ACADEMIC REGUALTIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

CIVIL ENGINEERING

For CBCS BASED B.TECH – FOUR YEAR PROGRAM
(Applicable for the batches admitted from AY 2016-17)

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Cheeryal (V), Keesara (M), Medchal. Dist., - 501 301

ACADEMIC REGULATIONS 2016
For CBCS Based B.Tech. PROGRAMMES

(Effective for the students admitted into I year from the
Academic Year **2016-17** and onwards)

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

Geethanjali College of Engineering and Technology (GCET) offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2016 - 17 onwards, 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.	Mechanical Engineering

2.0   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.

3.0   B.Tech. Programme Structure

3.1   The B.Tech. Programmes of GCET are of semester pattern, with 8 semesters constituting 4 academic years, each academic year having TWO semesters (first/odd and second/even semesters). Each semester shall be of 21 weeks duration (inclusive of examinations), with a minimum of 90 working days per semester.

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 4 (Four) academic years (8 semesters), with each academic year being divided into two semesters of 21 weeks (minimum of 90 working days) each, which includes instruction period, preparation and examinations period; each semester having - '**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) courses;
- One credit - for two hours/ week/ semester for Laboratory/Practical (P) Courses or Drawing Periods (D).
- Two credits for three hours/ week/ semester for Laboratory/Practical (P) Courses or Drawing Periods (D).
- One credit for two hours / week /semester for activity oriented course "Logical reasoning".
- 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) HS (Humanities and Social Sciences), (ii) BS (Basic Sciences), and (iii) ES (Engineering Sciences);

- Core Courses (CoC) and Elective Courses (EℓC)   are categorized as PS (Professional Courses), which are further subdivided as – (i) PC (Professional/ Departmental Core) Courses, (ii) SC (Soft Core Courses - professional courses which

can be opted from the given list along with the associated lab component) (iii) PE (Professional/ Departmental Electives) , (iv) OE (Open Electives); and (v) Project Works (PW);
- Minor Courses (1 or 2 Credit Courses, belonging to HS/ BS/ ES/ PC as per relevance).
- Mandatory course(s) (MC – Non credit oriented)

4.0   Course Work for B.Tech. Programme

4.1   A student, after securing admission, shall pursue the B.Tech. programme in a minimum period of 4 academic years, and a maximum period of 8 academic years (starting from the date of commencement of I Year).

4.2   Each student shall register for and secure the specified number of credits required for the completion of the B.Tech. programme and award of the B.Tech. degree in respective branch of Engineering.

4.3   Each semester is structured to provide typically 24 Credits (24 C), totalling to 192 credits (192 C) for the entire B.Tech. programme.

5.0   Course Registration

5.1   A 'Faculty Advisor or Counselor' shall be assigned to each student, who shall advise him about the B.Tech. programme, its structure along with curriculum, choice/option for courses, based on his competence, progress, pre-requisites and interest.

5.2   A Student may be permitted to Register for Course of his CHOICE with a typical total of 24 Credits per Semester (Minimum being 20 C and Maximum being 28 C, permitted deviation being ± 17%), based on his PROGRESS and SGPA/ CGPA, and study of the 'PRE-REQUISITES' as indicated for various Courses, in the Department Course Structure and Syllabus contents. However, a MINIMUM of 20 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

5.3   Choice for 'additional courses' to reach the Maximum Permissible Limit of 28 Credits (above the typical 24 Credit norm) must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/ Counselor.

5.4   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'.

5.5 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 the Head of the Department (a copy of the same being retained with Head of the Department, Faculty Advisor and the student).

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

5.7 Course options exercised and approved by Faculty Advisor are final and CAN NOT be changed, and CANNOT be inter-changed; further, alternate choices shall also not be considered. However, if the course that has 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 a new course (subject to offering of such a course), or for another existing course 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.

5.8 For **Mandatory Courses** like NCC/ NSS/ NSO etc., a '**Satisfactory Participation Certificate'** from the concerned authorities for the relevant semester is essential. No Marks or Grades or Credits shall be awarded for these activities.

6.0 Courses to be offered

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

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

6.3 More than ONE INSTRUCTOR may offer the SAME COURSE (Lab./Practicals may be included with the corresponding Theory course in the same semester) in any semester.

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

6.5   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'.

7   Attendance Requirements

7.1   A student shall be eligible to appear for the Semester End Examinations, if he acquires a minimum of 75% of attendance in lectures/tutorials/practicals/drawing/projects/seminars in aggregate of all the courses for that semester.

7.2   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.

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

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

7.5   Students, whose shortage of attendance is not condoned in any semester, are not eligible to take their Semester End Examinations and 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 courses 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 courses, namely, professional elective(s), soft-core with associated lab 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.

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

8   Academic Requirements

The   following   academic requirements have to be satisfied,   in addition to   the attendance requirements mentioned in Section No.**7.**

8.1   A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if he secures not less than 35% marks (for e.g. 25 out of 70 marks in theory course) 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.

8.2   A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Industry oriented Mini-Project/ Seminar, if he secures not less than 40% of the total marks to be awarded for each.   The student would be treated as failed, if he - (i) does not submit a report on his Industry Oriented Mini-Project, or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule, or (ii) does not present the Project Seminar as required in the IV year I Semester, or (iii) does not present the Technical Seminar as required in the IV year II Semester or (iv) secures less than 40% of marks in Industry oriented Mini-Project/ Seminar evaluations.

He may reappear once for each of the above evaluations, 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.

8.3   Promotion Rules

8.3.1   Case (i):A student registers for 24 credits or more in each semester as per the provision in section 5.2

8.3.1.1 A student shall not be promoted from I Year to II Year, unless he fulfils the attendance and Academic Requirements and secures a minimum of 24 credits out of 48   credits or more the student has registered in first year, from all the relevant regular and supplementary examinations, whether he   takes those examinations or not.

8.3.1.2 A student shall not be promoted from II Year to III Year, unless he fulfils the attendance and Academic Requirements and secures a minimum of 58 credits out of 96   credits or more the student has registered   up to and including II   Year   II Semester, from all the relevant regular and supplementary   examinations, whether he takes those examinations or not.

8.3.1.3 A student shall not be promoted from III Year to IV Year, unless he fulfils the attendance   and Academic Requirements and secures a minimum of 86 credits out of 144   credits or more the student has registered up to and including III   Year II

Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.2 Case (ii): A student registers for NOT less than 20 credits and less than 24 credits in each semester

8.3.2.1 A student shall not be promoted from I Year to II Year, unless he fulfils the attendance and Academic Requirements and secures a minimum of 50% of the credits registered in first year, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.2.2 A student shall not be promoted from II Year to III Year, unless he fulfils the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including II year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.2.3 A student shall not be promoted from III Year to IV Year, unless he fulfils the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including III year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.4 A Student shall register for all courses covering 192 credits as specified and listed (with the relevant courses as mentioned) in the Programme Structure, put up all the Attendance and Academic requirements for 192 Credits securing a minimum of C Grade (Pass Grade) or above in each course, and 'earn ALL 192 Credits securing SGPA ≥ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) ≥ 5.0, to successfully complete the B.Tech. Programme.

8.5 A student must secure the necessary 192 credits as specified for the successful completion of the entire B.Tech. programme (see section 12.1); however, only 186 credits shall be considered for evaluating his overall performance for the award of class as provided for under section 12.0. These 186 credits shall be arrived at by leaving out two courses (one from open elective courses and one from professional elective courses) carrying a total of 6 credits, which have the least Grade point scores.

8.6 Students who fail to earn 192 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.

8.7   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.

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

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

9.   Evaluation - Distribution and Weightage of Marks

9.1   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 courses, namely,   theory, drawing,   practicals,   seminar (Project, Technical), Major project, Industry Oriented Mini-Project, Comprehensive Viva-Voce, Minor Courses etc. The evaluations are as follows:

- Theory, practical, drawing and major project courses shall be evaluated based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination),
- Technical seminar and Major project seminar shall be evaluated based on 100% CIE (Continuous Internal Evaluation)
- Industry Oriented mini-project and comprehensive Viva-Voce shall be evaluated based on 100% SEE (Semester End Examination)

A letter grade corresponding to the % marks obtained shall be given for all courses.

9.2 a)
   i. For theory courses (inclusive of Minor Courses), 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 15 marks, with a duration of 120 minutes (20 minutes for objective and 100 minutes for subjective papers). Further, there shall be an allocation of 5 marks for assignment. The objective paper is set with multiple choice questions, True/ False, fill-in the blanks, matching type questions and short answer questions. Subjective paper shall contain 3 questions with internal choice, each for 5 marks. All three questions are to be answered.

ii. For "Logical Reasoning", a minor course, which is activity oriented, there shall be a continuous internal evaluation (CIE) during the semester for a total of 30 marks.

b) 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.

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

d) The first mid-term examination marks and first assignment marks shall make one set of CIE marks , and the second mid-term examination marks and second assignment marks 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.

e) The details of the question paper pattern for Semester End Examination 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: The question (numbered 01) under Part A consists of ten sub questions, two from each unit of the prescribed syllabus of the course. Each sub question carries 2 marks. All sub questions are compulsory.
- Part – B consists of five questions (numbered from 02 to 06), one each from the five units of the prescribed syllabus of the course. Each question carries 10 marks and may contain sub questions. For each question, there shall be an internal choice (it means, there shall be two questions from each unit, and the student should answer any one question). The student must answer all the questions of Part B.

Absence in mid-term examination(s):
- If any student is absent in one mid-term examination for any course on health grounds / any valid reasons approved by the College Academic Committee, only one test shall be conducted on all units by the college in each course at the end of each semester.
- If any student is absent in both mid-term examinations for any course on health grounds / any valid reasons approved by the College Academic Committee, only one test for 25 marks shall be conducted on all units and the marks secured out of 25 shall be divided by two, which shall be awarded against the said mid-term examination(s) after the student pays the prescribed fee.

9.3 For practical courses, there shall be a Continuous Internal Evaluation (CIE) during the semester for 30 marks, and 70 marks are assigned for lab/practical Semester End Examination (SEE). Out of the 30 marks for CIE, day-to-day work in the laboratory shall be evaluated for 15 marks; and for the remaining 15 marks - two internal practical tests (each of 15 marks) that include viva-voce shall be conducted by the concerned laboratory instructor and 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 internal examinations:
- If any student is absent in one laboratory internal examination for any laboratory course on health grounds / for any valid reasons approved by the College Academic Committee, only one test shall be conducted for 15 marks on 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 on health grounds / for any valid reasons approved by the College Academic Committee, only one test shall be conducted on all experiments and the marks secured out of 15 marks shall be divided by two, which shall be awarded against the said laboratory internal examinations.

9.4 For the courses having design and/or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Production Drawing Practice, and Estimation), the distribution shall be 30 marks for CIE (20 marks for day-to-day work, and 10 marks for internal tests) and 70 marks for SEE. There shall be two internal tests in a semester and the average of the two shall be considered for the award of marks for internal tests.

9.5 **Open Electives**: Students are to choose Open Elective(s) as per their programme structure.

9.6 a) There shall be an Industry Oriented Mini-Project, in collaboration with an industry of the relevant specialization, to be registered immediately after III Year II semester examinations, and taken up during the summer vacation for four weeks duration.

b) The industry oriented mini-project 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 of Mini-Project, and two Professors /Assoc-Professors faculty members of the department. There shall be no internal marks for industry oriented Mini-Project. The mini-project shall be evaluated at the end of IV Year I Semester.

9.7 There shall be a project seminar presentation in IV Year I semester. For the project Seminar, the student shall collect the information/ literature on the project, prepare a report, submit the same, and present as a seminar, which shall be evaluated as CIE for 100 marks by the project seminar review committee. The committee shall consist of Head of the Department, the supervisor of project, and two Professors/Associate professors of the department.

9.8

9.8.1 There shall be a technical seminar presentation in IV year II Semester. For the technical seminar a student shall collect information on a specialized technical topic, prepare a technical report and submit to the department at the time of Technical Seminar presentation. The Technical Seminar presentation (along with the Technical Report) shall be evaluated by Two Professors /Assoc-Professors and Head of the Department, for 100 marks. There shall be no SEE for seminar.

9.8.2 For courses, namely, "Gender Sensitization" and "Human Values and Professional Ethics", which are activity oriented minor courses of two credits, there shall be a SEE for Seventy (70) marks which shall be conducted with internal examiner(s) only.

9.8.3. For "Logical Reasoning" an activity oriented course, there shall be a SEE for Seventy (70) marks which shall be conducted with internal examiner(s) only.

9.9 There shall be a comprehensive viva-voce examination (SEE) for 100 marks in IV year II semester. It shall be conducted by an external examiner, Head of the department and two Professors / Assoc-Professors of the department.

9.10 Each student shall start the major project work during the IV Year I Semester, as per the instructions of the project guide/ project supervisor assigned by the Head of Department. Out of a total 100 marks allotted for the major project work, which shall be evaluated in IV year II semester, 30 marks shall be for CIE (Continuous Internal Evaluation) and 70 marks for the SEE (End Semester Viva-voce Examination). The project viva-voce shall be conducted by a committee comprising an external examiner, Head of the Department and project supervisor. Out of 30 marks allocated for CIE, 15 marks shall be awarded by the project supervisor (based on the continuous

evaluation of student's performance throughout the Project Work period), and the other 15 marks shall be awarded by a Departmental Committee consisting of Head of the Department and Project Supervisor, and two Professors/Assoc-Professors, based on the work carried out and the presentation made by the student during internal reviews (at least two internal reviews shall be conducted).

10.0   Grading Procedure

10.1   Marks shall be awarded to indicate the performance of each student in each theory course, or lab/practicals, or project seminar, technical seminar, or major project, or mini-project based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in section 9 above, and a corresponding letter grade shall be given.

10.2   As a measure of the student's performance, a 10-point absolute grading system using the following letter grades (UGC Guidelines) and corresponding percentage of marks shall be followed as mentioned in the table 10.2. Please also refer to section 8.

Table 10.2: Absolute grading system

% of Marks Secured in a course	*Letter Grade (UGC Guidelines)*	*Grade Points*
More 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**

10.3 A student obtaining F Grade in any course shall be considered '**FAILED**' and shall be required to reappear as 'supplementary candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his internal marks (CIE Marks) in those course(s) shall remain the same as those obtained earlier.

10.4 A letter grade does not imply any specific % of Marks.

10.5 In general, a student shall not be permitted to repeat any course(s) only for the sake of 'grade improvement' or 'SGPA/ CGPA improvement', However, he has to repeat all the courses pertaining to that semester, when he is detained due to shortage of attendance as listed in section 8.7.

10.6 A student earns Grade Point (GP) in each Course, on the basis of the letter grade obtained by him in that course. Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Course.
Credit Points (CP) = Grade Point (GP) x Credits …. for a course

10.7 The Student passes the course only when he gets GP $\geq$ 5 (C grade or above).

10.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a semester, by the Total Number of Credits registered during that semester. SGPA is rounded off to TWO decimal places. SGPA is thus computed as

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

where 'i' is the course indicator index (takes into account all courses in a semester), 'N' is the no. of courses 'REGISTERED' for the semester (as specifically required and listed under the Program Structure of the parent department), 'C_i' is the no. of credits allotted to the ith course, and 'G_i' represents the Grade Points (GP) corresponding to the letter grade awarded for that i^{th} course.

10.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in ALL registered courses in ALL semesters, and the total number of credits registered in ALL the semesters. CGPA is rounded off to TWO decimal places. CGPA is thus computed from the I Year second semester onwards, at the end of each semester, as per the formula

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

where 'M' is the TOTAL no. of courses (as specifically required and listed under the Course Structure of the parent department) the Student has

'REGISTERED' from the 1ˢᵗ semester onwards up to and inclusive of the semester S (obviously M > N), 'j' is the course indicator index (takes into account all Courses from 1 to S Semesters),'C_j' is the no. of credits allotted to the jth course, and 'G_j' represents the Grade Points (GP) corresponding to the letter grade awarded for that j^{th} Course. After registration and completion of I Year I semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

10.10 For merit ranking or comparison purposes, or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs shall be used.

10.11 For calculations listed in sections 10.6 through 10.10, performance in FAILED courses (securing F Grade) shall also be taken into account, and the credits of such courses shall also be included in the multiplications and summations.

10.12 Passing Standards:

10.12.1 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 in each semester (during the entire B.Tech. Programme) for award of the degree.

10.12.2 After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) 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 courses registered (course code, title, no. 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 10.6 through 10.10.

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

$$\text{\% of Marks} = (\text{final CGPA} - 0.5) \times 10$$

12.0 Award of Degree

12.1 A student who registers for all the specified courses 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 192 credits (with CGPA ≥ 5.0), within 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 8.5:

12.2.1 Students with final CGPA (at the end of the B. Tech Programme) $\geq$ 8.00, and fulfilling the following conditions shall be placed in 'FIRST CLASS with DISTINCTION'-
   i. should have passed all the subjects/courses in 'FIRST APPEARANCE' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of his first academic year,
   ii. should have secured a CGPA $\geq$ 8.00, at the end of each of the 8 sequential semesters, starting from the I Year I 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) $\geq$ 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) $\geq$ 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) $\geq$ 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) $\geq$ 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 medal'.

13.0 **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.

14.0   Transitory Regulations

14.1   General

14.1.1 A Student who has discontinued for any reason, or has been detained for want of attendance or NOT promoted due to lack of required credits as specified, 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 14.2 -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 I year of R09/R13/R15 Regulations of JNTUH due to lack of attendance, shall be permitted to join I year I Semester of AR16 Regulations of GCET and he is required to complete the study of B.Tech. programme within the stipulated period of <u>eight academic years</u> from the date of first admission in I Year.

14.2.2 A student who has been detained in any semester of II, III and IV years of R09/R13/R15 regulations of JNTUH for want of attendance shall be permitted to join the corresponding semester of AR16 regulations of GCET and is required to complete the study of B.Tech. <u>within </u>the stipulated period of <u>eight academic years</u> from the date of first admission in I Year.
The AR16 Academic Regulations of GCET under which a student has been readmitted shall be applicable to that student from that semester which shall include section 14.5

14.3   For students NOT promoted due to shortage of credits:

14.3.1 A student of R09/R13/R15 Regulations of JNTUH who has been detained due to lack of credits, shall be promoted to the next semester of AR16 Regulations of GCET only after acquiring the required credits as per the corresponding regulations of his/her first admission. For subsequent promotions the rule specified in section 14.5 shall be applicable. The student is required to complete the study of B.Tech within the stipulated period of <u>eight academic years</u> from the year of first admission. The AR16 Academic Regulations of GCET are applicable to a student from the year of readmission onwards.

14.4   For all students readmitted under AR16 Regulations of GCET:
14.4.1 A student who has failed in any course under any regulation has to pass those courses in the same regulations.

14.4.2 A student shall acquire a total of 192 credits for the award of degree. These 192 credits shall be the sum of all the credits secured in all the other regulations of his study (subsequent to normalization as per section 14.5) and those secured under AR16 Regulations of GCET.

14.4.3 If a student readmitted to AR16 Regulations of GCET, has any course with about 80% of syllabus in common with his previous regulations, that particular course in AR16 Regulations of GCET shall be substituted by another course to be suggested by GCET.

14.4.4 If a student readmitted to AR16 Regulations of GCET, has not studied any course/topics in his earlier regulations of study which is a prerequisite for further courses in AR16 Regulations of GCET, the College shall arrange to conduct remedial classes to cover those course/topics for the benefit of the students.

14.5   Promotion Rule
Where the credits allotted to a semester/year under the regulations studied in are different from that under AR16 regulations for the corresponding semester/year, the promotion rules of AR16 vide section 8.3 shall be applied after normalization. Normalization is done by scaling down or up the number of credits of a semester/year under the previous regulations to equal the number of credits of the corresponding semester/year under AR16 regulations and revising the secured credits also in the same proportion.

15.0   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 has to pass the failed courses which are equivalent to the courses of GCET, 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 GCET, the student has to study those courses in GCET in spite of 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.

16.0   Scope
 i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".
 ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".
 iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.
 iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.
 v) 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.
 vi) B.Tech (Regular) program is B.Tech 4 year degree program to which students are admitted to I year
 vii) B.Tech LE Scheme refers to the system under which students are admitted to II year of the B.Tech 4 year degree program.

* * * * *

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	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

	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.	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	Student of the colleges expulsion from the examination hall and cancellation of the

or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	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.

ACADEMIC REGULATIONS 2016
For CBCS Based B.Tech. (Lateral Entry (LE) Scheme)

(Effective for the students admitted into II year from the
Academic Year **2017-18** and onwards)

1.0   Eligibility for Admission

1.1   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 (ECET), or the JNTUH, or on the basis of any other order of merit approved by JNTUH, subject to reservations as prescribed by the Government of Telangana from time to time.

Admissions under the Lateral Entry Scheme are made into the Second (II) year of the Four (4) – year degree program

2.0   Course Work:

2.1   A student, after securing admission, shall pursue the B.Tech. programme   in   a minimum period of 3 academic years, and a maximum period of 6 academic years (starting from the date of commencement of II Year).

2.2   Each student shall register for and secure the specified number of credits required for the completion of the B.Tech. programme and award of the B.Tech. degree in respective branch of Engineering.

2.3   Each semester is structured to provide typically 24 Credits, totalling to 144 credits for the entire B.Tech. (LE) programme.

3.0   Promotion rules

3.1   Case (i): A student registers for 24 credits or more in each semester as per the provision in section 5.2 of AR16 regulations of B.Tech (Regular) four year degree program.

3.1.1   A student shall not be promoted from II Year to III Year, unless he fulfils the attendance and Academic Requirements and secures a minimum of 29 credits out of 48 credits or more the student has registered up to and including II Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

Department of Civil Engineering

3.1.2   A student shall not be promoted from III Year to IV Year, unless he fulfils the attendance   and Academic Requirements and secures a minimum of 58 credits out of 96 credits or more the student has registered up to and including III Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

3.2   Case (ii): A student registers for NOT less than 20 credits and less than 24 credits in each semester.

3.2.1   A student shall not be promoted from II Year to III Year, unless he fulfils the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including II year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

3.2.2   A student shall not be promoted from III Year to IV Year, unless he fulfils the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including III year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

4.0   A Student shall register for all courses covering 144 credits as specified and listed (with the relevant courses as mentioned) in the Programme Structure, put up all the Attendance and Academic requirements for 144 Credits securing a minimum of C Grade (Pass Grade) or above in each course, and earn ALL 144 Credits securing SGPA ≥ 5.0 (in each Semester),   and   CGPA (at the end of each successive Semester) ≥ 5.0, to successfully complete the B.Tech. programme.

4.1   A student must secure the necessary 144 credits as specified for the successful completion of the entire B.Tech. programme (see section 5.1); however, only 138 credits shall be considered for evaluating his overall performance for the award of class as provided for under section 5.0. These 138 credits shall be arrived at by leaving out two courses (one from open elective courses and one from professional elective courses) carrying a total of 6 credits, which have the least Grade point scores.

4.2   Students who fail to earn 144 credits as per the Programme Structure, and as indicated above, within 6 academic years from the date of commencement of their II Year shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

5.0 Award of Degree

5.1   A student who registers for all the specified courses 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 144 credits (with CGPA $\geq$ 5.0), within 6 academic years from the date of commencement of the second academic Year, shall be declared to have **'QUALIFIED'** for the award of the B.Tech. degree in the chosen branch of Engineering.

5.2   A student who qualifies for the award of the degree as listed in section 5.1, shall be placed in the appropriate class as follows based on evaluation as per section 4.1:

5.2.1 Students with final CGPA (at the end of the B. Tech Programme) $\geq$ 8.00, and fulfilling the following conditions shall be placed in 'FIRST CLASS with DISTINCTION'.
   i. should have passed all the subjects/courses in 'FIRST APPEARANCE' within the first   3 academic years (or 6 sequential semesters) from the date of commencement of his first academic year,
   ii. should have secured a CGPA $\geq$ 8.00, at the end of each of the 6 sequential semesters, starting from the II Year I 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, thereof.

5.2.2 Students having final CGPA (at the end of B.Tech. Programme) $\geq$ 8.00,   but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

5.2.3 Students with final CGPA (at the end of the B.TECH. Programme) $\geq$ 6.50 but < 8.00, shall be placed in 'FIRST CLASS'.

5.2.4 Students with final CGPA (at the end of the B.TECH. Programme) $\geq$ 5.50 but < 6.50, shall be placed in 'SECOND CLASS'.

5.2.5 All other Students who qualify for the award of the degree (as per section 5.1), with final CGPA (at the end of   the B.Tech. Programme) $\geq$ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

5.3   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.

5.4   Students fulfilling the conditions listed under Item (iii) of 5.2.1 alone shall be eligible for the award of 'college rank' and / or 'gold medal'.

6.0   Transitory Regulations

6.1   General

6.1.1   A Student who has discontinued for any reason, or has been detained for want of attendance or NOT promoted due to lack of required credits as specified, 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 6.2 through 6.4 as the case may be.

6.2   For students detained due to shortage of attendance:

6.2.1   A student who has been detained in any semester of II, III and IV years of R09/R13/R15 regulations of JNTUH for want of attendance shall be permitted to join the corresponding semester of AR16 regulations of GCET and is required to complete the study of B.Tech. within the stipulated period of six academic years from the date of first admission in II Year.
The AR16 Academic Regulations of GCET under which a student has been readmitted shall be applicable to the student from that semester which shall include section 6.5.

6.3   For students NOT promoted due to shortage of credits:

6.3.1   A student of R09/R13/R15 Regulations of JNTUH who has NOT been promoted due to lack of credits, shall be promoted to the next semester under AR16 Regulations of GCET only after acquiring the required credits as per the corresponding regulations of his/her first admission. For subsequent promotions, the rule specified in section 6.5 shall be applicable. The student is required to complete the study of B.Tech within the stipulated period of SIX academic years from the year of first admission. The AR16 Academic Regulations of GCET are applicable to a student from the year of readmission onwards.

6.4   For all students readmitted under AR16 Regulations of GCET:

6.4.1   A student who has failed in any course under any regulation has to pass those courses in the same regulations.

6.4.2   A student shall acquire a total of 144 credits for the award of degree. These 144 credits shall be the sum of all the credits secured in all the other regulations of his study (subsequent to normalization as per section 6.5) and those secured under AR16 Regulations of GCET.

6.4.3   If a student readmitted to AR16 Regulations of GCET, has any course with about 80% of syllabus in common with his previous regulations, that particular course in AR16 Regulations of GCET shall be substituted by another course to be suggested by GCET.

6.4.4 If a student readmitted to AR16 Regulations of GCET, has not studied any course/topics in his earlier regulations of study which is a prerequisite for further courses in AR16 Regulations of GCET, the College shall arrange to conduct remedial classes to cover those course/topics for the benefit of the students.

6.5   **Promotion Rule**

Where the credits allotted to a semester/year under the regulations studied in are different from that under AR16 regulations for the corresponding semester/year, the promotion rules of AR16 vide section 3.0 shall be applied after normalization. Normalization is done by scaling down or up the number of credits of a semester/year under the previous regulations to equal the number of credits of the corresponding semester/year under AR16 regulations and revising the secured credits also in the same proportion.

7.0   All the other regulations as applicable to B.Tech 4 – year degree program (Regular) shall hold good for B.Tech LE Scheme.

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	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

	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.	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	Student of the colleges expulsion from the examination hall and cancellation of the

or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	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.

DEPARTMENT OF CIVIL ENGINEERING

VISION

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

1. To provide a 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&D.
5. To produce engineers capable of critical thinking, devoted to a lifetime of 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 study with a commitment to lifelong learning for professional development.

PEO 2: Graduates would be able to apply problem-solving skills to various engineering problems including civil engineering that involves 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)
SCHEME OF INSTRUCTION AND EXAMINATION
B.Tech. CIVIL ENGINEERING

Academic Regulations: AR 16

PROGRAM STRUCTURE

FIRST YEAR – SEMESTER I

Sl. No.	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16EN1101	English-I	HS	2	-	-	30	70	100	2
2	16PH1101	Engineering Physics	BS	3	1	-	30	70	100	3
3	16MA1101	Mathematics – I	BS	4	1	-	30	70	100	4
4	16CS1102	Introduction to Computer Programming	ES	3	-	-	30	70	100	3
5	16ME1101	Engineering Drawing	ES	2	-	3	30	70	100	4
6	16ME1102	Engineering Mechanics – I	ES	2	1	-	30	70	100	2
7	16PH11L1	Engineering Physics Lab	BS	-	-	3	30	70	100	2
8	16CS11L2	Computer Programming Lab	ES	-	-	3	30	70	100	2
9	16WS11L1*	Engineering Workshop (EWS) / Information Technology Workshop (ITWS)	ES	-	-	3	30	70	100	2
		Total		**16**	**3**	**12**	**270**	**630**	**900**	**24**
		Total Periods Per Week		**31**						

*ME BoS specified the syllabus for EWS while CSE BoS specified the syllabus for ITWS.

Abbreviation	Description	Abbreviation	Description
HS	Humanities and Social Sciences	L	Lecture
BS	Basic Sciences	T	Tutorial
ES	Engineering Sciences	P	Practical
PC	Professional Core	D	Drawing
PE	Professional Elective	CIE	Continuous Internal Evaluation
SC	Soft Core	SEE	Semester End Examination
OE	Open Elective	Tot	Total
CC	Core Course	C	Number of Credits

Department of Civil Engineering

FIRST YEAR – SEMESTER II

Sl. No.	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16EN1201	English –II	HS	2	-	-	30	70	100	2
2	16PH1203	Physics for Engineers	BS	3	1	-	30	70	100	3
3	16MA1201	Mathematics – II	BS	3	1	-	30	70	100	3
4	16CH1201	Engineering Chemistry	BS	3	-	-	30	70	100	3
5	16CH1202	Environmental Studies	HS	3	-	-	30	70	100	3
6	16ME1201	Engineering Mechanics –II	ES	2	1	-	30	70	100	2
7	16EE1201	Basic Electrical and Electronics Engineering	ES	3	1	-	30	70	100	3
8	16EN12L2	English Lab	HS	-	-	2	30	70	100	1
9	16CH12L1	Engineering Chemistry Lab	BS	-	-	3	30	70	100	2
10	16HS12L1	Gender Sensitization	HS	-	-	3	30	70	100	2
		Total		19	4	8	300	700	1000	24
		Total Periods Per Week			31					

SECOND YEAR – SEMESTER I

Sl. No.	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16MA2102	Mathematics – III	BS	3	-	-	30	70	100	3
2	16CE2101	Building Materials, Construction & Planning	PC	3	-	-	30	70	100	3
3	16CE2102	Strength of Materials -I	ES	4	1	-	30	70	100	4
4	16CE2103	Surveying	PC	4	1	-	30	70	100	4
5	16CE2104	Fluid Mechanics	PC	4	1	-	30	70	100	4
6	16CE21L1	Strength of Materials Lab	ES	-	-	3	30	70	100	2
7	16CE21L2	Surveying Lab	PC	-	-	3	30	70	100	2
8	16MA21L1	Computational Mathematics Lab	BS	-	-	3	30	70	100	2
		Total		18	3	9	240	560	800	24
		Total Periods Per Week			30					

SECOND YEAR – SEMESTER II

Sl. No.	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16MA2201	Probability and Statistics	BS	4	1	-	30	70	100	4
2	16CE2201	Engineering Geology	PC	3	-	-	30	70	100	3
3	16CE2202	Concrete Technology	PC	3	-	-	30	70	100	3
4	16CE2203	Strength of Materials -II	PC	4	1	-	30	70	100	4
5	16CE2204	Hydraulics & Hydraulic Machinery	PC	4	1	-	30	70	100	4
6	16CE22L1	Engineering Geology Lab	PC	-	-	3	30	70	100	2
7	16CE22L2	Concrete Technology Lab	PC	-	-	3	30	70	100	2
8	16CE22L3	Fluid Mechanics & Hydraulic Machinery Lab	PC	-	-	3	30	70	100	2
		Total		18	3	9	240	560	800	24
		Total Periods Per Week			30					

THIRD YEAR – SEMESTER I

Sl. No.	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16CE3101	Structural Analysis	PC	4	1	-	30	70	100	4
2	16CE3102	Design of Reinforced Concrete Structures	PC	4	1	-	30	70	100	4
3	16CE3103	Engineering Hydrology	PC	3	1	-	30	70	100	3
4	16CE3104	Transportation Engineering	PC	4	1	-	30	70	100	4
5	16CE3105	Geotechnical Engineering	PC	3	1	-	30	70	100	3
6	16CE31L1	Transportation Engineering Lab	PC	-	-	3	30	70	100	2
7	16CE31L2	Geotechnical Engineering Lab	PC	-	-	3	30	70	100	2
8	16EN31L1	Advanced English Communication Skills Lab	HS	-	-	3	30	70	100	2
		Total		18	5	9	240	560	800	24
		Total Periods Per Week			32					

THIRD YEAR – SEMESTER II

Sl. No.	Course Code	Course	Category	L	T	P/D	CIE	SEE	Tot	C
				No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
1	16CE3201	Design of Steel Structures	PC	3	1	-	30	70	100	3
2	16CE3202	Foundation Engineering	PC	3	1	-	30	70	100	3
3	16CE3203	Environmental Engineering	PC	3	1	-	30	70	100	3
4	16CE3204	Irrigation Engineering	PC	3	1	-	30	70	100	3
5	**Open Elective – I**		OE	3	-	-	30	70	100	3
	16MB3221	Intellectual Property Rights								
	16EE3222	Industrial Safety and Hazards								
	16CS3223	JAVA Programming								
	16EC3224	Electronic Measuring Instruments								
	16ME3225	Nano Materials and Technology								
6	**Soft Core – I**		SC	3	1	-	30	70	100	3
	16CE3205	Geographic Information System								
	16CE3206	Advanced Structural Design								
7	16CE32L1	Environmental Engineering Lab	PC	-	-	3	30	70	100	2
8	**Soft Core - I Lab**		SC	-	-	3	30	70	100	2
	16CE32L2	Geographic Information System Lab								
	16CE32L3	Advanced Structural Design Lab								
9	16MB32P1	Human Values and Professional Ethics	HS	-	-	3	30	70	100	2
		Total		18	5	9	270	630	900	24
		Total Periods Per Week			32					

FOURTH YEAR – SEMESTER I#
 # Subject to final approval by Academic Council

Sl. No.	Course Code	Course	Category	L	T	P/D	CIE	SEE	Tot	C
1	16CE4101	Estimation, Costing & Contracts	PC	3	1	-	30	70	100	3
2	**Professional Elective – I**		PE	3	1	-	30	70	100	3
	16CE4102	Advanced Structural Analysis								
	16CE4103	Air & Water Transportation								
	16CE4104	Ground Improvement Techniques								
	16CE4105	Hydropower Engineering								
3	**Professional Elective – II**		PE	3	1	-	30	70	100	3
	16CE4106	Prestressed Concrete and Precast Structures								
	16CE4107	Health Monitoring and Retrofitting of Structures								
	16CE4108	Solid Waste Management								
	16CE4109	Ground Water Development and Management								
4	**Open Elective – II**		OE	3	-	-	30	70	100	3
	16MB4131	Supply Chain Management								
	16CS4132	Knowledge Management								
	16EE4133	Energy Conservation and Management								
	16EC4134	Basics of Communication Systems								
	16ME4135	Manufacturing Processes								
5	**Open Elective – III**		OE	3	-	-	30	70	100	3
	16MB4141	Banking and Insurance								
	16CS4142	Database Systems								
	16EE4143	Micro-Electro-Mechanical Systems								
	16EC4144	Principles of Wireless Communication Systems								
	16ME4145	Aspects of Heat Transfer in Electronically Controlled Units								
	16EN4147	Foreign Language - French								
	16EN4148	Foreign Language - Spanish								
	16EN4149	Foreign Language -German								

				L	T	P	Int	Ext	Total	Credits
	Soft Core –II									
6	16CE4110	Finite Element Methods for Civil Engineering	SC	3	1	-	30	70	100	3
	16CE4111	Pavement Analysis and Design								
7	16CE41L1	Computer Aided Structural Drafting Laboratory	PC	-	-	3	30	70	100	2
	Soft Core - II Lab									
8	16CE41L2	FEM for Civil Engineering Lab	SC	-	-	3	30	70	100	2
	16CE41L3	Pavement Analysis and Design Lab								
9	16CE4112	Industry Oriented Mini-project	CC	-	-	-	--	100	100	1
10	16CE4113	Major Project Seminar	CC	-	-	2	100	--	100	1
		Total		18	4	8	340	660	1000	24
		Total Periods Per Week			30					

FOURTH YEAR – SEMESTER II#
 # Subject to final approval by Academic Council

Sl. No.	Course Code	Course	Category	L	T	P/D	CIE	SEE	Tot	C
1	16CE4201	Construction Technology & Project Management	PC	4	-	-	30	70	100	4
2	**Professional Elective – III**		PE	3	1	-	30	70	100	3
	16CE4202	Structural Dynamics								
	16CE4203	Soil Dynamics and Machine Foundation								
	16CE4204	Environmental Impact Assessment & Management								
	16CE4205	Railway Engineering								
3	**Open Elective – IV**		OE	3	-	-	30	70	100	3
	16MB4251	Entrepreneurship								
	16CS4252	Web Development								
	16EE4253	Renewable Energy Sources								
	16EC4254	Biomedical Instrumentation								
	16ME4255	Materials Handling								
	16MA4257	Actuarial Statistics								
4	16CE4206	Technical Seminar	CC	-	-	2	100	--	100	1
5	16CE4207	Comprehensive Viva Voce	CC	-	-	-	--	100	100	3
6	16CE4208	Major Project	CC	-	-	15	30	70	100	10
		Total		10	1	17	220	380	600	24
		Total Periods Per Week			28					

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Comparison of AICTE Guidelines for Curriculum Structure for B.Tech Degree Program in Civil Engineering Vis-à-vis GCET Program

Sl. No	Broad Course Classification	Course Group/ Category	Course Description	Range of percentage credits given by AICTE	Credits Allotted in Civil Engineering Program	
					Number	%
1	Foundation Courses (FnC)	HS - Humanities and Social Sciences	Includes courses related to Humanities, Social Sciences and Management.	5% - 10%	14	7.3
2		BS - Basic Sciences	Includes courses related to Mathematics, Physics, Chemistry and Biology.	15% - 20%	29	15.1
3		ES - Engineering Sciences	Includes courses related to Materials, Workshop, Drawing, Basics of Electrical/ Electronics/ Mechanical/ Computer Engineering, Instrumentation.	15% - 20%	24	12.5
4	Core Courses (CoC)	PC - Professional Core	Includes core courses related to the chosen Parent Discipline/ Department/ Specialization/ Branch of Engineering.	30% - 40%	78	40.6
5	Elective Courses (ElC)	PE - Professional Electives	Includes Elective subjects related to the Parent Discipline/ Department/ Specialization/ Branch of Engineering.	10% - 15%	19	9.9
		SC - Soft Core	Includes core elective courses of the parent discipline with the associated laboratory			
6		OE - Open Electives	Include inter-disciplinary elective courses in an area outside the Parent	5% - 10%	12	6.3

			Discipline/ Department/ Specialization/ Branch of Engineering.			
7	Core Courses (CC)	Industrial Training/ Mini Project	Industrial Training/ Internship/ UG Mini-project	10% - 15%	16	8.3
		Project Work	B.Tech Project or UG Project or UG Major Project			
		Technical Seminar	Seminar/ Colloquium based on core contents related to the Parent Discipline/ Department/ Specialization/ Branch of Engineering.			
				Grand Total	192	100

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	Intellectual Property Rights (MBA)	16MB3121/16MB3221
22	Industrial Safety and Hazards (EEE)	16EE3122/16EE3222
23	JAVA Programming (CSE)	16CS3123/16CS3223
24	Electronic Measuring Instruments (ECE)	16EC3124/16EC3224
25	Nano Materials and Technology (ME)	16ME3125/16ME3225
26	Global Warming and Climate Change (CE)	16CE3126/16CE3226

Open Elective II

S. No.	Course Title	Course Code
31	Supply Chain Management (MBA)	16MB3231/16MB4131
32	Knowledge Management (CSE)	16CS3232/16CS4132
33	Energy Conservation and Management (EEE)	16EE3233/16EE4133
34	Basics of Communication Systems(ECE)	16EC3234/16EC4134
35	Manufacturing Processes (ME)	16ME3235/16ME4135
36	Building Technology (CE)	16CE3236/16CE4136

Open Elective III

S. No.	Course Title	Course Code
41	Banking and Insurance (MBA)	16MB3241/16MB4141
42	Database Systems (CSE)	16CS3242/16CS4142
43	Micro-electro-mechanical Systems(EEE)	16EE3243/16EE4143
44	Principles of Wireless Communication Systems (ECE)	16EC3244/16EC4144
45	Aspects of Heat Transfer in Electronically Controlled Units(ME)	16ME3245/16ME4145
46	Green Buildings (CE)	16CE3246/16CE4146
47	Foreign Language – French	16EN3247/16EN4147
48	Foreign Language –Spanish	16EN3248/16EN4148
49	Foreign Language –German	16EN3249/16EN4149

Open Elective IV

S. No.	Course Title	Course Code
51	Entrepreneurship (MBA)	16MB4251
52	Web Development (CSE)	16CS4252
53	Renewable Energy Sources (EEE)	16EE4253
54	Biomedical Instrumentation (ECE)	16EC4254
55	Materials Handling (ME)	16ME4255
56	Disaster Mitigation and Management (CE)	16CE4256
57	Actuarial Statistics (S&H)	16MA4257

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Cheeryal (V), Keesara (M), Medchal District - 501 301, Telangana State.

16EN1101 –ENGLISH - I

I Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Read well and speak grammatically correct English.
2. Become a good communicator, both written and oral.
3. Analyse, interpret the given data/text and infer appropriately.
4. Design an outline for a paragraph, essay, letters, etc.
5. Listen actively and respond accordingly.
6. Apply classroom learning to conduct oneself in a multicultural environment.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Speak fluent, intelligible and grammatically correct English.
CO 2: Use language appropriately in various functional contexts.
CO 3: Analyze a given situation / text and interpret accordingly.
CO 4: Write effectively in formal and informal situations.
CO 5: Acquire active listening skills and demonstrate the same.
CO 6: Acquire the nuances of behavioral etiquette in a multicultural environment.

Syllabus:

UNIT-I

Reading	*Tea Party* by Ruth PrawerJhabvala
Vocabulary	Homonyms, Homophones Homographs
Grammar	Nouns and Articles Types of Verbs
Speaking	Greeting people and taking leave Introducing oneself and others
Writing	Writing sentences Punctuation

UNIT-II

Reading	1) *Risk Management* by Joe Crompton 2) *Sivakasi* by AmruthaGayatri
Vocabulary	1) Synonyms 2) Antonyms and Synonyms, Commonly misspelt words
Grammar	1) Subject-verb agreement 2) The present tense

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Speaking	Giving Directions
Writing	Paragraph Writing Note making, Note taking

UNIT-III

Reading	1) *Polymer Banknotes* 2) *The one thing every business executive must understand about social media* by Kerpen
Vocabulary	1) Collocations 2) Technical Vocabulary
Grammar	1) Past Tense & Future Tense 2) Adjectives – Comparison, Prepositions
Speaking	1) Group Discussions 2) Speaking on the telephone (Telephone Etiquette)
Writing	Information Transfer

UNIT-IV

Reading	1) *IF* by Rudyard Kipling 2) *Courage and integrity are at the core of the successful leadership*
Vocabulary	1) Positive descriptive vocabulary, Common errors in English 2) Idioms and Phrases
Grammar	1) Reported Speech 2) Active voice and passive voice
Speaking	1) Talking about hypothetical situations 2) Narrating experiences/events and expressing opinions
Writing	1) Letter Writing 2) Phrasal Verbs 3) Guided Composition

UNIT-V

Reading	Study Skills
Vocabulary	Functional vocabulary related to writing and reading
Grammar	Picture Reading/ Interpretation
Writing	Job Application Narrative Reviews-articles/newspaper/books/movies Essay/articles

Text Book:
1. *Skills Annexe: Functional English for Success,* Orient Longman

Reference Books:
1. Contemporary English Grammar Structures and Composition by David Green, Macmillan Publishers 2010, New Delhi.
2. Innovate with English: A course in English for engineering students by T Samson, Foundation Books.
3. English Grammar Practice by Raj N Bakshi, Orient Longman.
4. Spoken English by R.K.Bansal and Harrison, Orient Longman.
5. Technical Communication by Meenakshi Raman, Oxford University Press.
6. Grammar Games by Renuvolcuri Mario, Cambridge University Press.
7. Enrich Your English by Thakur K.B.P. Sinha, Vijay Nicole Imprints Pvt.Ltd.

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16PH1101–ENGINEERING PHYSICS

I Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand the fundamental aspects of crystal structures, various types of crystal defects and methods of determining the crystal structures using X- ray diffraction.
2. Distinguish different types of dielectric polarization mechanisms; understand the properties of different dielectric materials and their applications.
3. Demonstrate classification of magnetic materials; understand the phenomenon of superconductivity and the applications of magnetic materials and superconductors.
4. Understand the concepts of interference, diffraction, light amplification, working of various types of LASERs and their applications.
5. Outline the behaviour of materials at nanoscale, three methods of preparation of nanomaterials and their characterization techniques with applications.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain the fundamentals of crystal structures; summarize various crystal defects and methods of determining the crystal structures using X-Rays.
CO 2: Explain different types of dielectric polarization mechanisms, and the properties of different dielectric materials and their applications.
CO 3: Explain different types of magnetic materials, phenomenon of superconductivity and applications of magnetic materials and superconductors.
CO 4: Explain phenomena of interference, diffraction, and light amplification process, construction and working of Ruby, He-Ne, Semiconductor LASERs and their applications in different fields.
CO 5: Illustrate awareness of sol-gel method, physical vapour deposition method, ball milling method for preparation of nanomaterials and their applications.

Syllabus:

UNIT-I: **Crystallography and X-Ray diffraction**
Space lattice, unit cell, lattice parameters, crystal systems, Bravais lattices, atomic radius, coordination number and atomic packing factors of simple cubic, body centered cubic, face centered cubic, and diamond structure. Crystal directions & planes, Miller indices, interplanar spacing of orthogonal crystal systems.
Defects in crystal: Point defects, line defects (Qualitative Treatment). Estimation of Schottky and Frenkel defects, Burger's vector. Bragg's law, X-Ray diffraction- Laue method and powder method. Applications of X-Rays in different fields.

UNIT-II: Dielectric properties

Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic and ionic polarizations (Quantitative), orientation and space charge polarizations (qualitative). Internal fields in solids, Clausius-Mosotti equation, Piezo, Pyro & Ferro electricity and their applications.

UNIT-III: Magnetic Properties

Permeability, field intensity, magnetic field induction, magnetization, magnetic susceptibility, origin of magnetic moment, Bohr magneton, classification of Dia, Para, Ferro, Antiferro and Ferri magnetic materials; domain theory of Ferro magnetism- Hysteresis curve, soft and hard magnetic materials, applications of magnetic materials. Basic concepts of superconductivity and properties of super conductors: Type –I, Type – II super conductors, BCS theory (Qualitative), applications of superconductors in science and engineering.

UNIT-IV: Optics and LASERs

Introduction to interference, theory of interference in thin films, Newton's rings, anti-reflection coatings; introduction to diffraction, diffraction due to single slit, double slit and diffraction grating. Lasers and their characteristics, stimulated absorption, spontaneous emission and stimulated emission, Einstein's coefficients and relation between them, pumping schemes, optical resonator, various types of Lasers: Ruby Laser, He-Ne Laser, Semiconductor Laser and applications of Lasers.

UNIT-V: Nanoscience

Origin of Nanoscience, Nanoscale, classification of nanomaterials- surface to volume ratio, Quantum confinement, synthesis of nanomaterials– sol gel method, physical vapour deposition method, ball milling method; properties of nanomaterials, characterization of nanomaterials using Scanning Electron Microscope(SEM), Transmission Electron Microscope(TEM), Applications of Nano-science in various fields.

Text Books:
1. Engineering Physics, K. Malik, A. K. Singh, Tata McGraw Hill Book Publishers.
2. Engineering Physics, M N Avadhanulu, S Chand Publications

Reference Books:
1. Introduction to Solid State Physics, Charles Kittel, John Wiley Publishers, 8th edition.
2. Fundamentals of Physics, David Halliday, John Weily Publishers.
3. University Physics, Sear's and Zemansky (10th Edition), Wesly Publishers.
4. Applied Physics, PK Mittal, I.K. International Publishing House.
5. Engineering Physics, V. Rajendran, Tata McGraw Hill Book Publishers.

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16MA1101–MATHEMATICS - I

I Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand various types of Matrices, properties and rank of a 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 and apply the same to electrical circuits and simple harmonic motion.
5. Analyse properties of Laplace Transform, Inverse Laplace Transform and convolution theorem and apply the same to solve ordinary differential equations.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Write the matrix representation of a set of linear equations and analyse solutions of a system of equations.
CO 2: Deduce eigenvalues and eigenvectors of a matrix and apply the same to reduce quadratic form into a canonical form through linear and orthogonal transformations.
CO 3: Identify the type of differential equation and use the appropriate method to solve the same.
CO 4: Apply differential equations to solve engineering problems particularly, electrical circuits and simple harmonic motion.
CO 5: Solve ordinary differential equations of second and higher order using Laplace Transform techniques.

Syllabus:

UNIT-I: Theory of Matrices-I
Real matrices-symmetric, Skew-symmetric, Orthogonal, Complex matrices: Hermitian, Skew Hermitian, Unitary Matrices and Idempotent Matrix, Finding rank of a matrix by reducing to Echelon and Normal forms, Inverse of a non-singular matrix using row/column transformations (Gauss-Jordan method). Consistency of system of linear equations(homogeneous and non-homogeneous) using the rank of a matrix, Solving mxn and nxn linear system of equations by Guass elimination.

UNIT-II: Theory of Matrices-II

Cayley-Hamilton Theorem (without proof) - Verification, Calculating inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors, Linear Transformation-Orthogonal Transformation, Eigenvalues and eigenvectors of a matrix, Properties of eigenvalues and eigenvectors of real and complex matrices, Linearly independent eigenvectors of a matrix when the eigenvalues of the matrix are repeated, Quadratic forms up to three variable, Rank-Positive definite, negative definite, semi-definite, Index, signature of a quadratic form.

UNIT – III: First Order Ordinary Differential Equations

Differential equations- exact, linear and Bernoulli, Applications of first order differential equations-Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories. Electrical Circuits.

Unit-IV: Higher Order Ordinary Differential Equations

Linear, homogeneous and non-homogeneous differential equations of second and higher order with constant coefficients, Non homogeneous of the type e^{ax}, sinax, cosax and x^n, $e^{ax}V(x)$, $x^nV(x)$ and Method of variation of parameters, Applications of second order differential equations to Electrical circuits and simple harmonic motion.

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. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
2. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.

Reference Books:
1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publications.
2. Engineering Mathematics by Srimanta pal, Subhodh C.Bhunia, Oxford higher Education.
3. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
4. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th edition, 2013, Chapman & Hall/ CRC
5. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.
6. Ordinary & Partial Differential Equations, M D Raisinghania, S. Chand.

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16CS1102–INTRODUCTION TO COMPUTER PROGRAMMING

I Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand the intricacies of program development and problem solving techniques using Raptor tool.
2. Understand the structure of a C-language Program, list, describe, classify the C data types, input and output concepts as they apply to programs in C.
3. Describe the expression types; understand the rules of precedence and associativity in evaluating the expressions.
4. Understand how a C program evaluates logical and repetitive (loop) statements.
5. Describe the importance of modularity and design multi-function programs.
6. Understand the basic concepts and uses of arrays using C-Language Program.
7. Understand the concept and use of pointers for memory management techniques.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Demonstrate problem solving skills by developing algorithms to solve problems using Raptor tool.
CO 2: Incorporate the concept of variables, constants and basic data types in a C language program.
CO 3: Use simple input and output statements in a C Language Program.
CO 4: Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.
CO 5: Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.
CO 6: Implement C programs using arrays.
CO 7: Write and execute programs that access and manage data through pointers.

Syllabus:

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.

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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.

UNIT-V

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, void pointer, null pointer.
Pointer Applications - Arrays and Pointers, Pointer Arithmetic and arrays, passing an array to a function.
Memory allocation functions – malloc(), calloc(), realloc(), free().
Array of pointers, pointers to functions, C program examples.

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

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16ME1101–ENGINEERING DRAWING

I Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

L	T	P/D	C
2	-	-/3	4

Course Objectives:
Develop ability to
1. Visualize and communicate all engineering elements and understand various concepts such as dimensions, conventions and standards related to working drawings.
2. Understand the fundamentals of geometrical curves and their applications in engineering.
3. Visualize different positions of planes and solids.
4. Visualize various isometric views and their applications in engineering.
5. Understand multi-view representations and their conversion into pictorial views and vice versa.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Visualize and communicate all engineering elements and represent the same using standard dimensions and conventions related to working drawings used in engineering practice.
CO 2: Comprehend concepts of all 2D elements such as Conic Sections and 3D Objects namely, Prisms, Cylinders, Pyramids and Cones.
CO 3: Draw orthographic projections of straight lines, planes and solids of given engineering components.
CO 4: Construct isometric scale, isometric projections and views of given engineering components.
CO 5: Visualize multi-view representations and its conversion into pictorial views and vice versa.

Syllabus:

UNIT-I
Introduction to Engineering drawing & Importance of Engineering drawing:
Principles of Engineering Drawing, Various Drawing Instruments., Lettering &dimensioning, BIS standards, Title block, Geometrical constructions, Bisecting a line, arc and angle, Dividing straight line in to equal number of parts, Tangents to circles and arcs, Construction of pentagon, hexagon, inscribing circles inside regular polygons and vice versa etc.,
Curves: Construction of curves used in engineering practice: Conic sections including rectangular hyperbola - **General method only**, Cycloid, Epi-cycloid, Hypocycloid and Involutes.
Scales: Construction of different types of scales - Plain scale, Diagonal scale, Vernier scale

UNIT-II
Introduction to Orthographic projections: Conventions-first and third angle projections.
Projections of points: in all four quadrants.
Projections of straight lines: Lines in simple position, inclined to one plane and parallel to other plane.
Projections of straight lines: Line inclined to both the planes.

UNIT-III
Projections of planes: Planes in simple position, plane inclined to one plane and perpendicular to other plane, plane inclined to both the planes.
Projections of solids: (Cube, tetrahedron, Cone, Cylinder, Regular Prisms and Pyramids): solids in simple position (Axis perpendicular to one plane)

UNIT-IV
Isometric projections: Principle of isometric projection - isometric scale - isometric views - conventions - plane figures. Simple and compound solids - isometric projection of objects having non-isometric lines.

UNIT-V
Transformation of projections: Conversion of Isometric views to orthographic views. Conversion of orthographic views to Isometric views - simple objects.

Text Books:
1. Engineering Drawing – N.D. Bhatt, Charotar Publications.
2. Engineering Drawing- Basant Agarwal, Tata McGraw Hill Publications.

Reference Books:
1. Engineering Graphics- P I Varghese Tata McGraw Hill Education Pvt. Ltd.
2. Engineering Drawing – P.J. Shah, S.Chand Publishers.
3. Engineering Drawing- Johle/Tata Mcgraw Hill Book Publishers.
4. Engineering Drawing – M.B. Shah and B.C. Rana, Pearson.
5 .Engineering Drawing - K.VenuGopal and V.Prabu Raja New Age Publications.
6. Engineering Drawing - John. PHI Learning Publisher.

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16ME1102–ENGINEERING MECHANICS - I

I Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand basic terms and representation of forces and simplify any force system using free body diagram.
2. Accurately draw free body diagrams for determining internal forces and their reactions on various structures.
3. Apply equilibrium equations to solve problems comprising frictional forces.
4. Determine centroid, first moment of inertia and second moment of inertia of various structures.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Describe position, forces, and moments in terms of vector notation in two and three dimensions.
CO 2: Draw free body diagrams accurately and write appropriate equilibrium equations from the free body diagram, including support reactions.
CO 3: Apply concepts of equilibrium to analyse systems that include frictional forces.
CO 4: Calculate moments, centroids, and centres of mass for discrete particles: a body of arbitrary shape and a body having axial symmetry corresponding moments of Inertia.

Syllabus:

UNIT-I
Introductory concepts: Scope of mechanics, preview in statics and dynamics, fundamental concepts, scalar and vector quantities, Newton laws.
Resultants of force system: Introduction, Parallelogram Law, force and components, Resultant of coplanar concurrent forces, Moment of force and principles of moments, Varignon's theorem, couple and moment of couple, Resultant of any force system, Components of forces in space, Spatial forces and its applications.

UNIT-II
Equilibrium of force system: Introduction, free-body diagram, Equations of Equilibrium, Equilibrium of planar system, equilibrium of spatial systems.

UNIT-III
Friction: Introduction, Theory of friction, Angle of friction, Laws of friction, cone of friction, block friction.
Friction: ladder friction, wedge friction.

UNIT-IV

Centroids and Center of Gravity: Introduction, Center of gravity of flat plate, Centroid of areas and lines, importance of Centroids and moment of area, Centroids of composite figures, Theorems of Pappus.

UNIT-V

Moments of Inertia: Definition of moment of inertia, Polar moment of inertia, Radius of gyration, Transfer formula for moment of inertia, Moments of inertia for composite bodies, Product of inertia, Transfer formula for product of inertia, Mass moment of inertia.

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

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

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16PH11L1–ENGINEERING PHYSICS LAB

I Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

(Any ten of the following twelve experiments are to be conducted)
Course Objectives:
Develop ability to
1. Determine modulii of elasticity; measure moment of inertia of a fly wheel; evaluate coupling constant and the frequency of A.C signal.
2. Determine the dispersive power of glass, wavelength of spectral lines in mercury spectrum, wavelength of LASER and radius of curvature of plano-convex lens.
3. Determine the magnetic induction at several points on the axis of coil carrying current using Stewart and Gee's method, time constant of a capacitor and the resonant frequency and quality factor of a LCR circuit.
4. Determine the energy gap of a given semiconductor; plot the V-I characteristics of solar cell.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Infer modulii of elasticity of a given material, compute shearing stress and strain: identify their limitations, deduce the moment of inertia of a body and explain its concept.
CO 2: Explain the concept of conservation of energy through determination of coupling constant. Compute the frequency of an A.C. signal using sonometer.
CO 3: Demonstrate the optical phenomena like dispersion, interference and diffraction.
CO 4: Compute the magnetic induction using Stewart and Gee's method. Explain the signal delay in electronic circuits by calculating time constant of a capacitor. Compute the resonant frequency and quality factor of a LCR circuit.
CO 5: Calculate energy gap of a given semiconductor. Obtain the V-I characteristics of solar cells and specify their applications.

LIST OF EXPERIMENTS:

1. Determination of Rigidity Modulus of a given wire using Torsional Pendulum.
2. Determination of Young's Modulus of the material of a beam- Cantilever-Uniform bending.
3. Determination of Moment of inertia of a Fly Wheel.
4. Coupled oscillator – Determination of coupling constant.
5. Frequency of A.C. supply – Sonometer method (Using electromagnet).
6. Determination of Dispersive Power of the material of a Prism –Spectrometer.
7. Determination of Radius of curvature of a given Plano Convex lens by forming Newton's Rings.
8. Determination of wavelength of spectral lines of mercury spectrum - Diffraction grating.
9. Determination of the wavelength of a given source of LASER-Diffraction Grating.
10. Determination of magnetic field of induction at several points on the axis of coil carrying current using Stewart and Gee's method.

11. Time constant of given RC combination.
12. Study the frequency response of LCR series circuit and to find the resonant frequency and quality factor.

Additional Experiments:
1. Study the V-I characteristics of a Solar cell.
2. Determination of Energy gap of a given semiconductor.

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16CS11L2 –COMPUTER PROGRAMMING LAB

I Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to
1. Understand the intricacies of program development and problem solving techniques using Raptor tool.
2. Understand the structure of a C-language Program, list, describe, classify the C data types, input and output concepts as they apply to programs in C.
3. Describe the expression types; understand the rules of precedence and associativity in evaluating the expressions.
4. Understand how a C program evaluates logical and repetitive (loop) statements.
5. Describe the importance of modularity and design multi-function programs.
6. Understand the basic concepts and uses of arrays using C-Language Program.
7. Understand the concept and use of pointers for memory management techniques.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Demonstrate problem solving skills by developing algorithms to solve problems using Raptor tool.
CO 2: Incorporate the concept of variables, constants and basic data types in a C language program.
CO 3: Use simple input and output statements in a C Language Program.
CO 4: Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.
CO 5: Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.
CO 6: Implement C programs using arrays.
CO 7: Write and execute programs that access and manage data through pointers.

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

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2.	Draw Flow chart using RAPTOR for, a. Calculate the area of a Circle b. Calculate the area of a Square c. Calculate the area of a Rectangle d. Interchange two numbers e. Find the sum of square of two numbers f. Convert Centigrade to Fahrenheit g. Convert Radians to Degrees h. Display the roots of Quadratic Equation
3	Draw Flow chart using RAPTOR to, a. Check the given number is Positive or Negative b. Check the given number is even or odd c. Display whether a person is eligible for vote or not d. Calculate the Largest of two numbers e. Check the given year is leap year or not f. Check whether two numbers are equal or not g. Find the largest value among three given numbers

4	Draw Flow chart using RAPTOR to,
	a. Calculate and display the grade of a student
	    i. < 30 % - Fail
	    ii. Between 31 and 50 – C grade
	    iii. Between 51 to 60 – B grade
	    iv. Between 61 to 75 – A grade
	    v. Greater than 75 - distinction
	b. Find the quadratic roots of an equation (real or imaginary)
	c. Check the given number is multiple of 2,4and 8

5	Draw Flow chart using RAPTOR to, a. Display n numbers using looping b. Calculate the sum of n natural numbers c. Display the even numbers below n d. Calculate sum of even numbers and odd numbers from 1 to n (n value supplied by the user)
6	a. Write a C program to display student details b. Write a C program to perform arithmetic operations c. Write a C program to implement increment and decrement operators d. Write a C program to implement conditional operator e. Write a C program to implement bit wise operator

7	a. Write a C program to calculate the biggest of given two numbers
	b. Write a C Program to print the result depending on the following
	    i. < 30 % - Fail
	    ii. Between 31 and 50 – C grade
	    iii. Between 51 to 60 – B grade
	    iv. Between 61 to 75 – A grade
	c. Write a C Program to implement arithmetic calculator using switch case

8	a. Write a C program to find sum of n natural numbers b. Write a C program to find individual digits of the given number

	c. Write a C program to find factorial of a given number
9	a. Write a C program to display the prime numbers below n (where n value is given by user) b. 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. c. Write a C program to generate the first n terms of the sequence. d. Write a C program to find the quadratic roots of an equation e. Write a C program to calculate sum of the following geometric equation $Sum = 1 + x + x^2 + x^3 + \ldots + x^n$
10	a. Write a C program to find the given number is palindrome or not b. Write a C program to find GCD and LCM of two given numbers using functions c. Write a C program to find the factorial of a given number using recursive function d. Write a C program to generate the Fibonacci series using recursive function

11	e. Write a C program to find largest and smallest numbers in a list of array elements using functions
	f. Write a C program to sort the given list of elements in ascending order using functions.
	g. 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".
	    i. Using fixed length array
	    ii. Using variable length array.

12	a. Find the duplicate elements in the list of sorted array b. Write a C program that uses functions to perform the Addition of Two Matrices c. Write a C program that uses functions to perform the Multiplication of Two Matrices

13	a. Write a C program to swap two integers using following methods
	    i. call by value
	    ii. call by reference
	b. Write a C program to find sum of even and odd numbers using functions and pointers

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

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16WS11L1–ENGINEERING WORKSHOP (EWS) / INFORMATION TECHNOLOGY WORKSHOP (ITWS)

I Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

ENGINEERING WORKSHOP

Course Objectives:
Develop ability to
1. Inculcate general machining skills.
2. Understand the dignity of labour, precision, safety at work place, team working and development of positive attitude.
3. Gain hands-on experience on different trades of engineering such as fitting, carpentry, tin smithy, welding, foundry, black smithy, house wiring and sheet metal.
4. Acquire knowledge of thread cutting and pipe joining in plumbing.
5. Understand the concept of Machining with lathes and automats.
6. Be aware of power tools used in various Engineering applications.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Use various modern engineering tools for engineering practice.
CO 2: Recognize dignity of labour and workshop safety regulations.
CO 3: Design and model different prototypes in carpentry such as T-Lap Joint and L-Lap Joint.
CO 4: Make basic prototypes in Tin Smithy such as Open Scoop and Rectangular Tray.
CO 5: Perform basic House Wiring techniques such as Series wiring, Staircase (one lamp with two switches) Connection, Connecting one lamp with one switch, connecting two lamps with one switch.
CO 6: Design and model basic prototypes in fitting such as L-Fitting, V-Fitting and Dove tail Fitting.
CO 7: Make basic prototypes in Black Smithy such as S-Hook, C –Hook and Flat Chisel.
CO8: Perform basic Foundry such as Dumbbell Pattern, Stepped Pulley Pattern and Gear Pattern.
CO 9: Demonstrate knowledge of welding process, Plumbing and power Tools.

LIST OF EXPERIMENTS:

I.   **TRADES FOR EXERCISES:**
    At least TWO exercises from each trade:
    1. **Carpentry:** T-Lap Joint, L-Lap Joint, Cross Lap joint, Dove Tail Joint.
    2. **Fitting:** L-Fitting, V-Fitting, Dove tail Fitting.
    3. **Tin-Smithy:** Open Scoop, Rectangular Tray, Funnel and development of jobs carried out and soldering.
    4. **House-Wiring:** Series Wiring, Staircase Wiring, Connecting one lamp with one switch, connecting two lamps with one switch.
    5. **Black Smithy:** S-Hook, C –Hook, Flat Chisel.
    6. **Foundry:** Dumbbell Pattern, Stepped Pulley Pattern, Gear pattern.

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II. TRADES FOR DEMONSTRATION & EXPOSURE:
1. **Welding:** V-Butt Joint, Corner Butt Joint, Lap Joints.
2. Power tools used in construction, wood working, electrical engineering and mechanical engineering.
3. **Plumbing:** Thread Cutting, Pipe Joining –1, Pipe Joining -2.

Text Books:
1. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edition, SciTech publishers.
2. Workshop manual by Venkat Reddy, 2nd Edn, SciTech publishers.

Reference Books:
1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. John K.C., Mechanical Workshop Practice. 2nd Edition, PHI, 2010.
3. Jeyapoovan T andPranitha S., Engineering Practices Lab Manual, 3rd Edition, Vikas Publications, 2008.

INFORMATION TECHNOLOGY WORKSHOP (ITWS)
Course Objectives:
Develop ability to
1. Identify different components of Personal Computer (PC) and their configurations.
2. Identify various steps for disassembly and assembly of PC components.
3. Install Windows and Linux operating systems on Personal Computers.
4. Troubleshoot simple hardware and software related problems.
5. Make Text Documents using various features of document preparation tools such as MS-Word, Libre Office Write, LaTex.
6. Make Spread Sheet using various features of worksheet preparation tools namely, MS-Excel, Libre Office Calc.
7. Make Presentations using various features of presentation tools namely, MS-Powerpoint, Libre Office Express.

Course Outcomes:
At the end of the course, student would be able to:
CO 1: Identify the components of Personal Computer (PC) System.
CO 2: Disassemble and assemble the components of Personal Computer.
CO 3: Troubleshoot trivial hardware and software related problems.
CO 4: Use productivity software such as MS Office Tools: Word, Excel, Power Point, Libre Office Tools: Write, Calc, Express and LaTex.
CO 5: Install Operating Systems such as Windows and Linux on personal computers.

LIST OF EXERCISES:

Week 1	**Task 1**: Different generations of computers, computing environments, Identify the peripherals of a computer, components in CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral.
	Task 2: The students need to go through the video which shows the process of assembling a PC. The student should disassemble and assemble the PC back to its working condition.

Week 2	**Task 1:** Every student should learn installing Windows-7 in the personal computer. **Task 2:** Hardware & software Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals and Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.
Week 3	**Task**: Every student should learn the process of installing Linux in the computer along with configuring as dual boot with both windows and Linux.
Week 4	**Task 1**: Features of Word Processor Tool: Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track changes. **Task 2**: Creating a Newsletter: Features: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge.
Week 5	**Task 1**: Features of Spread sheet Tool: Creating a Scheduler - Features:- Gridlines, Format Cells, Summation, auto fill, Formatting Text **Task 2**: Calculating GPA : Cell Referencing, Formulae in spread sheet – average, standard deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, lookup, Sorting, Conditional formatting.
Week 6	**Task**: Features of Presentation tool: Students will work on basic power point utilities and tools which help them to create power point presentation. Presentation Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks, Inserting – Images, Clip Art, Audio, Video, Objects, Tables and Charts Lines and Arrows.
Week 7	**Task:** Document preparation using LaTex
Week 8	**Task:** Document, Spread sheet and Presentation using Libre Office

Text Books:
1. Comdex Information Technology Course Tool Kit, Vikas Gupta, WILEY Dreamtech, 2009-10 Edition.
2. Introduction to Information Technology, ITL Education Solutions Limited, Pearson Education, 2012.

Reference Books:
1. Introduction to Computers, Peter Norton, 6/e McGraw Hill Publishers.
2. LaTex Companion, Leslie Lamport, PHI/ Pearson.
3. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education.
4. IT Essentials PC Hardware and Software Companion Guide, Third Edition, David Anfinson and Ken Quamme, CISCO Press, Pearson Education.

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16EN1201 –ENGLISH - II

I Year. B.Tech. CE– II Semester.
Prerequisite(s): 16EN1101 English- I.

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

Course Objectives:
Develop ability to
1. Function in multidisciplinary teams.
2. Understand professional and ethical responsibility.
3. Apply strategies and inculcate life skills.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Acquire interpersonal and life skills
CO 2: Demonstrate professional ethics and etiquette.
CO 3: Demonstrate application of various strategies to real life situations.

Syllabus:

UNIT-I

	Steps in Writing Process Cover letter and Job Application, Letter
Writing	CurriculumVitae
	Resume
	Abstract
	Writing and Responding to a blog

UNIT-II

Reading	1) *MokshagundamVisvesvaraya*
	2) *The Palm Islands*
Vocabulary	Prefixes and Suffixes
Grammar	Joining ideas using conjunctions, Adverbs
Speaking	Opinion-based questions
Writing	Summarizing

UNIT – III

Reading	1) *Leela's Friend* by R.K.Narayan
	2) *Forensic Science*
Vocabulary	Guessing the words, Using the Appropriate word, Phrasal verbs
Grammar	Knowing with questions
Speaking	Presentation
Writing	Report Writing

UNIT – IV

Reading	*1) The Last Leaf* by O.Henry
	2) Choose how to start your day
Vocabulary	Idioms
Grammar	Relating objects by using prepositions, Ergative verbs
Speaking	Creative Speaking Activity
Writing	Technical Report Writing

UNIT – V

Reading	*1) Indian Crowds* by Nirad C.Chaudhuri
	2) Snippets that focus on cultural differences among the people
Vocabulary	One-Word Substitutes (related to the lesson)
Grammar	Synthesis of Sentences
Speaking	Activity on Indo-American Cultural Differences
Writing	Day to day-experiences of students while travelling

Text Books:
1. *Epitome of Wisdom*, Orient Longman
2. *A Passage to England* by Nirad C. Chaudhuri

Reference Books:
1. Contemporary English Grammar Structures and Composition by David Green, Macmillan Publishers 2010, New Delhi
2. Innovate with English: A Course in English for Engineering Students by T Samson, Foundation Books
3. English Grammar Practice by Raj N Bakshi, Orient Longman
4. English Pronunciation in Use by Hancock, M. 2009, Cambridge University Press
5. Technical Communication by Meenakshi Raman, Oxford University Press
6. Grammar Games by Renuvolcuri Mario, Cambridge University Press
7. Enrich Your English by Thakur K.B.P. Sinha, Vijay Nicole Imprints Pvt. Ltd

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16PH1203–PHYSICS FOR ENGINEERS

I Year. B.Tech. CE–II Semester.
Prerequisite(s): 16PH1101 – Engineering Physics.

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

Course Objectives:
Develop ability to
1. Understand principle of sound propagation, basic requirements of a good auditorium, noise control in machines and automobiles, different methods of production of Ultrasonic waves and their applications.
2. Discuss the rotatory motion of rigid bodies; understand the concept of moment of inertia and its significance in rotatory motion, various types of modulii of elasticity.
3. Distinguish types of frictions, understand various principles involved in fluid motion, understand the concept of viscosity, and methods of production and measurement of low pressure.
4. Discuss the formation of energy bands in solids, classification of solids, and find the carrier concentration in intrinsic semiconductor, understand the concept of Fermi level and Hall Effect.
5. Understand the principle of optical fiber communication; distinguish various types of optical fibers and their applications.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain the basic requirements of a good auditorium, noise control of machines and automobiles, outline methods of production and applications of ultrasonics.
CO 2: Explain concepts of moment of inertia, torque, importance of rotatory motion of rigid bodies and the methods of determining elastic modulii of different materials.
CO 3: Interpret principles of fluid motion; explain viscosity of lubricants, production and measurements of low pressure.
CO 4: Distinguish between conductors, semiconductors and insulators; find the carrier concentration in intrinsic semiconductor and identify the type of extrinsic semiconductor through Hall Effect.
CO 5: Explain modes of propagation, attenuation in optical fibers and the applications of optical fibers in communication, sensors and detectors.

Syllabus:

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

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

UNIT II: Dynamics of Rigid bodies

Angular momentum, angular acceleration, moment of inertia and its significance. Rotational kinetic energy, torque, work done by a torque, concept of torsional oscillations, torsional pendulum, KE of a rolling body on horizontal plane, rolling body on inclined plane, Moment of Inertia of a fly wheel and its applications. Modulii of elasticity, Poisson's ratio, beam-bending moment- cantilever- uniform and non-uniform bending.

UNIT III: Friction, Wear and Fluid motion

Surface irregularities, sliding friction – rolling friction – effects of frictional heat – wear – mechanism of lubrication – various types of lubrication (qualitative treatment)
Turbulent and streamline motion, rate of flow, equation of continuity, Bernoulli's theorem, practical applications- Venturimeter, Torricelli's theorem.
Viscosity**:** Poiseuille's method, Ostwald's Viscometer, production and measurement of low pressures, rotary oil pump and diffusion pump, Pirani and Penning Gauge.

UNIT IV: Band theory of solids and semiconductors:

Electron in a periodic Potential, Bloch theorem, Kronig-Penny Model (Qualitative Treatment), Brillouin Zones (E-K curve), origin of energy band formation in solids, concept of effective mass of an electron, classification of materials into conductors, semiconductors & insulators.
Classification of semiconductors - n-type, p-type, Fermi level in Intrinsic and Extrinsic semiconductors, Variation of Fermi level with temperature and concentration of dopants in extrinsic semiconductors, calculation of carrier concentration in intrinsic semiconductor (Quantitative treatment), carrier concentration in Extrinsic Semiconductors (Qualitative treatment), direct and indirect band gap semiconductors, Hall effect.

UNIT V: Fiberoptics

Principle of optical fiber, construction of an optical fiber, acceptance angle and acceptance cone, numerical aperture, Types of optical fibers, modes of propagation, attenuation in optical fibers, Block diagram of optical fiber communication system, applications of optical fibers in sensors and detectors (displacement, smoke and liquid level detectors).

Text Books:
1.   Strength of Materials, R. S. Kurmi and Gupta, S.Chand publications.
2.   A Text Book of Engineering Physics, M. N. Avadhanulu, S. Chand publications.

Reference Books:
1. Elements of properties of matter mechanics, D.S. Mathur, S. Chandpublications.
2. A textbook of Engineering Mechanics, R.K. Bansal, Laxmi Publications.
3. Engineering Mechanics, S Timoshenko, K H Young, J V Rao, SukumarPati, Tata McGraw Hill publications.
4. Properties of Matter, Brijlal & Subramanyam, S. Chand publications.
5. Engineering Mechanics, K.L. Kumar, Tata McGraw Hill publications.

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16MA1201–MATHEMATICS - II

I Year. B.Tech. CE– II Semester.
Prerequisite(s):16MA1101 Mathematics – I.

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

Course Objectives:
Develop ability to
1. Identify the methods of differential calculus to optimize single and multivariable functions.
2. Evaluate improper integrals using Beta and Gamma functions.
3. Evaluate multiple integrals and apply the same to solve engineering problems.
4. Understand convergence of the series using Fourier series technique and to find solution of integral equations using Fourier Transforms.
5. Explain properties of vector operators. Use vector calculus to determine the length of a curve, area between surfaces and volume of solids.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Apply the methods of differential calculus to optimize single and multivariable functions.
CO 2: Evaluate improper integrals using Beta and Gamma functions.
CO 3: Evaluate multiple integrals and apply the concepts of the same to find areas, volumes and moment of inertia of regions on a plane or in space.
CO 4: Apply Fourier series to find convergence of series and Fourier Transforms to solve integral equations.
CO 5: Apply vector operators on scalar and vector point functions to compute length of a curve, area between surfaces and volume of solids, using vector calculus.

Syllabus:

UNIT-I: Functions of Several Variables
Limit, Continuity, Partial Differentiation, Total Derivatives, Functions of several variables- Functional dependence- Jacobian- Maxima and Minima of functions of two variables without constraints and with constraints-Method of Lagrange multipliers

UNIT-II: Improper Integration
Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.

UNIT-III: Multiple Integration and its Applications
Multiple integrals – double and triple integrals – change of order of integration- change of variables (polar, cylindrical and spherical), Finding the area of a region using double integration and volume of a region in space using triple integration.

UNIT – IV: Fourier series and Transforms

Definition of periodic function, Fourier expansion of periodic functions in a given interval of length 2π. Determination of Fourier coefficients – Fourier series of even and odd functions– Fourier series in an arbitrary interval – even and odd periodic continuation – Half–range Fourier sine and cosine expansions, Fourier integral theorem –Fourier sine and cosine integrals, Fourier Integral transforms–Fourier sine and cosine transforms and their properties–inverse transforms– Finite Fourier transforms

UNIT–V: Vector Calculus

Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties, - Laplacian operator - Solenoidal and irrotational vectors, Scalar Potential function, directional derivatives. Line integral – work done – Surface integrals -Volume integral. Green's theorem, Stoke's theorem and Gauss's Divergence theorems (Statement & their Verification).

Text Books:
1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons Publishers
2. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

Reference Books:
1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publications.
2. Engineering Mathematics by Srimanta pal, Subhodh C.Bhunia, Oxford higher Education.
3. Mathematics for Engineers and Scientists, Alan Jeffrey, 6ht Edi, 2013, Chapman & Hall/ CRC
4. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.
5. Ordinary & Partial Differential Equations, M D Raisinghania, S. Chand.

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16CH1201–ENGINEERING CHEMISTRY

I Year. B.Tech. CE–II Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Define and understand various conductances in electrochemistry, functional working of electrodes, different types of batteries and cells along with their applications.
2. Understand the concept of corrosion; distinguish various types of corrosion and prevention.
3. Identify the causes of hardness in water and its treatment using various techniques.
4. Classify polymers and their applications; understand different mechanisms of polymerisation and different fibers along with their applications.
5. Understand the engineering materials namely, cement, lubricants, ceramics and glass.
6. Understand various adsorption techniques and its applications.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain
    a. Various conductances in electrochemistry.
    b. Functional working of electrodes.
    c. Construction and working of different types of batteries and cells along with their functional differences and applications.
CO 2: Explain corrosion and causes of corrosion, distinguish various types of corrosion and explain various methods to prevent corrosion.
CO 3: Explain hardness in water and various techniques used to treat the same.
CO 4: Distinguish clearly various polymers and various synthetic and natural fibers; explain various polymerization processes.
CO 5: Explain the properties of various materials namely, cement, lubricants, ceramics and glass and their applications.
CO 6: Explain various adsorption techniques and its applications.

Syllabus:

UNIT I: Electrochemistry and Batteries
Electro Chemistry: Conductance -Specific, Equivalent and Molar, their Units;
EMF: Galvanic Cell; types of Electrodes: Calomel, Quinhydrone and Glass; Nernst equation and its applications; Concentration cells, determination of pH using glass electrode-Numerical problems.
Batteries: Introduction, types of batteries: Primary cells and secondary cells, differences between them with examples.
Fuel cells: Hydrogen-Oxygen fuel cell; applications of fuel cells.

UNIT II: Corrosion and its control methods
Corrosion: Introduction, definition, Types of Corrosion and disadvantages of corrosion. Mechanism of corrosion- chemical and electrochemical corrosion. Factors affecting rate of corrosion– Nature of metal and Nature of Environment –Electrochemical series and its applications, Corrosion control methods – Cathodic protection (sacrificial anodic and impressed current). **Surface coatings**: Metallic coatings and methods of application of metallic coatings – hot dipping (galvanization and tinning), Electro plating (Copper plating) and Electroless plating (Ni plating) – **Organic coatings**– Paints - constituents and their functions.

UNIT III: Water and its treatment
Hardness of Water: Types of hardness-temporary and permanent, units and interrelation between them, Boiler troubles–Scale and sludge, Priming and foaming, Caustic embrittlement- Treatment of boiler feed water–Internal treatment (Colloidal and Calgon conditioning)–External treatment–Zeolite process, ion exchange process. Potable water- Steps involved in treatment of potable water–Disinfecting water by chlorination and ozonization – Reverse Osmosis and its significance.

UNIT IV: Polymers
Introduction: Classification of polymers, Types of Polymerization–addition and condensation, differences between addition and condensation polymers, Mechanism of free radical addition polymerization.
Plastics: Thermoplastic and Thermosetting resins, differences between thermoplastic and thermosetting polymers. Preparation, properties and engineering applications of PVC, Teflon and Bakelite.
Fibers: Introduction, types- natural and synthetic. Preparation, properties and uses of Nylon–6, 6, Nylon 6, 10. Fiber Reinforced Plastic (FRP) –Carbon fiber reinforced plastic and applications.

UNIT V: Materials and Surface Chemistry
A) Materials Chemistry
Cement –Introduction, Types of Cement, setting and hardening of Portland cement, Reinforced Concrete.
Lubricants–Characteristics of good lubricant, properties– flash and fire, cloud and pour point and their significance, Nano Fabricated Lubricants.
Ceramics- Advanced Ceramics.
Glass– Reinforced glass material.
B) Surface Chemistry Adsorption– Introduction, Types of adsorption, Isotherms– Freundlich and Langmuir adsorption isotherm, applications of adsorption, Application of adsorption in heterogeneous catalysis (automotive catalysts).
Colloids– Definition, optical properties and application of colloids in industry.

Text Books:
1. Engineering Chemistry by R.P. Mani, K.N. Mishra, B. Rama Devi /CENGAGE learning.
2. Engineering Chemistry by P.C Jain; Monica Jain, Dhanpatrai Publishing Company (2008).

Reference Books:
1. Engineering Chemistry by B. Siva Shankar McGraw Hill Publishing Company Limited, New Delhi (2006),
2. Engineering Chemistry J.C. Kuriacase; J. Rajaram, Tata McGraw Hills Publishing.
Company Limited, New Delhi (2004).
3. Text Book of Engineering Chemistry by S.S. Dara; Mukkati S. Chand.
Co Publishers, New Delhi (2006).
4. Chemistry of Engineering Materials by CV Agarwal, C.P Murthy, A.Naidu, BS Publications.
5. An Introduction to Electro Chemistry by Samuel Glassstone, East-West Pvt.ltd.
6. Corrosion Engineering by Mars G.Fontana, McGraw Hill.

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16CH1202–ENVIRONMENTAL STUDIES

I Year. B.Tech. CE–II Semester.
Prerequisite(s): None.

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

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.

Syllabus:

UNIT- I: Ecosystem
Scope and importance of ecosystem, Classification of ecosystem, Introduction to biotic and abiotic components, Forest and desert ecosystem, Functions of eco system food chains, food webs and ecological pyramids, Flow of energy in an ecosystem, Biogeochemical cycles - Nitrogen cycle and Carbon cycle, Phosphorous cycle and Hydrological cycle.

UNIT- II: Natural Resources
Classification of resources, Water resources-Use and over utilization of surface and ground water, Mineral resources-Environmental effects of extracting and using mineral resources –Case study, Land resources – Land degradation, man induced landslides, Energy resources – renewable, solar energy, wind energy, applications, Non-renewable resources- fossil fuels, nuclear energy, Chernobyl and Fukushima Daiichi nuclear disasters.

UNIT- III: Biodiversity and Biotic Resources
Introduction, definition, genetic, species and ecosystem diversity, Types of diversity, Alpha, Beta and Gamma, Value of biodiversity- Consumptive use, productive use , ethical, aesthetic and intrinsic values , Hotspots of biodiversity in India, Threats to biodiversity, Conservation of biodiversity – In-situ and Ex-situ methods, bioaccumulation and biomagnifications.

UNIT- IV: Environmental Pollution and Control Technologies
Classification of Pollution, Air pollution causes, effects and remedial measures , Water pollution, causes, effects and remedial measures, Noise Pollution, Emission standard limits, Acid rains. Wastewater treatment technologies- Common and Combined Effluent Treatment Plants (CETP), Thermal Pollution causes, effects and remedial measures, Solid Waste Management, Greenhouse effect and Global warming, Ozone layer depletion and its effects.

UNIT- V: Environmental Policy, Legislation & EIA
Definition of Impact and Types of Impact, Steps involved in Environmental Impact Assessment (EIA) methodology, methods of base-line data acquisition, Impacts of development on different environmental components, Prediction of Impacts , Methods of rain-water harvesting traditional and modern methods , National Environmental Policy. Air conservation act, Water conservation act, Forest conservation act.
Towards Sustainable Future: Concept of Sustainable development, Threats of sustainable development, Environmental education, Conservation of resources, Concept of Green building.

Text Books:
1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha - University Grants Commission.
2. Environmental Studies by Anubha Kaushik& C.P. Kaushik

Reference Books:
1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, B S Publication
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Introduction to Environmental Management by Mary.K. Theodare, Louis Theodare, CRC Press, Taylor &Francis group.
4. Fundamentals of Ecology by Eugene P.Odum, Gary W.Barrett, Thomson International.

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16ME1201–ENGINEERING MECHANICS - II

I Year. B.Tech. CE–II Semester.
Prerequisite(s):
16ME1102 Engineering Mechanics – I
16PH1101 Engineering Physics.

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

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 impulse, momentum of particles, rigid bodies and vibrations associated with dynamics of rigid bodies.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Calculate and analyse the forces in members and structures.
CO 2: Apply the principles of dynamics to solve various engineering problems.
CO 3: Apply the principles of kinematics, kinetics of particles and rigid bodies to find solutions of problems in straight and curvilinear motions.
CO 4: Apply the concepts of impulse, momentum and vibrations associated with dynamics of rigid bodies to solve engineering problems.

Syllabus:

UNIT-I
Analysis of structures: Introduction, construction of trusses, method of joints, method of sections.

UNIT-II
Kinematics of a particle: Introduction, Motion of a particle, rectilinear motion, Curved motions, Concepts of kinematics of rigid bodies.

UNIT-III
Kinetics of particles: Introduction, Principles of Dynamics, D'Alemberts Principle.
Kinetics of particles: Translation analysis as a particle, Concepts of kinetics of rigid bodies.

UNIT-IV
Work Energy Method: Introduction, Work energy equation for translation, work energy applied to particle motion, Work energy applied to connected bodies, Work energy applied to plane 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, (1998), Harper – Collins publishers, New Delhi.
2. Engineering Mechanics, S.S. Bhavikatti& J.G. Rajasekharappa, (2012), New Age International, India.

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

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16EE1201–BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

I Year. B.Tech. CE– II Semester.
Prerequisite(s):
16PH1101Engineering Physics
16MA1101 Mathematics-I

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

Course Objectives:
Develop ability to
1. Understand basic concepts of Ohm's Law and Kirchhoff's Law applicable in electrical circuits; working principle of voltage, current and power measuring instruments.
2. Understand the principles of operation of DC machines and applications.
3. Understand basic operating principles of single phase transformer, alternator and induction motor.
4. Understand electronic devices namely, p-n diode and zener diode and their applications.
5. Understand fundamental concepts of transistors, SCR and their applications.
6. Understand working principle of Cathode Ray Oscilloscope (CRO).

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain basic concepts of electrical circuits and analyze the same.
CO 2: Explain the functioning of voltage, current and power measuring instruments.
CO 3: Explain working of DC machines which include DC generators and DC motors.
CO 4: Explain working of single phase transformer, alternator and induction motor.
CO 5: Explain functioning of p-n diode, zener diode and their applications.
CO 6: Explain functioning of transistors, SCR and their applications.
CO 7: Explain working of CRO and its application.

Syllabus:

UNIT-I
Basic Circuit analysis: Basic definitions, types of elements, Ohm's Law, resistive networks, Kirchhoff's Laws, inductive networks, capacitive networks, series, parallel circuits and star-delta and delta-star transformations.
Instruments: Basic principle of measuring instruments – Permanent Magnet Moving Coil (PMMC) and Moving Iron (MI) instruments.

UNIT-II
DC Machines: Construction and principle of operation of DC Generator – EMF equation – windings – lap and wave windings-characteristics of DC generator- types – DC motor types – torque equation – applications –speed control of DC motor- three point starter.

UNIT-III
Transformers: Principle of operation of single phase transformers –EMF equation – Open Current (OC) and Short Circuit (SC) test of single phase transformer - losses – efficiency and regulation.

AC Machines: Principle of operation of alternators – regulation by synchronous impedance method –Principle of operation of induction motor – slip – torque characteristics – applications.

UNIT-IV
Diodes: p-n junction diode operation, symbol, V-I characteristics, diode applications, and rectifiers – half wave, full wave and bridge rectifiers (simple problems). Zener diode operation, symbol, V-I characteristics.

UNIT-V
Transistors: Regions of operations of transistors, types of configurations of transistors, p-n-p and n-p-n junction transistor, transistor as an amplifier, SCR characteristics and applications.

Cathode Ray Oscilloscope (CRO): Principles of CRT (Cathode Ray Tube), deflection, sensitivity, electrostatic and magnetic deflection, applications of CRO - voltage, current and frequency measurements.

Text Books:
1. Basic concepts of Electrical Engineering, PS Subramanyam, BS Publications.
2. Electronic Devices and Circuits, S.Salivahanan, N.Suresh Kumar, A.Vallavaraj,Tata McGraw-Hill companies.

Reference Books:
1. Basic Electrical Engineering, S.N. Singh, PHI.
2. Basic Electrical Engineering, Abhijit Chakrabarthi, Sudiptanath, Chandrakumar Chanda, Tata-McGraw-Hill.
3. Principles of Electrical Engineering, V.K Mehta, Rohit Mehta, S.Chand Publications.
4. Basic Electrical Engineering, T.K.Nagasarkar and M.S. Sukhija, Oxford University Press.
5. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI.
6. Basic Electrical Engineering by D.P.Kothari , I.J. Nagrath, McGraw-Hill.
7. Electronic Devices and Circuits, K. LalKishore, BS Publications.
8. Electronic Devices and Circuits, J. Millman, C.C.Halkias, and SatyabrataJit, Tata McGraw-Hill companies.
9. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, PEI/PHI.
10. Introduction to Electronic Devices and Circuits, Rober T. Paynter, PE.
11. Integrated Electronics, J. Millman and Christos C. Halkias, Tata McGraw-Hill companies.
12. Electronic Devices and Circuits, Anil K. Maini, VarshaAgarwal, Wiley India Pvt. Ltd.

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16EN12L2–ENGLISH LAB

I Year. B.Tech. CE– II Semester.
Prerequisite(s):16EN1101English-I

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

Course Objectives:
Develop ability to
1. Use Computer-aided Multimedia learning tools for individual language learning.
2. Sensitize student to the nuances of English speech sounds, accent, intonation and rhythm.
3. Listen actively and speak with intelligibility.
4. Apply language skills in real-life situations.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Demonstrate the nuances of language through audio-visual tools during presentation**.**
CO 2: Demonstrate good writing skills.
CO 3: Speak intelligibly.
CO 4: Practice usage of International Phonetic Alphabet.

Syllabus:
Module: 1
Ice Breaking, JAM
Module: 2
Speech Sounds
Module: 3
Listening Activities (Only for demonstrative purpose)
Module: 4
Situational Dialogues, Debate
Module: 5
Information Transfer
Module: 6
Presentation Skills
Additional Topics
Stress Management
Negotiation Skills

Reference Books:
1. Speaking English Effectively, Krishna Mohan and N.P.Singh, MacMillan Publishers, 2011.
2. How to prepare for interviews by ShashiKumar.V and Dhamija P.V
3. English Pronunciation in Use by Hancock, M. 2009, Cambridge University Press
4. Spoken English, a Manual of Speech and Phoneticsby R.K.Bansal and J.B.Harrison, Orient Black Swan 2013.
5. Spoken English CDs by Shashi Kumar and Dhamija
6. A Manual entitled English Language Communication Skills Lab Manual cum Workbook by Cengage Learning India 2013
7. GCET ELCS Lab Workbook.

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16CH12L1–ENGINEERING CHEMISTRY LAB

I Year. B.Tech. CE– II Semester.
Prerequisite(s): None.
Course Objectives:
Develop ability to

L	T	P/D	C
-	-	3/-	2

1. Understand the preparation of compounds namely, Aspirin and Biodiesel.
2. Use instrumental methods namely, Potentiometry, Conductometry and Colorimetry to find the concentration of a given solution.
3. Experimentally determine the physical constants namely, viscosity and surface tension of a given liquid using Ostwald's Viscometer and Stalagmometer respectively.
4. Use EDTA method to find the hardness of water, estimate chlorides in hard water by Precipitation titration, ferrous iron in water by Dichrometry and iodine in different salts using Iodometry.
5. Understand the preparation of Oil of Winter green.
6. Experimentally determine ferrous iron in cement by Colorimetric method.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Employ the techniques which are fundamental in the preparation of Aspirin, Biodiesel and oil of Winter Green.
CO 2: Use various instrumental methods in volumetric analysis namely, Potentiometry, Condoctometry to determine the concentration of a given solution.
CO 3: Use various titration methods namely, EDTA, Precipitation, Iodometry and Dichrometry for estimating different chemical compounds/ions present in various samples.
CO 4: Estimate the concentration of a coloured compound using the technique of Colorimetry.
CO 5: Experimentally determine the physical properties of liquids such as viscosity and surface tension.
Any ten of the following twelve experiments must be conducted.

LIST OF EXPERIMENTS:

 I.   Preparation of compounds
   1. Preparation of Aspirin
   2. Preparation of Biodiesel
 II.   Instrumental Methods
  A. Potentiometry
   3. Titration of Strong acid vs Strong base by Potentiometry.
   4. Titration of Weak acid vs Strong base by Potentiometry.
  B. Conductometry
   5. Titration of Strong acid vs Strong base by Conductometry.
  C. Colorimetry
   6. Estimation of Copper by Colorimetric method.

III.   Physical Constants
      7. Determination of Viscosity of given liquid by Ostwald's Viscometer.
      8. Determination of Surface tension of given liquid by Stalagmometer.

IV.   Titrimetry
      9. Estimation of Hardness of water by EDTA method.
     10. Estimation of Chlorides in hard water by Precipitation method.
     11. Estimation of Ferrous Iron in water by Dichrometry.
     12. Estimation of Iodine in different salts using Iodometry.

Additional Experiments (Mandatory)
      1. Preparation of Oil of Winter green.
      2. Determination of Ferrous iron in cement by Colorimetric method.

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16HS12L1–GENDER SENSITIZATION

I Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

Course objectives:
Develop ability to
1. Sensitize with regard to gender issues.
2. Provide a critical perspective on the requirements of healthy socialization of both genders.
3. Create awareness and understanding on some of the key biological changes of both genders.
4. Apprise on the importance of sharing domestic work and the economic contribution of women.
5. Create awareness on the impact of gender violence on society.
6. Create consciousness on the contribution of women of Telangana in its development.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Demonstrate sensitivity with regard to gender issues.
CO 2: Show healthy socialization among both the genders that can be observable.
CO 3: Show empathy on some of the key biological changes of both genders.
CO 4: Realize the importance of sharing domestic work and economic contribution of women.
CO 5: Realize the impact of gender violence on society.
CO 6: Show awareness on the contribution of women of Telangana in its development.

Syllabus:

UNIT-I:
UNDERSTANDING GENDER:
Gender: why should we study it? (*Towards a world of equals: Unit-1*)
Socialization: Making women, making men (*Towards a world of equals: Unit-2*)
Introduction. Preparing for Womanhood. Growing up male. First lessons in caste. Different masculinities.
Just relationships: being together as Equals (*Towards a world of equals: Unit-12*)
Mary kom and Onler. Love and Acid just do not mix. Love Letters. Mother and Fathers. Further reading: Rosa Parks-The Brave Heart.

UNIT-II:
GENDER AND BIOLOGY:
Missing women: Sex selection and its consequences (*Towards a world of equals: Unit-4*)
Declining sex ratio. Demographic consequences.
Gender spectrum: beyond the Binary (*Towards a world of equals: Unit-10*)
Two are many? Struggles with discrimination.
Additional reading: our Bodies, our Health (*Towards a world of equals: Unit-13*)

UNIT –III:
GENDER AND LABOUR:
House work: the invisible Labour (*Towards a world of equals: Unit-3*)
"My mother doesn't work". "share the load".
Women's work: its politics and economics (*Towards a world of equals: Unit-7*)
Fact and fiction. Unrecognized and work. Further reading: Wages and condition of work.

UNIT-IV:
ISSUES OF VIOLENCE:
Sexual Harassment: Say No! *(Towards a world of equals: Unit-6)*
Sexual Harassment, not Eve-teasing- coping with Everyday Harassment-Further reading: "chupulu".
Domestic violence: speaking out (*Towards a world of equals: Unit-8*)
Is home a safe place? – When women unite [film].Rebuilding lives. Further Reading: New Forums for justice.
Thinking about sexual violence (*Towards a world of equals: Unit-11*)
Blaming the victim– "I Fought for my life ...." –Further Reading: The Caste Face of violence.

UNIT – V:
GENDER STUDIES:
Knowledge: Through the lens of Gender (*Towards a world of equals: Unit-5*)
Point of View. Gender and the Structure of Knowledge. Further Reading: Unacknowledged women Artists of Telangana.
Whose History? Questions for Historians and Others *(Towards a world of equals: Unit-9)*
Reclaiming a past. Writing other Histories. Further Reading: Missing pages from Modern Telangana History.

Text Books:
1. "Towards a World of Equals: A Bilingual Textbook on Gender" Written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, VasudhaNagaraj, AsmaRsheed, GoguShyamala, DeepaSreenivas and Susie Tharu.

References Books:
1. Sen, Amarthya. "More than one million Women are missing." New York Review of Books 37.20 (20 December 1990). Print. "We were Making History....." Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.
2. Tripti Lahari. "By the Numbers: Where Indian Women Work." Women's Studies Journal (14 November 2012) Available online at: http// blogs.wsj.com/ India real time/2012/11/14/by-the-number-where Indian-women-work/>
3. K. Sathyanarayana and Susie Tharu (Ed) Steel Nibs Are sprouting: New Dalit writing South India, Dossier 2: Telugu and Kannada http://harpercollins.co.in/BookDatails.asp?Book cod=3732
4. Vimala. "Vantillu (The Kitchen)". Women Writing in India: 600 BC to the present. Volume //: the 20th Century Ed. Susie Tharu and K. Llita. Delhi: Oxford University Press, 1995. 599-601.

5. Shatugna, Veena et at. "Women's work and its Impact on Child Health and Nutrition", Hyderabad, National Institute of Nutrition, Indian Council of Medical Research 1993.
6. Stree Shakti Sangatana. "We were Making History....." Life Stories of Women in the Telangana People's struggle. New Delhi: Kali for Women, 1989.
7. Menon, Nivedita. "Seeing like a Feminist", New Delhi: Zubban-Penguin Books, 2012.
8. Jayaprabha A. "Chupulu (Stares)". Women Writing in India: 600BC to the present. Volume //. The 20th Century Ed. Susie Tharu and K. Llita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shyan and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical analysis." International Journal of Humanities and Social Science invention 2.4(2013).
10. Gautham, Liela and Gita Ramaswamy. "A conversation between a Daughter and Mother."Broadsheet on contemporary politics. Special issue on Sexuality and Harassment: Gender Politics on Campus Today. Ed. Madhumeeta sinha and Asma Rasheed. Hyderabad: Anveshi Research center for Women's Studies, 2014.
11. Abdulali Sohaila "I Fought for for My Life ....and Won." Available online at: http//www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
12. Jaganathan Pradeep, Partha Chetterjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Permanent black and Ravi Dayal Publishers, New Delhi, 2000.
13. K. Kapadia. "The violence of Develop: the politics of Identity, Gender and Social Inequalities in India", London: Zed Boos, 2002.
14. S. Benhabib. "Situating the Self: Gender, Community, and post modernism in contemporary Ethics", London: Routledge, 1992.
15. Viginia Woolf. "A Room of one's Own",Oxford: Black Swan. 1992.
16. T. Banuri and M. Mahmood. "Just Development: Beyond Adjustment with a Human Face", Karachi: Oxford University press,1997.

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16MA2102–MATHEMATICS - III

II Year. B.Tech. CE– I Semester.
Prerequisite(s): 16MA1101 Mathematics-I.

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

Course Objectives:
Develop ability to
1. Understand approximation of a polynomial/curve to satisfy the given set of data.
2. Determine approximate zeros of an algebraic/transcendental/system of equations using suitable numerical methods.
3. Evaluate differentiation/integration methods for a given set of data using numerical methods.
4. Apply various numerical methods to compute approximate solution of a given ordinary differential equation with initial conditions.
5. Apply Partial Differential Equations to solve problems in one dimensional heat and wave equations.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Approximate a polynomial/curve to satisfy the given set of data.
CO 2: Apply suitable numerical methods to find the approximate root/solution of algebraic/transcendental/system of equations.
CO 3: Apply various numerical methods to evaluate differentiation/integration for a given set of data.
CO 4: Solve a given ordinary differential equation with initial conditions using suitable numerical methods.
CO 5: Apply partial differential equations to solve problems namely, one dimensional wave equation and heat equation.

Syllabus:

UNIT-I: Interpolation and Curve fitting
Interpolation: Introduction-Errors in polynomial Interpolation - Finite Differences - Forward Differences - Backward Differences - Central Differences - Symbolic relations and separation of symbols - Difference Equations - Differences of a polynomial - Newton's formulae for interpolation-interpolation with unevenly spaced points-Lagrange's interpolation formula.
Curve fitting: Fitting of a straight line - Second degree curve –exponential curve -power curve by method of least squares.

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UNIT-II: Root finding Methods

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 GaussSeidel Iteration method.

UNIT-III: Numerical Differentiation, Integration

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

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 Methods.

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, one dimensional Heat equation.

Text Books:
1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

Reference Books:
1. Computer Oriented Numerical Methods by V. Rajaraman, PHI Learning.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
3. Engineering Mathematics by Srimanta pal, Subhodh C.Bhunia, Oxford Higher Education.
4. A Text book of Higher Engineering Mathematics, Bali N P and Saxena, Lakshmi Publications.
5. Introductory methods of Numerical Analysis by S.S. Sastry, PHI learning.

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16CE2101–BUILDING MATERIALS, CONSTRUCTION AND PLANNING

II Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

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

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
CO 1: Explain characteristics of building materials and identify their suitability for building works.
CO 2: Select suitable type of foundations, lintels, floors, roofs, plumbing, ventilation, fire protection, plastering and painting services for the building.
CO 3: Select suitable type of formwork for the construction of building.
CO 4: Explain significance of emerging building materials and basics of green building.
CO 5: Comprehend building bye-laws and develop building plans accordingly.

Syllabus:

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.

UNIT–III
Building Components: Lintels, Arches and its Geometrical forms, walls, vaults – Stair cases, 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 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 bye-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. Construction Technology – Vol – I & II, Roy Chudley, Pearson Prentice Hall.
6. Civil Engineering Materials by Tech. Teachers Training Institute, McGraw Hill Education, 1992.
7. Alternative Building Materials and Technologies, K.S.Jagadish, B.V. Venkatarama Reddy and K.S. NanjundaRao, New Age International Pvt. Ltd, 2009.

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16CE2102–STRENGTH OF MATERIALS – I

II Year. B.Tech. CE– I Semester.
Prerequisite(s):
16ME1102 Engineering Mechanics-I
16ME1201 Engineering Mechanics-II

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

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 and interpret the deflection of simply supported, cantilever and overhanging beams.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Evaluate the strength of various civil engineering materials against structural actions such as compression, tension, shear and bending.
CO 2: Construct shear force and bending moment diagrams for beams and compute stresses and strains in shear and bending in the cross section of beams subjected to transverse loading.
CO 3: Define and analyse shear stresses in beams and plot shear stress distribution across cross section of beams.
CO 4: Design circular shafts and helical springs with appropriate resisting capacities for use in automobiles and industry.
CO 5: Determine deflection of beams by various methods namely, double integration, Macaulay's method, Mohr's theorems, Moment area method and Conjugate beam method.

Syllabus:

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 moduli 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 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 angle sections.

UNIT–IV

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations : $T/J = q/r = N\theta/L$ – 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 – 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: Introduction – 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, 2016.
2. Strength of Materials, R.Subramanian, Oxford University Press, 2010.

Reference Books:
1. Strength of Materials, W.A. Nash, McGraw-Hill Education, 2014.
2. Mechanics of Materials, Gere & Timoshenko, CBS Publishers, 2004.
3. Mechanics of Materials, James M. Gere and Barry J. Goodno, Cengage, 2013.
4. Elements of Strength of Materials, S.P. Timoshenko & D.H. Young, East West Press, 2011.
5. Mechanics of Structures Vol –I, S.B.Junnarkar and H.J.Shah, Charotar Publishing House Pvt. Ltd., 2014.
6. Strength of Materials, S.S. Rattan, McGraw Hill Education, 2011.
7. Fundamentals of Solid Mechanics, M.L.Gambhir, PHI Learning, 2009.
8. Strength of Materials and Structures, John Case, Lord Chilver& Carl T.F. Ross, Butterworth-Heinemann publishers, 2003.

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16CE2103–SURVEYING

II Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand working principles of land surveying equipment such as chain, compass, plane table, theodolite, dumpy level, auto level and their importance in civil engineering works.
2. Understand the determination of elevations of different points using levelling instruments for civil engineering projects such as fixing the plinth level of buildings or to align canal, sewerage system or road, or to locate dam, etc.
3. Understand the preparation of topographic details and plot contour maps using Theodolite 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 Trigonometric levelling and Tacheometric applications.
6. Understand curves and methods of curve setting for design and construction of roads, culverts, railway lines, pipelines, etc.
7. Study the modern techniques in surveying with 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
CO 1: Explain basic surveying operations and computations using chain/tape, compass and plane table survey; theories of errors and their analysis; computation of areas.
CO 2: Illustrate the levelling operations and apply the principles of levelling and contouring, prepare contour maps and estimate volumes of earth work.
CO 3: Explain use of Theodolite for traversing and make traverse computations.
CO 4: Employ methods to handle different cases to determine the elevations of various points using concepts of Trignometric levelling and apply corrections such as curvature, refraction and axis signal in observations.
CO 5: Compute parameters required for setting out simple and compound curves.
CO 6: Explain use of modern tools such as Total Station and GPS.
CO 7: Explain concepts of remote sensing and GIS and apply them in civil engineering problems.

Syllabus:

UNIT–I
Introduction: Surveying Objectives, Classification and Principles of Surveying, Scales, Conventional symbols and code of signals, Linear Measurements, Instruments for surveying, Preparation of map and plan.
Chain Surveying: Measurement of distance, chain surveying principles, selection of stations, offsets, locating building corners, field book, chain surveying instruments, conventional signs.
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, adjustment of closing error.
Plane Table Surveying: Principle and instruments used in plane table surveying, working operations, methods of plane table surveying.

UNIT–II
Levelling: Basic definitions, Description of a point (position) on the earth's surface, 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, methods of contouring – interpolation, contour gradient, contour maps.

UNIT–III
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–IV
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–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. Text book of Surveying, C. Venkataramiah, Universities Press, 2011.

Reference Books:
1. A Text book of Surveying and Levelling, R. Agor, Khanna Publishers, 2015.
2. Surveying: Theory and Practice, S.S. Bhavikatti, I.K. International Publishing House Pvt. Ltd, 2011.
3. Elements of Plane Surveying, Arthur R Benton and Philip J Taety, McGraw Hill Education, 2000.
4. Surveying (Vol 1, 2 & 3), K R Arora, Standard Book House, 2012.
5. Plane Surveying, A.M.Chandra, New Age International Pvt. Ltd Publishers, 2015.
6. Higher Surveying, A.M. Chandra, New Age International Pvt Ltd Publishers, 2015.
7. Surveying (Volume – 1, 2 & 3), B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2016.
8. Surveying (Volume – 1 & 2), S K Duggal, McGraw Hill Education, 2013.
9. Surveying and Levelling, N.N. Basak, McGraw Hill Education.
10. Global Positioning System - Theory and Practice, Hoffman.B, H.Lichtenegga and J.Collins, Springer - Verlag Publishers, 2001.

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16CE2104–FLUID MECHANICS

II Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand properties of fluids.
2. Understand hydrostatic law and its application in pressure measurement using manometers and pressure gauges; forces on different planes.
3. Understand classification of fluid flow, continuity equation, velocity potential, stream function, flow net analysis.
4. Understand fluid dynamics using Euler's and Bernoulli's equations; measurement of flow using Pitot tube, Venturimeter, Orificemeter, orifices, mouthpieces, notches and weirs.
5. Understand flow characteristics of laminar and turbulent flows; hydraulic gradient line and total energy line; Losses in pipes: series and parallel.
6. 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
CO 1: Compute properties of fluids namely density, specific weight, specific volume, viscosity, surface tension and vapour pressure.
CO 2: Compute pressure using manometers and forces on submerged bodies using hydrostatic law.
CO 3: Determine the possibility of flow using continuity equation; velocity potential and stream function.
CO 4: Determine flow velocity using Pitot tube and discharge using Venturimeter, Orificemeter, orifice, mouthpiece, notches and weirs.
CO 5: Determine losses in pipes for laminar and turbulent flows.
CO 6: Determine thickness of Boundary Layer using Navier Stokes equation.

Syllabus:

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
Buoyancy and Floatation: Stability of bodies, metacenter, liquid in relative equilibrium.
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 Books:
1. Hydraulics and Fluid Mechanics including Hydraulic Machines, P.N. Modi and S.M. Seth, Standard Book House, 2013.
2. Fluid Mechanics, Frank. M. White, McGraw-Hill Education, 2015.

Reference Books:
1. Fluid Mechanics, J F Douglas, J M Gasiorek, J A Swaffield and L B Jack, Pearson 2015.
2. Mechanics of Fluids, Merle C. Potter, David C Wiggert, Bassem.H Ramadan, Cengage Learning, 2012.
3. Fluid Mechanics, V.L. Streeter, E.B.Wylie and K.W. Bedford, McGraw-Hill Education, 2016.
4. Fluid Mechanics, A.K. Jain, Khanna Publishers, 2014.
5. Introduction to Fluid Mechanics and Fluid Machines, S.K.Som, GautamBiswasand S. Chakraborty, McGraw Hill Education, 2015.
6. Engineering Fluid Mechanics, K.L. Kumar, S Chand, 2014.
7. Mechanics of Fluids, Irving Shames, McGraw-Hill Education, 2002.
8. Introduction to Fluid Mechanics, Robert W. Fox, Philip J. Pritchard, Alan T. McDonald, Student Edition, John Wiley & Sons Inc, 2015.

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16CE21L1–STRENGTH OF MATERIALS LAB

II Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

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 deflection of simply supported and cantilever beams.
3. Understand the application of Maxwell's theorem.
4. Understand the application of Electrical resistance strain gauges.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Determine Young's modulus of materials of simply supported and cantilever beams by conducting deflection test.
CO 2: Determine modulus of rigidity of materials by conducting torsion test and spring test.
CO 3: Assess quality of materials by conducting hardness test and impact test.
CO 4: Determine stiffness and spring index for a given spring specimen.
CO 5: Operate Universal Testing Machine (UTM).
CO 6: Determine strain using electric resistance strain gauge.

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 by conducting deflection test on cantilever beam.
3. Determination of Young's modulus 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. Use of Electrical Resistance Strain Gauges.
12. Determination of Young's modulus for the given specimen by conducting deflection test on continuous beam.

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16CE21L2–SURVEYING LAB

II Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to
1. Understand basic and advanced surveying instruments used in field and develop contour maps from field data.
2. Understand appropriate methods for the solution of field problems.
3. Understand applications of Theodolite surveying in different field conditions.
4. Understand concept of Tacheometric surveying.
5. Recognize modern instruments for solving surveying problems and also understand concepts of automation in surveying.
6. Understand application of Total Station in various field conditions.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Conduct survey and collect field data.
CO 2: Prepare field notes from survey data and interpret data.
CO 3: Draw plans and maps to determine areas for civil engineering works.
CO 4: Develop Longitudinal and Cross Sectional Levelling for road works and canal works using Auto Level.
CO 5: Conduct traversing, contouring, curve setting, distance, gradient between two points using Total Station.

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. Distance between inaccessible points.
5. Heights and distances using the principles of Tacheometric surveying.
6. Determination of area using Total station.
7. Traversing using Total station.
8. Contouring using Total station.
9. Determination of remote height using total station.
10. Distance, gradient and difference in height between two inaccessible points using Total Station.
11. Curve setting using Total station.
12. Setting out works for buildings and pipe lines using Total station.
13. Finding position of stations using G.P.S.

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16MA21L1–COMPUTATIONAL MATHEMATICS LAB

II Year. B.Tech. CE– I Semester.
Prerequisite(s): 16CS1102 Introduction to Computer Programming

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to write and execute programs using C-programming/octave/Scilab to
1. Find the solution of system of non-homogeneous equations by L-U decomposition method.
2. Construct a polynomial of suitable degree by using the discrete data.
3. Find the numerical solutions of ordinary differential equations using different numerical methods like Taylor's series method, Picard's method, Euler's method, Euler's modified method and Runge-Kutta method, when the usual methods fail to find the general solution of a differential equation.
4. Apply numerical integration methods to find integration of unintegrable functions.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Determine the solution of system of non-homogeneous equations by L-U decomposition method.
CO 2: Construct a polynomial of suitable degree by using the discrete data.
CO 3: Apply Numerical differentiation techniques to find first, second and higher order derivatives, when the function under consideration is not differentiable.
CO 4: Determine the numerical solutions of ordinary differential equations using different numerical methods like Taylor's series method, Picard's method, Euler's method, Euler's modified method and Runge-Kutta method, when usual methods fail to find the general solution of differential equation.

Programming Tasks:
1. Determine y for a given x, if two arrays of x and y of same size are given (using Newton's interpolation both forward and backward).
2. Determine y for a given x, if two arrays of x and y of same size are given (using Lagrange's and Gauss's interpolation).
3. Find the solution of given system of linear equations using L-U decomposition method.
4. Find the solution of given system of linear equations using Jacobi's method.
5. Find the solution of given system of equations using Gauss-seidel iteration method.
6. Find the solution of given system of equations using Gauss Jordan elimination method.
7. Evaluate definite integral using trapezoidal rule, Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule.
8. Solve a given differential equation using Taylor's series.
9. Solve a given differential equation using Euler's and modified Euler's method.
10. Solve a given differential equation using Runge-Kutta method.

Advance Lab techniques:
1. Solve system of equations using QR-algorithm.
2. Solve system of equations using Predictor-Corrector algorithm.

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16MA2201–PROBABILITY AND STATISTICS

II Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand different types of random variables and their distributions.
2. Estimate population parameters statistically from a sample of population.
3. Estimate correlation coefficient and coefficient of regression of the given data.
4. Examine statistical hypothesis for large and small samples.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Distinguish between random variables pertaining to discrete and continuous distribution systems.
CO 2: Compute moments and moment generating functions of Binomial, Poisson and Normal distribution.
CO 3: Calculate sample statistics from given population and estimate population parameters.
CO 4: Identify similarity between two variables using correlation coefficient and coefficient of regression.
CO 5: Apply hypothesis procedure to test means and proportions using z-test for large samples and t-test, F-test, chi-square test for small samples.

Syllabus:

UNIT-I
Single Random variables and probability distributions: Probability Theory, Baye's Theorem, Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution, Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution, Binomial, Poisson & normal distributions and their properties, Moment generating functions of the above three distributions, and hence finding the mean and variance.

UNIT-II
Sampling Distributions & Estimations: Definitions of population, sampling, statistic, parameter, Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimations – likelihood estimate, interval estimations.

UNIT-III
Correlation & Regression: Correlation, coefficient of correlation, rank correlation (Karl Pearson's coefficient of correlation, Spearman's coefficient of correlation), regression, regression coefficient, lines of regression.

UNIT-IV
Testing of hypothesis (Large Samples): Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, two sided test, Large sample tests: (i) Test of Equality of means of two samples equality of sample mean and population mean (cases of known variance & unknown variance, equal and unequal variances) (ii) Tests of significance of difference between sample S.D and population S.D. (iii) Tests of significance difference between sample proportion and population proportion & difference between two sample proportions.

UNIT-V
Testing of hypothesis (Small Samples):
Small sample tests: Student t-distribution, its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples Snedecor's F- distribution and it's properties. Test of equality of two population variances Chi-square distribution, it's properties, Chi-square test of goodness of fit.

Text Books:
1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press.
3. Operations Research by S.D. Sharma.

Reference Books:
1. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.
2. Probability and Statistics by John J. Schiller, Murray R Spiegel, A. V. Srinivasan, Tata McGraw - Hill Education.
3. Engineering Mathematics by Srimanta pal, Subhodh C.Bhunia, Oxford higher Education.
4. Probability and Statistics by T.K.V.Iyengar and B.Krishna Gandhi Et, S Chand.
5. Fundamentals of Mathematical Statistics by S C Gupta and V.K.Kapoor.
6. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
7. Operations Research by S. Kalavathy, Vikas Publishing House Pvt Ltd.

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16CE2201–ENGINEERING GEOLOGY

II Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand origin and development of various surface features of earth including beneath the surface of the earth.
2. Understand nature of geographic distribution of rocks and engineering properties of rocks on the earth.
3. Understand nature of geological structures and their importance on civil engineering structures.
4. Understand concepts of geological and geophysical investigations on site.
5. Understand geology of dams and tunnels.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain weathering process of rocks.
CO 2: Explain different minerals and distinguishing features exhibited by rocks.
CO 3: Describe various rock deposits in India and suggest suitable types of foundation for different civil engineering structures.
CO 4: Give details of geological investigations on site.
CO 5: Explain subsurface information and groundwater potential sites through geophysical investigations.
CO 6: Evaluate suitability of site for dam construction, tunnel construction, recognize causes and effects of earthquakes and landslides; suggest mitigation measures.

Syllabus:

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. A Textbook of Engineering Geology, N. Chennakesavulu, Laxmi Publications, 2013
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. Fundamental of Engineering Geology, F.G. Bell, Aditya Books Pvt. Ltd., 2007.
6. Principles of Engineering Geology & Geotechnics, Dimitri P. Krynine & William R. Judd, CBS Publishers & Distributors, First Indian Edition, 2005.
7. Engineering Geology, Subinoy Gangopadhyay, Oxford University Press India, 2013.
8. Seismotectonic Atlas of India, Geological Survey of India, 2005.

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16CE2202–CONCRETE TECHNOLOGY

II Year. B.Tech. CE– II Semester.
Prerequisite(s):
16CE2101 Building Materials, Construction and Planning.

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

Course Objectives:
Develop ability to
1. Understand properties of various types of concrete.
2. Understand usage of admixtures in concrete.
3. Understand design of concrete mixes of requisite strength.
4. Be aware of latest developments in concrete technology.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain preparation and properties of concrete.
CO 2: Describe influence of admixtures on the properties of concrete.
CO 3: Explain behavior of fresh and hardened concrete.
CO 4: Design concrete mixes as per IS code.
CO 5: Identify need for special concretes.

Syllabus:

UNIT–I
Cement: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Tests on physical properties – Different grades of cement.
Admixtures: Types of admixtures – mineral and chemical admixtures.

UNIT–II
Aggregates: Classification of aggregate – Particle shape and texture – Bond, strength and other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption and moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine and coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT–III
Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation and bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Importance of Water in Concrete - Quality of mixing water.

UNIT–IV
Hardened Concrete: Water / Cement ratio – Abram's Law – Gelspace ratio – Nature of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.
Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.
Elasticity, Creep and Shrinkage: Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep and time – Nature of creep – Effects of creep – Shrinkage – Types of shrinkage.

UNIT–V
Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – 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, 2006.

Reference Books:
1. Concrete Technology, M.L. Gambhir, McGraw Hill Education, 2013.
2. Concrete Technology, Job Thomas, Cengage Learning India, 2015.
3. Concrete: Microstructure, Properties and Materials, P. Kumar Mehta, Paulo J.M. Monteiro, McGraw Hill Education, 2006.
4. Concrete Technology, A.R.Santhakumar, Oxford, 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: 2009 Guidelines for Concrete Mix Proportioning.
4. IS 456: 2000 Plain and Reinforced Concrete – Code of practice.
5. IS 516 – 1959 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.

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16CE2203–STRENGTH OF MATERIALS – II

II Year. B.Tech. CE– II Semester.
Prerequisite(s): 16ME1102 Engineering Mechanics-I
16ME1201 Engineering Mechanics-II
16CE2102 Strength of Materials - I.

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

Course Objectives:
Develop ability to
1. Understand principal stresses and strains in the assessment of civil engineering structures.
2. Understand concept of failure theories.
3. Understand columns subjected to direct and bending stresses.
4. Understand direct and bending stresses acting on chimneys, retaining walls and dams.
5. Understand behavior of thin cylinders, spherical shells and thick cylinders.
6. Be familiar with basic knowledge of Structural Analysis.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Determine principal stresses and strains in structural members.
CO 2: Determine buckling/ failure load for axially loaded columns.
CO 3: Analyze columns and struts.
CO 4: Calculate stresses in thin cylinders, spherical shells and thick cylinders subjected to internal and external pressures.
CO 5: Formulate equilibrium and compatibility equations for structural members.
CO 6: Understand concepts of indeterminacy and determinacy for structural components and analyze pin jointed frames.

Syllabus:

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.
Theories of Failure: Introduction – Various theories of failure – Maximum principal stress theory, Maximum principal strain theory, Maximum shear stress theory – Strain energy and Shear strain energy theory (Von Mises Theory).

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

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

Thick Cylinders: Introduction – Lame's theory for thick cylinders – Derivation of Lame's formulae – Distribution of hoop and radial stresses across thickness – Design of thick cylinders – Compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

UNIT–IV

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 and frames. Merits of indeterminate structures over determinate structures.

UNIT–V

Analysis of Perfect Frames: Types of frames- Perfect, Imperfect and Redundant pin jointed frames, assumptions, transfer of load to joints from wind and other forces - Analysis of determinate pin jointed frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Unit Load Method. Deflections of simple beams and pin- jointed plane trusses. Deflections of statically determinate bent frames.

Text Books:
1. Mechanics of Materials, Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf and David F. Mazurek, McGraw-Hill Education, 2014.
2. Basic Structural Analysis, K.U. Muthu, Azmi Ibrahim, Maganti Janardhana and M. Vijayanand, I.K. International Publishing House Pvt. Ltd, 2015.

Reference Books:
1. Strength of Materials, B.S. Basavarajaiah and P Mahadevappa, Universities Press, 2015.
2. Strength of Materials, R.Subramanian, Oxford University Press, 2010.
3. Fundamentals of Solid Mechanics, M.L.Gambhir, PHI Learning, 2009.
4. Strength of Materials, U.C. Jindal, Pearson Education, 2012.
5. Mechanics of Materials, Russell C. Hibbeler, Pearson Education, 2013.
6. Strength of Materials, D.S Prakash Rao, Universities Press.
7. Mechanics of Structures Vol –I & II, S.B.Junnarkar and H.J.Shah, Charotar Publishing, 2014.
8. Strength of Materials, S.S. Rattan, McGraw Hill Education, 2011.

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16CE2204–HYDRAULICS AND HYDRAULIC MACHINERY

II Year. B.Tech. CE– II Semester.
Prerequisite(s): 16CE2104 Fluid Mechanics

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

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. Study model and prototype relations for hydraulic structures.
4. Understand forces exerted by jet on fixed vane, moving vane on different planes.
5. Understand components, function, and uses of Pelton wheel, Kaplan and Francis turbines.
6. Understand components, function, and uses of centrifugal and reciprocating pumps.
7. Understand basic layout of hydropower plant.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Design the most economic channel section using Chezy's and Manning's formulae.
CO 2: Compute flow profiles in channel transitions and provide suitable energy dissipators.
CO 3: Analyze the relationship between the model and prototype of hydraulic structures.
CO 4: Calculate efficiency for different types of turbines, centrifugal pumps and reciprocating pumps.
CO 5: Explain basic principles in establishing hydropower plants.

Syllabus:

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. Flow in Open Channels, K. Subramanya, McGraw Hill Education, 2016.
2. Hydraulic Machines, K. Subramanya, McGraw Hill Education, 2013.

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. Fluid Mechanics, Frank.M. White, McGraw-Hill Education, 2015.
4. Fluid Mechanics, A.K. Jain, Khanna Publishers, 2016.
5. Hydraulics and Fluid Mechanics including Hydraulic Machines, P.N. Modi and S.M. Seth, Standard Book House, 2013.
6. Elements of Open-channel flow, K.G. RangaRaju, McGraw Hill Education.
7. Flow through Open Channels, Rajesh Srivastava, Oxford University Press India, 2011.
8. Open-Channel Hydraulics, Richard H. French, Water Resources Publications, 2007.
9. Introduction to Fluid Mechanics, Robert W. Fox, Philip J. Pritchard, Alan T. McDonald, Student Edition, John Wiley & Sons Inc, 2015.

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16CE22L1–ENGINEERING GEOLOGY LAB

II Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

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. Study different Geological Maps.
6. 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
CO 1: Apply various properties of minerals and rocks for solving geological problems.
CO 2: Draw geological section and interpret geological aspects such as folds, faults and unconformities.
CO 3: Apply concept of folds, faults and unconformities and suggest necessary measures.
CO 4: Locate the occurrence of different rocks, soils and study of topographic maps.
CO 5: Suggest on the groundwater location keeping in view the electrical resistivity aspects of soil/ rock in that locality.

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.

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16CE22L2–CONCRETE TECHNOLOGY LAB

II Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to
1. Understand physical and mechanical properties of cement such as Normal Consistency, Fineness, Initial and final setting time, specific gravity, soundness and Compressive strength by conducting tests as per IS codes of practice.
2. Understand physical properties of aggregate such as size, shape, toughness and bulking by performing tests according to IS codes of practice.
3. Gain practical knowledge on properties of fresh, hardened and self-compacting concrete and its behaviour.
4. 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: Conduct quality control tests on cement to determine its properties such as normal consistency, fineness, initial and final setting time, specific gravity, soundness and compressive strength.
CO 2: Conduct quality control tests on aggregates to determine size, shape, toughness, and bulking of aggregates.
CO 3: Explain the preparation and properties of fresh concrete and determine its workability by compaction factor, slump, Vee-bee and Flow table tests to give an idea of water-cement ratio for construction works.
CO 4: Explain the properties of hardened concrete by determining its Young's modulus and Compressive strength.
CO 5: Conduct tests using Non Destructive Methods to certify and check construction of buildings by determining the quality of concrete in terms of surface hardness, compressive strength, uniformity, internal flaws, defects, cracks, workmanship and durability.

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. Shape test on aggregates.
      3. 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. Self-compacting Concrete
      1. Slump flow test.
      2. V funnel.
      3. L Box.

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

VI. Non Destructive Test of Concrete
      1. Rebound Hammer.
      2. Ultrasound Pulse Velocity (UPV).

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16CE22L3–FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

II Year. B.Tech. CE– II Semester.
Prerequisite(s): 16CE2104 Fluid Mechanics

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to
1. Understand Bernoulli's theorem.
2. Understand working principles, components, functions of Venturimeter and Orificemeter.
3. Study flow through orifices, mouthpieces and notches.
4. Understand minor and major losses in pipes.
5. Study the basic energy features of the hydraulic jump in channel and also determine the loss of energy due to the jump.
6. Study performance of Pelton wheel and Francis turbine.
7. Study performance of centrifugal and reciprocating pumps.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Conduct experiment for verification of Bernoulli's theorem.
CO 2: Compute coefficient of discharge through flow measuring devices such as Venturimeter, Orificemeter, orifices, mouth pieces, notches, and weirs.
CO 3: Distinguish between laminar and turbulent flows and identify their governing parameters.
CO 4: Demonstrate practical understanding of minor losses caused due to pipe fittings, sudden pipe contraction and expansion; and major losses due to friction in pipe flow.
CO 5: Determine the coefficient of impact of jet on stationary vane by comparing the actual force with theoretical force exerted by jet on vane.
CO 6: Demonstrate practical working of Pelton wheel and Francis turbine to study their characteristics such as discharge, power, specific speed and turbine efficiency.
CO 7: Demonstrate practical working of centrifugal and reciprocating pumps and conduct tests at various speeds to obtain pump characteristics such as discharge, head, power and pump efficiency.

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 characteristics of a single stage/ multi-stage centrifugal pump.
12. Performance characteristics of a reciprocating pump.

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16CE3101 – STRUCTURAL ANALYSIS

III Year. B.Tech. CE– I Semester.
Prerequisite(s):
16CE2102 STRENGTH OF MATERIALS-I
16CE2203 STRENGTH OF MATERIALS-II

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

Course Objectives:
Develop ability to
1. Understand different types of arches and analyse them.
2. Grasp knowledge on the analysis of beams like propped cantilevers and fixed beams.
3. Understand slope deflection method and moment distribution method.
4. Understand three moment equation and Kani's method.
5. Understand concepts of moving loads and influence lines.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain analysis of three hinged determinate arches and two hinged indeterminate arches.
CO 2: Draw Shear force diagram (SFD) and Bending moment diagram (BMD) for the propped and fixed beams.
CO 3: Analyse beams and portal frame using slope deflection and moment distribution method.
CO 4: Explain about continuous beams and can draw the elastic curve, analysing the beam using Kani's method.
CO 5: Draw SFD and BMD for the moving loads and also able to draw influence line diagram for the beams with different loading condition.

Syllabus:

UNIT–I
Propped Cantilever And Fixed Beams: Types of props – Elastic and Rigid props, Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia, subjected to 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-II
Continuous Beams: Introduction-Continuous beams. Clapeyron's theorem of three moments-Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang. Effects of sinking of supports.
Slope Deflection Method: Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams - Analysis of Single Bay – single storey Portal Frames by Slope Deflection Method, Sway and Non-sway Analysis.

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UNIT–III
Moment Distribution Method: Application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams - Analysis of Single Bay Single Storey Portal Frames by Moment Distribution Method, Sway and Non-sway Analysis.
Kani's Method: Analysis of continuous beams including settlement of supports using Kani's method. Shear force and bending moment diagrams. Elastic Curves.

UNIT–IV
Three Hinged Arches– Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches. Linear Arch. Eddy's theorem. Analysis of Three hinged arches. Normal Thrust and radial shear in an arch. Geometrical properties of parabolic and circular arch. Three hinged circular arch at different levels. Absolute maximum bending moment diagram for a three hinged arch.
Two Hinged Arches: Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

UNIT–V
Moving Loads: Introduction - Maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated UDL longer than the span, UDL shorter than the span, two point loads with fixed distance between them and several point loads-Equivalents uniformly distributed load-Focal length.
Influence Lines: Introduction – Applications to bridges (only description) - Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section - Point loads, UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of deck and through Pratt and Warren trusses. Equivalent uniformly distributed load, Focal length.

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

Reference Books:
1) Structural Analysis, Devdas Menon, Narosa Publishing House, 2010.
2) Theory of Structures Vol I & II, G.S.Pandit, S.P.Gupta and R Gupta, McGraw Hill Education, 2017.
3) Theory of Structures, S. Ramamrutham, Dhanpat Rai Publication, 2014.
4) Structural Analysis, R.C.Hibbeler, Pearson Education, 2008
5) Basic Structural Analysis, C.S.Reddy, McGraw Hill Education, 2017.
6) Fundamentals of Structural Analysis, M.L.Gamhir, PHI Learning Pvt. Ltd, 2011.
7) Mechanics of Structures Vol – I and II, H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd, 2016.

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16CE3102 – DESIGN OF REINFORCED CONCRETE STRUCTURES

III Year. B.Tech. CE– I Semester.
Prerequisite(s):
16CE2102 Strength of Materials-I
16CE2203 Strength of Materials-II
16CE2202 Concrete Technology

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

Course Objectives:
Develop ability to:
1. Provide basic concepts of reinforced concrete design.
2. Gain knowledge on various methods of design.
3. Provide design of simple structural elements such as beams, columns, footings and slabs

Course Outcomes:
At the end of the course, student would be able to
CO 1: Design Reinforced Concrete beams using limit state.
CO 2: Design Reinforced Concrete slabs.
CO 3: Design Reinforced Concrete Columns.
CO 4: Design Reinforced Concrete footings.
CO 5: Design structures for strength and check for serviceability.
CO 6: Design stair cases.

Syllabus:

UNIT–I
Concepts of RC. Design: Working Stress Method - Limit State method – Material Stress-Strain Curves – Safety factors – Characteristic values. Stress Block parameters – IS – 456 – 2000.
Beams: Limit state analysis and design of singly reinforced, doubly reinforced, Flanged beam sections.

UNIT–II
Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

UNIT- III
Slabs - Design of one way slab, Two-way slabs and continuous slab Using I S Coefficients.
Limit state design for serviceability for deflection, cracking and codal provision.

UNIT–IV
Short and Long columns – Under axial loads, uniaxial bending and biaxial bending – I S Code provisions.
Design of dog-legged staircase.

UNIT–V
Footings: Different types of footings – Design of isolated, square, rectangular, circular footings and combined footings.

Text Books:
1. Design of Reinforced Concrete Structures: IS:456-2000, N. Krishna Raju, CBS Publishers, 2016.
2. Reinforced Concrete Design, S.Unnikrishna Pillai & Devdas Menon, McGraw Hill Education, 2017.

Reference Books:
1. Reinforced concrete design, N.Subrahmanian, Oxford University Press, 2013.
2. Limit state designed of reinforced concrete, P.C.Varghese, Prentice Hall of India, 2008.
3. Design of Reinforced concrete structures, S. Ramamrutham, Dhanpat Rai Publications, 2015.
4. Design of Reinforced Concrete Structures, I.C.Syal & A.K.Goel, S.Chand & company, 2007.
5. Fundamentals of reinforced concrete, N.C. Sinha and S.K Roy, S. Chand publisher, 2017.
6. Design of concrete structures, Arthus H.Nilson, David Darwin, and Chorles W. Dolar, McGraw Hill Education, 2005.
7. Reinforced concrete structures, Dheerendra Babu, Falcon publishers.

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16CE3103 – ENGINEERING HYDROLOGY

III Year. B.Tech. CE– I Semester.
Prerequisite(s):
16CE2104 Fluid Mechanics
16CE2204 Hydraulics and Hydraulic Machinery

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

Course Objectives:
Develop ability to
1. Understand the basic concepts of engineering hydrology and its applications.
2. Understand the effect of evaporation, infiltration and runoff on the hydrological cycle.
3. Understand the different methods of measuring streamflow.
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
CO 1: Estimate the rainfall over a catchment area.
CO 2: Evaluate abstractions from precipitation data.
CO 3: Determine stream flow using Stream gauging.
CO 4: Estimate the role of evaporation, infiltration and runoff on hydrographs.
CO 5: Estimate the capacity of reservoir using mass curve analysis.
CO 6: Computation of design discharge over a catchment.
CO 7: Formulate and solve hydrologic flood routing models
CO 8: Assess different aquifer parameters influencing the groundwater occurrence.

Syllabus:

UNIT–I
Introduction to Engineering Hydrology and its applications - 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 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.
3. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, 22nd edition.

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. Hydrology in Practice, E.M. Shaw, K.J.Beven, N.A. Chappell and Rob Lamb, CRC Press, 2015.
5. Irrigation, Water Resources & Water Power Engineering, P.N. Modi, Standard Book House, 2011.
6. Irrigation and Water Power Engineering, B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2016.
7. Hydrology: Principles, Analysis and Design, H.M.Raghunath, New Age International, 2015.

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16CE3104 -TRANSPORTATION ENGINEERING

III Year. B. Tech. CE– I Semester.
Prerequisite(s):
16CE2103 Surveying

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

Course Objectives:
Develop ability to
1. Gain knowledge on highway development, planning and its geometric design.
2. Classify highways, urban roads and explain its importance in planning process.
3. Understand different elements used in design of road geometrics.
4. Gain knowledge on traffic regulations and its management.
5. Understand fundamental principles of traffic flow, traffic characteristics, its measurements and their interpretation for optimal utility.
6. Understand properties of pavement materials and their suitability for construction of pavements.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain the importance of highway development in India.
CO 2: Classify roads based on functional classification; describe design elements as sight distance, horizontal curvature, super elevation, grades, visibility on vertical curves, cross section elements.
CO 3: Apply fundamentals of physics and mathematics knowledge in deriving geometric design equations; Plan surveys, preparation of survey forms and data collection from field for highway geometrical design.
CO 4: Estimate basic characteristics of traffic stream, conduct traffic studies and analyze traffic data for improvement of intersections.
CO 5: Explain properties highway materials in construction.
CO 6: Explain the principles of construction and maintenance of highways.

Syllabus:

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

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-V

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.

Text Books:
1. Highway Engineering, S.K.Khanna, C.E.G.Justo, A. Veeraragavan, Nem Chand & Bros Publishers, Revised 10th edition, 2017.
2. Traffic Engineering and Transport Planning, Dr.L.R.Kadiyali, Khanna Publishers, 2011.

Reference Books:
1. Traffic and Highway Engineering, Nicholas J. Garber & Lester A. Hoel, Cengage Learning, 2015.
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.

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16CE3105 – GEOTECHNICAL ENGINEERING

III Year. B.Tech. CE– I Semester.
Prerequisite(s):
16CE2104 Fluid Mechanics
16CE2201 Engineering Geology

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

Course Objectives:
Develop ability to
1. Understand properties of soil and to determine the behaviour of soil under various conditions and loads.
2. Understand I.S classification of soil.
3. Understand consolidation of soil.
4. Understand shear strength of soil by different laboratory test.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain the mechanism and behaviour of soil for different loads.
CO 2: Determine properties of soil by laboratory test.
CO 3: Explain the formation and structure of soils.
CO 4: Describe the basic concept of Mass volume relationship and relative density of soil.
CO 5: Explain the concept of seepage.

Syllabus:

UNIT–I
Introduction: Soil formation and structure clay Mineralogy – moisture content – Mass- volume relationship – Relative density.

Index Properties of Soils: Grain size analysis – Sieve– consistency limits and indices – 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 –Permeability of layered soils – In-situ permeability tests (Pumping in and Pumping out test).

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

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, Braja M.Das, Cengage Learning Publishers, 2015.

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16CE31L1 -TRANSPORTATION ENGINEERING LAB

III Year. B. Tech. CE– I Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to
1. Describe tests on aggregate materials used for road construction.
2. Gain knowledge on Bitumen grading used for flexible pavement construction.
3. Analyze different tests on Bitumen materials along with its specifications.
4. Examine test performed for Bitumen mixes.
5. Assess the quality of the material used in pavement construction and compare with IRC specifications.
6. Identify the field data required for assessing the traffic parameters.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Categorize aggregate used in pavements along with its suitability.
CO 2: Evaluate stability parameters of bitumen mixes.
CO 3: Apply methods for assessing various types of material to be used in the pavement construction.
CO 4: Plan for the collection of field data and to present the same data for the analysis and take decisions for smooth movement of the traffic.

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. Marshal stability Test

  III. TRAFFIC STUDIES
   1. Traffic volume studies
   2. Speed studies
   3. Parking studies

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16CE31L2 – GEOTECHNICAL ENGINEERING LAB

III Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

L	T	P/D	C
0	0	3/-	2

Course Objectives:
Develop ability to
1. To impart knowledge of various tests conducted to know the properties of soil.
2. Gain Knowledge on field tests involved in knowing the soil properties.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Determine index and engineering properties of soils
CO 2: Determine density of soil.
CO 3: Determine specific gravity of soil.
CO 4: Determine shear strength of the soil.
CO 5: Determine optimum moisture content of soil.

LIST OF EXPERIMENTS

1. Atterberg Limits (Liquid Limit, Plastic 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. California Bearing Ratio Test (CBR Test)
8. Determination of Coefficient of consolidation
9. Unconfined compression test
10. Direct shear test
11. Vane shear test
12. Triaxial shear test

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16EN31L1 – ADVANCED ENGLISH COMMUNICATION SKILLS LAB

III Year. B.Tech. CE– I Semester.
Prerequisite(s): None.

L	T	P/D	C
0	0	3/-	2

Course Objectives:
Develop ability to
1. Improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed and respond appropriately in different socio-cultural and professional contexts.
2. Communicate their ideas relevantly and coherently in writing.
3. Prepare them for their placements.

Course Outcomes:

At the end of the course, student would be able to

CO 1: Accomplish fluency in English vocabulary and use it contextually.

CO 2: Develop academic and professional writing skills.

CO 3: Improve or enhance job prospects.

CO 4: Inculcate employability skills.

LIST OF EXERCISES:

S.NO		NAME OF THE EXERCISE
1.	Activities on Vocabulary Building.	Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations and usage of vocabulary.
2.	Activities on Fundamentals of Inter-personal Communication	Strategies for good communication and focus on body language-Starting a Conversation-responding appropriately and relevantly- formal & informal conversation, Communication in different situations.
3.	Resilience and Personal Management	Managing stress, time, anger and other emotions, assertiveness and culture shock
4.	Activities on Group Discussion	Dynamics of Group Discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics of evaluation.

5.	Activities on Writing	Writing process, gather information, formatting, editing, types of essays, SOP. Portfolio writing- planning for writing- improving one's writing, brochures and newsletters.
6.	Activities on Interview Skills	Concept and process, Pre-interview planning, opening strategies, answering strategies, interview through Tele-conference & video-conference and Mock interviews, Videos of Mock Interviews.
	ADDITIONAL EXERCISES	
1	Cross-Cultural Communication – Accepting and understanding various cultures.	
2	Attitude towards work, what is a profession?, who is a professional?, what is professionalism? and positive thinking.	

REFERENCE BOOKS:

1. *Technical communication* by Meenakshi Raman & Sangeetha Sharma, Oxford University Press, 2009.
2. *Advanced Communication Skills Laboratory Manual* by Sudha Rani, D,Pearson Education, 2011.
3. *Technical Communication* by Paul .V. Anderson. 2007. CENGAGE Learning Pvt Ltd.
4. *Business And Professional Communication by Keys for Work place Excellence* by Kelly M Quintanilla& Shawn T. Wahi . Sage South Asia Edition. Sage publication, 2011.
5. *The Basics of Communications: A Relational Perspective* by Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications, 2012.
6. *English Vocabulary in Use* series, Cambridge University Press 2008.
7. *Management Shapers Series* by Universities Press (India) Pvt Ltd., Himayath Nagar Hyderabad, 2008.
8. *Handbook for Technical Communication* by David A Mc Murrey & Jaoanne Buckely, 2012. CENGAGE learning.
9. *Communication Skills* by Leena Sen , PHI Learning pvt ltd, New Delhi 2009.
10. *Handbook for Technical Writing* by David A Mc Murrey & Joanne Buckely CENGAGE learning, 2008.
11. *Job hunting* by Colm Downes , Cambridge University Press, 2008.
12. *Master Public Speaking* by Anne Nicholls, JAICO Publishing House, 2006.
13. *English for Technical Communication for Engineering Students* by Aysha Viswamohan, Tata Mc Graw- Hill, 2009.
14. Books on TOEFL/ GRE/GMAT/CAT/ IELTS by Barron's / DELTA / Cambridge University Press.
15. *International English for Call Centers* by Barry Tomalin and Suhashini Thomas , Macmillanpublishers2009.

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Cheeryal (V), Keesara (M), Medchal District - 501 301, Telangana State.

16CE3201–DESIGN OF STEEL STRUCTURES

III Year. B.Tech. CE– II Semester.
Prerequisite(s):
16CE3101 Structural Analysis.
16CE3102–Design of Reinforced Concrete Structures.

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

Course Objectives:
Develop ability to:
1. Understand various materials used and their properties in the steel design.
2. Study various connections involved in steel structures.
3. Understand design principles of various components of steel structures.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Analyse and design steel structural elements.
CO 2: Analyse and design bolted and welded connections.
CO 3: Analyse and design tension members.
CO 4: Analyse and design compression members.
CO 5: Analyse and design beams.
CO 6: Analyse and design built up members and column base.
CO 7: Analyse and design plate girders.
CO 8: Analyse and design roof trusses.

Syllabus:

UNIT–I
Materials – types of structural steel – mechanical properties of steel – Concepts of plasticity – yield strength. Loads – and combinations local buckling behaviour of steel. Concept of limit State Design – Limit States – Design Strengths- deflection limits – serviceability – stability check. Bolted connections – IS: 800 – 2007 - specifications – Design strength – efficiency of joint – prying action. Welded connections – Types of welded joints – specifications - design requirements.

UNI –II
Design of tension members – Design strength – Design procedure splice - lug angle.
Design of compression members – Buckling class – slenderness ratio / strength design – laced – battened columns – splice – column base – slab base – axial load.

UNIT–III
Plastic Theory, Plastic hinge, Classifications of beams as per I.S 800-2007.
Design of Beams – Plastic moment – Bending and shear strength / buckling – Built up sections – laterally / supported beams - Design of eccentric bolted connections – Framed – unstiffened/ stiffened / seat connection.

UNIT–IV
Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of bearing stiffeners – intermediate stiffeners – Design of Web splice and Flange splice.

UNIT–V
Design of roof trusses – Types of roof trusses, loads on trusses – purlin design – truss design, Design of joints and end bearings.

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

Reference Books:
1. Design of steel structures Edwin H.gaylord, Jr. charless N.gaylord and Jams Stallmeyer, McGraw Hill Education, 2010.
2. Fundamental of Structural Steel Design, M L Gambhir, McGraw Hill Education, 2017.
3. Structural Design and Drawing, N.Krishna Raju, Universities Press, 2005.
4. Design of Steel structures, K.S. Sai Ram, Person Education, 2013.

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16CE3202–FOUNDATION ENGINEERING

III Year. B.Tech. CE– II Semester.
Prerequisite(s):
16CE3105 Geotechnical Engineering.

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

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 of design of cofferdam and cassions

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain different soil exploration methods in detail and identify appropriate method based on field conditions.
CO 2: Determine stability of slopes.
CO 3: Design retaining wall.
CO 4: Determine bearing capacity of soil.
CO 5: Design various kinds of foundations.

Syllabus:

UNIT–I
Soil Exploration: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test – pressure meter – 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, Bishop's Simplified 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, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

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

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

Coffer Dams: Earth embankments, cantilever sheet piles, braced coffer dams, double wall coffer dams, cellular, coffer dams – circular, diaphragm type.

Text Books:
1. Principles of Foundation Engineering, Braja M. Das, Cengage Learning, 2013.
2. Soil Mechanics and Foundation Engineering, Dr. K.R. Arora, Standard Publishers, 2011.

Reference Books:
1. Soil Mechanics and Foundation Engineering, V.N.S. Murthy, CBS Publishers, 2009.
2. Foundation Engineering, P.C. Varghese, Prentice Hall India Learning Pvt. Ltd., 2009.
3. Soil Mechanics and Foundation Engineering, Santosh Kumar Garg, Khanna Publishers, 2003.

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16CE3203–ENVIRONMENTAL ENGINEERING

III Year. B.Tech. CE– II Semester.
Prerequisite(s):
16CE3103 Engineering Hydrology

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

Course Objectives:
Develop ability to
1. Understand the 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 treatment units, their principles, design, operations and maintenance of each process.
4. Understand the design of water distribution systems and sewerage systems.
5. Understand the purpose of wastewater treatment units, their principles, design, operations and maintenance of each process.
6. Understand sludge treatment and its disposal methods.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Analyze characteristics of water and wastewater quality parameters and their standards.
CO 2: Design a drinking water treatment plant with appropriate treatment techniques to meet the quantity and quality requirements for any community.
CO 3: Design water distribution systems to provide adequate water pressure and flow rates to meet various end-user needs such as domestic use, industrial use, fire demand, and institutional use.
CO 4: Apply theoretical knowledge to conduct analysis on a broad variety of environmental problems.
CO 5: Design a sewage treatment plant with suitable treatment techniques meeting all environmental rules and regulations.
CO 6: Design of sludge handling systems and use of bio-solids as a soil conditioner.
CO 7: Design septic tanks.

Syllabus:

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.

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UNIT–II
Layout and general outline of water treatment units – Sedimentation – Principles – Design factors – Coagulation – Flocculation – Clarifier design – Coagulants – Feeding arrangement – Filtration – Working of slow and rapid gravity filters – Multimedia filters – Design of filters – Troubles in operation – Comparison of filters – Disinfection – Chlorination, chlorine demand – Other disinfection practices – Miscellaneous treatment methods.

UNIT–III
Distribution systems requirement – Method and layouts – Design procedures – Hardy Cross and Equivalent pipe methods – Pipe 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 – Stormwater overflows combined flow.
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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, inverted syphons, catch basins, flushing tanks, ejectors, pumps and pump houses – House drainage – Components requirements – Sanitary fittings – Traps – One pipe and two pipe systems of plumbing – Ultimate disposal of sewage – Sewage farming - Dilution.
.
UNIT–V
Wastewater treatment plant – Flow diagram – Primary treatment – Design of screens – Grit chambers – Skimming tanks – Sedimentation tanks – Principles of design – Biological treatment – 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, 2012.
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.
7. Theory and Practice of Water and Wastewater Treatment, Ronald L. Droste, Wiley India Pvt. Ltd, 2014.

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16CE3204–IRRIGATION ENGINEERING

III Year. B.Tech. CE– II Semester.
Prerequisite(s):
16CE3103 Engineering Hydrology

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

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
CO 1: Explain different types and methods of irrigation systems and irrigation terminology.
CO 2: Design a suitable irrigation canal using Kennedy's and Lacey's theories.
CO 3: Calculate the life of a reservoir.
CO 4: Assess the suitability of a dam for any given criteria.
CO 5: Explain different forces acting on a gravity dam along with the causes of failure, remedies and analyse gravity dam.
CO 6: Analyse earthen dams and explain their causes of failure and give remedies.
CO 7: Explain purpose of spillways and energy dissipation devices.
CO 8: Draw diversion headwork and explain its components.
CO 9: Explain design principles of weirs on permeable foundations using creep theories.
CO 10: Explain canal falls, canal regulators and cross drainage works.

Syllabus:

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, 2014.
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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16MB3221– INTELLECTUAL PROPERTY RIGHTS
OPEN ELECTIVE - I

III Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand the various concepts, importance and types of intellectual property rights.
2. Discuss the purpose of trademarks.
3. Analyze the fundamental laws of copy rights and patents.
4. Understand trade secret laws, trade secret litigation and unfair completion.
5. Understand the latest developments in IPR.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Acquire knowledge on intellectual property rights
CO 2: Track the regulation process of trademark. Discuss the functions of trademark.
CO 3: Identify the importance of copyrights, patents searching process and transfer of Ownership
CO 4: Know about secret laws, unfair competition, false advertising.
CO 5: Reciprocate to new developments of intellectual property rights.

Syllabus:

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.
3. Cornish, William Rodolph & Llewelyn, David. Intellectual property: patents, copyright, trademarks and allied rights. Sweet & Maxwell, 8/e, 2013.

Reference Books:
1. Cornish, William Rodolph. Cases and materials on intellectual property. Sweet & Maxwell, 5/e, 2006.
2. Lo, Jack and Pressman, David. How to make patent drawings: a patent it yourself companion. Nolo, 5/e 2007.

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16EE3222– INDUSTRIAL SAFETY AND HAZARDS
OPEN ELECTIVE - I

III Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Determine responsibility for safety in the workplace.
2. Learn to recognize workplace hazards.
3. Learn how to develop procedures to eliminate of lessen those hazards.
4. Apply basic Federal and State Safety Rules to the workplace.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Understand the fundamental concepts of accident prevention with a basic knowledge of safe work rules designed to promote an accident free workplace.
CO 2: Understand the relief systems.
CO 3: Understand the electrical hazards and safety handling of equipments.
CO 4: Understand the effects of momentum and buoyancy.
CO 5: Understand different case studies.

Syllabus:

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 Book:
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. Mannan S., "Lee's Loss Prevention in the Process Industries", Vol.II, 3rdEd., Butterworth-Heinemann.2005.
4. Indian Electricity Act and Rules, Government of India.
5. Power Engineers –Handbook of TNEB, Chennai, 1989.
6. Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt.LTd., England, 1988.

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16CS3223– JAVA PROGRAMMING
OPEN ELECTIVE - I

III Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand basic concepts of object oriented programming.
2. Understand the primitive data types built into the Java language and features of strongly typed language.
3. Understanding scope, lifetime, and the initialization mechanism of variables and parameter passing mechanisms.
4. Understand file streams and database connectivity using Java language.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Apply the concepts of OOPs in problem solving.
CO 2: Use data abstraction, inheritance, polymorphism, encapsulation and method overloading principles in structuring computer applications.
CO 3: Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO 4: Use Java standard class library with necessary exception handling mechanisms in constructing computer applications.
CO 5: Develop java programs using multi-threading, files and database concepts and their connectivity.

Syllabus:

UNIT-I
Object Oriented Characteristics - Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, procedural and Object oriented programming paradigms
Java Programming - History of Java, comments, data types, variables, constants, scope and life time of variables.

UNIT-II
Operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow block scope, conditional statements, loops break and continue statements. simple java program, arrays, 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, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing 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, producer consumer pattern.

UNIT –V

Files: streams – byte streams, character streams, text input/ Output binary input/ output
Random access file 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 Schildt 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, Pearson Education.

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16EC3224– ELECTRONIC MEASURING INSTRUMENTS
OPEN ELECTIVE - I

III Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

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

Course Objectives:
Develop ability to
1. Understand various measuring systems functioning and metrics for performance analysis.
2. Understand principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3. Understand use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Identify various electronic instruments based on their specifications for carrying out a particular task of measurement.
CO 2: Measure various physical parameters by appropriately selecting the transducers.
CO 3: Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

Syllabus:

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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16ME3225– NANO MATERIALS AND TECHNOLOGY
OPEN ELECTIVE - I

III Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

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

Course Objectives:
1. This course is primarily intended to expose the students to a highly interdisciplinary subject
2. To enable the students understand the basic concepts of Nanotechnology
3. To enhance the knowledge of students in nanomaterials
4. To familiarize the students with the properties of nanomaterials and their applications
5. To expose the students MEMS / NEMS devices and their applications

Course Outcomes:
At the end of the course, student would be able to
CO 1: Able to design a component / material that would provide us a " better tomorrow" via Nanotechnology
CO 2: Understand synthesis and properties of nanostructured materials.
CO 3: Analyze magnetic and electronic properties of quantum dots
CO 4: Understand structure, properties and applications of Carbon nanotubes.
CO 5: Understand applications of nanoparticles in nanobiology and nanomedicine.

Syllabus:

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 recrystallization.
Template based synthesis: Electrochemical deposition, Electro-phoretic deposition. Electro-spinning and Lithography.

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UNIT IV: Two dimensional Nano-Structures
Fundamentals of film growth. Physical vapour Depostion (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), Electrochemical 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. Guozhong Cao - Nano structures and Nano materials: Synthesis, properties and applications - Imperial College press in 2004, 2nd edition.
2. Rechard Booker and Earl Boysen, Nanotechnology, Willey, 2006.

Reference Books:
1. T. Pradeep, Nano: The Essentials; Tata McGraw-Hill, 2008.
2. W.R. Fahrner, Nanotechnology and Nanoelectronics; Springer,2006.

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
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Cheeryal (V), Keesara (M), Medchal District - 501 301, Telangana State.

16CE3205 – **GEOGRAPHIC INFORMATION SYSTEM**
SOFT CORE - I

III Year. B.Tech. CE– II Semester.
Prerequisite(s):
16CE2103 Surveying

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

Course Objectives:
Develop ability to
1. Understand the principles of Geographic Information Systems (GIS) and its applications to Civil Engineering Problems.
2. Create projects on transportation, water resources using GIS as a tool for it.
3. Have an understanding of GIS and its relationship to mapping software.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Explain various types of data used in GIS.
CO 2: Prepare geospatial features in computing environment.
CO 3: Create GIS and cartographic outputs for presentation.
CO 4: Analyze spatial and attribute data for solving spatial problems.
CO 5: Describe various GIS applications relevant for Civil Engineering.

Syllabus:

UNIT–I
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–II
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.

Department of Civil Engineering

UNIT–III
Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data.

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

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

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
GIS Applications: Transportation, Water Resources, Environment, Geology, Emergency Management, Agriculture, Real Estate. Advances in GIS.

Text Books:
1. Introduction to Geographic Information System, Kang-Tsung Chang, McGraw Hill Education, 2016.
2. Remote Sensing and GIS, Lillesand and Kiefer, John Willey, 2015.
3. Remote Sensing and GIS, B.Bhatta, Oxford Publishers, 2015.

Reference Books:
1. Concepts & Techniques of GIS, C.P.Lo, Albert K.W. Yeung, Pearson, 2013.
2. Principles of Geo physical Information Systems, Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers, 2016.
3. Basics of Remote sensing & GIS, S.Kumar, Laxmi Publications, 2014.

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16CE3206–ADVANCED STRUCTURAL DESIGN
SOFT CORE - I

III Year. B.Tech. CE– II Semester.
Prerequisite(s):
16CE3102–Design of Reinforced Concrete Structures

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

Course Objectives:
Develop ability to
1. Provide advanced concepts of reinforced concrete design.
2. Impart knowledge of various methods of design like Working Stress Method.
3. Understand the concepts of design of structural elements such as Retaining Walls, Flat slabs, Concrete Bridges.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Analyse and design RC Retaining wall.
CO 2: Analyse and design Water Tank.
CO 3: Analyse and design Flat slabs.
CO 4: Analyse and design Concrete Bridges.
CO 5: Analyse and design Chimneys, Bunkers, silo.

Syllabus:

UNIT –I
Design and Detailing of cantilever type of retaining walls – Stability Check. Principles of Counter fort Retaining walls and shelf type retaining walls.

UNIT – II
Design of circular and rectangular Water tanks at Ground level and elevated with staging.

UNIT – III
Design of Flat slabs with and without drop
Design of Raft and pile foundations.

UNIT – IV
Design of Concrete Bridge – IRC loading Design of Stab bridge, T – beam girder bridge.
Introduction to Steel bridges.

UNIT – V
Design of RCC Chimney 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 Design, S.Unnikrishna Pillai & Devdas Menon, McGraw Hill Education, 2017.
2. Advanced Reinforced Concrete Structures, Krishna Raju, CBS Publishers, 2005.
3. Reinforced Concrete Structures Vol.2 by B.C.Punmia, Ashok Kumar Jain and Kumar Jain, Laxmi, Publications, 2015.
4. Bridge Engineering, S.Ponnuswamy, McGraw Hill Education, 2017.

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16CE32L1 – ENVIRONMENTAL ENGINEERING LAB

III Year. B.Tech. CE– II Semester.
Prerequisite(s): 16CH12L1 Engineering Chemistry

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to
1. Understand drinking water and wastewater quality parameters, their testing procedures and standards set up by Government of India.
2. Measure the concentration of water and wastewater characteristics.
3. Understand the importance of measuring pH, turbidity, conductivity, alkalinity, acidity, solids, chlorides, dissolved oxygen, BOD, COD, etc in water and wastewater treatment process.
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
CO 1: Determine physical, chemical and biological characteristics of drinking water.
CO 2: Determine physical, chemical and biological characteristics of wastewater.
CO 3: Determine optimum coagulant dosage.
CO 4: Determine break-point chlorination.
CO 5: Assess the quality of water and wastewater.

LIST OF EXPERIMENTS
Determination of:
1. pH
2. Turbidity.
3. Conductivity and Total Dissolved Solids.
4. Total Solids, Organic and Inorganic Solids.
5. Alkalinity
6. Acidity.
7. Chlorides.
8. Iron.
9. Dissolved Oxygen.
10. Nitrates.
11. Optimum Coagulant dosage.
12. Chlorine demand.
13. Total Phosphorous.
14. Biological Oxygen Demand (BOD).
15. Chemical Oxygen Demand (COD).

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16CE32L2 – GEOGRAPHIC INFORMATION SYSTEM LAB
SOFT CORE – I LAB

III Year. B.Tech. CE– II Semester.
Prerequisite(s):
16CE2103 Surveying

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to
1. Impart knowledge about GIS and its applications in Civil Engineering.
2. Understand concepts of geo-referencing any map with the real world co-ordinates.
3. Grasp knowledge on simple processing techniques which are used frequently in field.

Course Outcomes:
At the end of the course, the student will be able to:
CO 1: Identify the control points that can be used for geo-referencing
CO 2: Carry out geo-referencing of topographic sheets and raster images.
CO 3: Perform digitization of points, lines and polygon features on map.
CO 4: Explain the functionalities of open source software's.
CO 5: Perform assignments pertaining to the use of GIS in Civil Engineering applications.

LIST OF EXERCISES:

1) Identification of best locations of ground control points and mosaicing the different sources of maps of information like topographic sheets and satellite data and other drawings.

2) Mosaicing the different sources of maps of information like topographic sheets and satellite data and other drawings.

3) Geo-referencing of map either from Topo sheet and Raster Image.

4) Digitization of points features and assigning attributes to it.

5) Digitization of line features and assigning attributes to it.

6) Digitization of polygons features and assigning attributes to it.

7) Generation of topology for the vector layers generated.

8) Case study for any Civil Engineering Application of choice.

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16CE32L3–ADVANCED STRUCTURAL DESIGN LAB
SOFT CORE – I LAB

III Year. B.Tech. CE– II Semester.
Prerequisite(s):
16CE2102 Strength of Materials I.
16CE3102–Design of Reinforced Concrete Structures

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to:
1. Impart knowledge of available software for the analysis and design of structures.
2. Provide the knowledge of design of various Structural elements.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Analyze and Design RC Structural elements Like Beams, Frames.
CO 2: Analyze and Design Multistorey Building.
CO 3: Analyze and Design Water Tanks.
CO 4: Analyze and Design Slab Bridges and Plate girder.

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. Water tank.
8. Slab bridges.
9. Plate girders.
10. Roof Trusses.

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16MB32P1– HUMAN VALUES AND PROFESSIONAL ETHICS

III Year. B.Tech. CE– II Semester.
Prerequisite(s): None.

L	T	P/D	C
-	-	3/-	2

Course Objectives:
Develop ability to
1. Learn the importance of human values in holistic personality development.
2. Understand the importance of humane environment
3. Initiate trust on fellow human, support human relations.
4. Improve and grow through human relations
5. Promote growth through peace and humanistic education.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Build on personal value system.
CO 2: Focus on co existence.
CO 3: Translate "Vishwas" to "Samman"
CO 4: Understanding existence as co existence
CO 5: Compete in professional ethics.

Syllabus:

UNIT–I
Introduction - Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT–II
Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT–III
Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT–IV
Understanding Harmony in the nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT–V
Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

    a. Ability to utilize the professional competence for augmenting universal human order,
    b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
    c. Ability to identify and develop appropriate techologies and management patterns for above production systems.
Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order.

    a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
    b. At the level of society: as mutually enriching institutions and organizations.

Text Books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

Reference Books:

1. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.