Industrial wastes – Differences between industrial and municipal wastewaters - Effects of industrial effluents on sewers and Natural water Bodies.

UNIT – II:

Pre and Primary Treatment – Equalization, Proportioning, Neutralization, Oil Separation by Floatation – Waste Reduction – Volume Reduction ¬ Strength Reduction

UNIT – III:

Waste Treatment Methods – Nitrification and De-nitrification – Phosphorous removal – Heavy metal removal – Membrane Separation Process – Air Stripping and Absorption Processes – Special Treatment Methods - Disposal of Treated Wastewater.

UNIT – IV:

Characteristics and Composition of wastewater and Manufacturing processes of Industries like Sugar, Characteristics and Composition of Industries like Food Processing Industries, Steel and Petroleum Refineries.

UNIT – V:

Characteristics and Composition of Industries like Textiles, Tanneries, Atomic Energy plants and other Mineral Processing Industries – Joint Treatment of Raw Industrial wastewater and Domestic sewage - Common Effluent Treatment Plants (CETP) – Location, Design, Operation and Maintenance Problems – Economical aspects.

TEXT BOOKS:

1. Industrial Wastewater Treatment, A.D. Patwardhan, PHI Learning, 2017.
2. Industrial Waste Water Pollution Control, W Wesley Eckenfelder, McGraw-Hill, 2nd edition.

REFERENCE BOOKS:

1. Wastewater Treatment, M.N. Rao and A.K Datta, Oxford & Ibh, 2017.
2. Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy, McGraw Hill, 2017.

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18CE4204 – Soil Dynamics and Machine Foundation
(Professional Elective – V)

IV Year. B.Tech. CE– II Semester.
Prerequisite(s):
18CE3204 Foundation Engineering

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

Course objectives: Develop ability to

1. Familiarize students with wave propagation and the dynamic properties of soil
2. Understand importance of designing machine foundation for reciprocation and impact machines
3. Understand 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 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 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 behaviour of cyclically loaded soils, Strength of cyclically loaded soils, Dynamic soil properties - field testing techniques,

Natural frequency of foundation soil system- Barkan's and I.S methods of determining natural frequency. Tschebotarioff's reduced natural frequency

UNIT–III:

Liquefaction of soils: Definitions,Mechanism of liquefaction,laboratory studies, Dynamic triaixal tests, cyclic simple shear test,comparision of cyclic stress causing liquefaction under triaxial and shear tests. Standard curves and correlation for liquefaction,

UNIT–IV:

Vibration Isolation: Types & 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 foundation. General requirements, permissible amplitudes and bearing pressures. Analysis and design requirements of foundations for rotary, reciprocating and impact type of machines as per I.S code

TEXT BOOKS:

1. Soil Dynamics and Machine Foundations, Swami Saran,Galgotia Publications (P) Ltd, 2016.
2. Foundation for Machines: Analysis and Design, Prakash Shamsher and Vijay K. Puri, John Wiley & Sons, 2004.

REFERENCE BOOKS:

1. Handbook of Machine Foundations, P. Srinivasalu 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, IndrajitChowdhury and Shambu P.Dasgupta, CRC Press, 2008.

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18CE4205 – Rehabilitation and Retrofitting of Structures
(Professional Elective – V)

B. Tech. CE IV Year, II Sem

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

Prerequisite(s):
18CE3201 – Design of Reinforced Concrete Structures.

Course objectives: Develop ability to

1. Understand the concepts of distress in structures and its prevention.
2. Understand corrosion of steel reinforcement, fire related damage and their prevention.
3. Assess structural damage by NDT.
4. Understand suitable rehabilitation techniques for a damaged structure.
5. Understand health monitoring of structures.

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

CO1. Comprehend the causes of deterioration of structures and their prevention.

CO2. Explain the damage to structures due to corrosion, fire and their preventive measures.

CO3. Diagnose a structure by NDT for damage assessment.

CO4. Recommend suitable repair and retrofitting techniques to rehabilitate a damaged structure.

CO5. Employ suitable instrumentation to monitor the health of structures.

UNIT – I:

Introduction, deterioration of Structures, distress in structures, causes and prevention. mechanism of damage, types of damage.

UNIT – II:

Corrosion of steel reinforcement, causes, mechanism and prevention, damage of structures due to fire, fire resisting of structures, phenomena of desiccation, carbonation of concrete.

UNIT – III:

Inspection and testing, symptoms and diagnosis of distress, damage assessment, NDT.

UNIT – IV:

Repair of structure, common types of repairs, repair in concrete structures, repairs in under water structures, guniting, shortcrete, underpinning, strengthening of structures, strengthening methods, retrofitting, jacketing.

UNIT – V:

Health monitoring of structures, use of sensors, building instrumentation.

TEXT BOOKS:

1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications, 2009.
2. Non-Destructive Evaluation of Concrete Structures, J.M. Bungey, Surrey University.
3. Diagnosis and treatment of structures in distress, R.N. Raikar, 1994.

REFERENCE BOOKS:

1. Maintenance, Repair and Rehabilitation and Minor works of buildings, P.C. Varghese, PHI Learning, 2014.
2. Monitoring and Assessment of Structures, Graham Armer, CRC Press, 2001.
3. Building Failures: Diagnosis and Avoidance, W.H. Ransom, Routledge.
4. Defects and Deterioration in Buildings, B.A. Richardson, EF & N Spon Press, London.
5. Concrete Repair and Maintenance Illustrated, W.H. Ranso, RS Means Company Inc, 1991.
6. Building Failures: Diagnosis and Avoidance, B.A. Richardson, EF & N Spon Press, 1991.
7. Concrete Technology by A.R. Santakumar, Oxford University press, 2006.

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18CE4206 – Elements of Earthquake Engineering
(Professional Elective – V)

B. Tech. CE IV Year, II Sem

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

Prerequisite(s):
18CE3201 – Design of Reinforced Concrete Structures.

Course objectives: Develop ability to

1. Know basic concepts of Earthquake Engineering.
2. Comprehend the concepts of response spectrum.
3. Describe the basic concepts of Earthquake Resistant Design.
4. Correlate the IS codal proportions of Earthquake Resistant design and capacity design.
5. Explain about Earthquake disaster management and mitigation.

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

CO1. Articulate the basic concepts of Earthquake Engineering.

CO2. Generate site specific response spectrum.

CO3. Explain the basic concepts of Earthquake resistant design of RC structures.

CO4. Comprehend the concept of capacity design.

CO5. Recommend measures for the Earthquake disaster management and mitigation.

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, epicental distance, focal depth, etc. ground motion and their characteristics, factors affecting ground motions.

UNIT – II:

Concept of response spectra, generation of site- specific spectrum, estimation of PGA, earthquake design spectrum and inelastic spectra.

UNIT – III:

Concept of earthquake resistant design, design philosophy, four virtues of EQRD: stiffness, strength, ductility and configurations.

UNIT – IV:

Introduction to Capacity design concepts, introduction to IS: 1893 (I-V), IS 4326, seismic forces on nonstructural elements.

UNIT – V:

Introduction to earthquake disaster management and mitigation.

TEXT BOOKS:

1. Earthquake resistant design and risk reduction by Dowrick, D. J., John Wiley& Sons publications, 2009.
2. Earthquake spectra and design-Earth system dynamics by Newmark, N. M & Hall, W. J,1982.

REFERENCE BOOKS:

1. Earthquake Resistant Design of Structures by Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India, 2009.
2. Earthquake Resistant Design of Structures by S. K. Duggal, Oxford University press, 2007.
3. Earthquake Resistant Engineering Structures by C. A. Brebbia, WIT press, 2011.
4. Earthquake Resistant Engineering Structures: Design, Build and Retrofit by Mohiuddin Ali Khan, Elsevier Science & Technology, 2012.
5. Earthquakes by Bruce A Bolt, Freeman and company, New York, 2004.

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18EE4242 – Mico-Electro-Mechanical Systems

(Open Elective – III)

B.Tech. CE IV Year, II Sem

Prerequisite(s): None

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

Course Objectives: Develop ability to

1. Understand semiconductors and solid mechanics used to fabricate MEMS devices.
2. Understand basics of Micro fabrication techniques.
3. Understand various sensors and actuators
4. Understand different materials used for MEMS
5. Understand applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

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

CO1. Identify different types of semiconductor and solid mechanic materials that are used to fabricate MEMS devices.

CO2. Apply basic science, circuit theory, Electro-magnetic field theory, control theory in Micro fabrication techniques

CO3. Distinguish between different sensors and actuators

CO4. Distinguish between various processes involved in Micro machining

CO5. Apply the knowledge of MEMs to other advanced applications such as polymer and optical MEMs

UNIT-I:

Basics: Intrinsic Characteristics of MEMS, Energy Domains and Transducers, Sensors and Actuators, Introduction to Micro fabrication, Silicon based MEMS processes, New Materials, Review of Electrical and Mechanical concepts in MEMS, Semiconductor devices, Stress and strain analysis, Flexural beam bending, Torsional deflection

UNIT-II:

Sensors and Actuators-I: Electrostatic sensors, Parallel plate capacitors, Applications, Inter-digitated Finger capacitor, Comb drive devices, Micro Grippers, Micro Motors, Thermal Sensing and Actuation , Thermal expansion, Thermal couples, Thermal resistors, Thermal Bimorph, Applications, Magnetic Actuators, Micro-magnetic components, Actuation using Shape Memory Alloys

UNIT-III:

Sensors and Actuators-II: Piezoresistive sensors, Piezoresistive sensor materials, Stress analysis of mechanical elements, Applications to Inertia, Pressure, Tactile and Flow sensors, Piezoelectric sensors and actuators, piezoelectric effects, piezoelectric materials, Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT –IV:

Micromachining: Silicon Anisotropic Etching, Anisotrophic Wet Etching, Dry Etching of Silicon, Plasma Etching, Deep Reaction Ion Etching (DRIE), Isotropic Wet Etching, Gas Phase Etchants, Case studies, Basic surface micro machining processes, Structural and Sacrificial Materials, Acceleration of sacrificial Etch, Striction and Antistriction methods

UNIT –V:

Polymer and Optical MEMS Polymers in MEMS, Polimide, SU-8, Liquid Crystal Polymer (LCP), PDMS, PMMA, Parylene, Fluorocarbon, Application to Acceleration, Pressure, Flow and Tactile sensors, Optical MEMS, Lenses and Mirrors, Actuators for Active Optical MEMS.

TEXT BOOKS:

1. Chang Liu, “Foundations of MEMS”, Pearson Education Inc., 2006.
2. Tai Ran Hsu, “MEMS & Micro systems Design and Manufacture” Tata McGraw Hill, New Delhi, 2002.

REFERENCE BOOKS:

1. Nadim Maluf,“ An Introduction to Micro Electro Mechanical System Design”, Artech House, 2000.
2. Stephen D Senturia, “Microsystem Design”, Springer Publication, 2000.
3. Mohamed Gad-el-Hak, editor, “ The MEMS Handbook”, CRC press Baco Raton, 2000
4. Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, “Micro Sensors MEMS and Smart Devices”, John Wiley & Son LTD,2002
5. James J.Allen, “Micro Electro Mechanical System Design”, CRC Press Publisher, 2010
6. Thomas M.Adams and Richard A.Layton, “Introduction MEMS, Fabrication and Application,” Springer 2012.

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18ME4243 - Principles of Automobile Engineering

(Open Elective-III)

B.Tech. CE IV Year, II Sem

Pre-requisites: None

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

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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18EC4244 - 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 systems.

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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18CS4245 - Database Systems
(Open Elective III)

B.Tech. CE IV Year, II Sem

Prerequisites: None

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

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 Databases: Data analysis, data mining, data warehousing, spatial and geographical, multimedia database, mobility and personal database, distributed information system. World Wide Web, OLAP

TEXT BOOK(S):

1. Database System Concepts, Abraham Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education(India) Private Limited , 6th edition.

REFERENCE BOOK(S):

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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18MB4246 – Entrepreneurship
(Open Elective – III)

B.Tech. CE IV Year, II Sem
Pre Requisites: **None.**

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

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, the 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.

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18CE4207 – Technical Seminar

IV Year. B.Tech. CE– II Semester.

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.

18CE4208 – Major Project

IV Year. B.Tech. CE– II Semester.

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.