CMR COLLEGE OF ENGINEERING& TECHNOLOGY

(UGC Autonomous)

Kandlakoya, Medchal Road, Hyderabad – 501 401

ACADEMIC REGULATIONS - R 22

FOR CBCS & OUTCOME BASED B.TECH (REGULAR, HONOURS and MINOR) PROGRAMMES

(**Effective for the students admitted into I year from the Academic Year 2022-23**)

1.0 Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)

CMR College of Engineering & Technology, Hyderabad offers 4 Years (8 Semesters) Bachelor of Technology (B.Tech.) Regular, Honours and Minor degree Programmes, under Choice Based Credit System (CBCS), with effect from the Academic Year 2022-23 and onwards, in the Branches of Engineering.

2.0 Eligibility for Admission

2.1 Admissions will be done as per the norms prescribed by the Government of Telangana. The Government orders in vogue shall prevail.

2.2 The candidate should have passed the qualifying examination Intermediate or equivalent on the date of admission.

2.3 Seats in each program in the college are classified into Category–A (70% of intake) and Category-B (30% of intake) besides Lateral Entry. Category-A seats will be filled by the Convener, TSEAMCET Admissions. Category-B seats will be filled by the College as per the guidelines of the Competent Authority.

2.4 Lateral Entry seats for 10% of the candidates from the approved strength of the course shall be admitted into the III Semester directly based on the rank secured by the candidate in TSECET in accordance with the guidelines from the Competent Authority.

2.5 The medium of instructions for the entire undergraduate programme in Engineering & Technology will be **English** only

3.0 B.Tech. Programme Structure

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

3.2 **UGC/ AICTE** specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

3.2.1 Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters (First/Odd and Second/Even). Each Semester shall have a minimum of 90 Instructional Days.

semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum/course structure suggested by AICTE are followed.

3.2.2 Credit Courses

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

- One credit for one hour/ week/ semester for Theory/ Lecture (L) courses or Tutorials.
- One credit for two hours/ week/ semester for Laboratory/ Practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

All subjects/ courses offered for the undergraduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The University has followed almost all the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BSC – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ESC - Engineering Sciences	Includes Fundamental Engineering Subjects
3		HSMC – Humanities andSocial Sciences	Includes subjects related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PCC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Elective Courses (EℓC)	PEC – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6		OEC – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.

7	Core Courses (PROJ)	Project Work	B.Tech. Project or UG Project or UG Major Project or Project Stage I & II
8		Industry Training/ Internship/ Mini-project/ Mini- Project/ Skill Development Courses	Industry Training/ Internship/ Mini-Project/ Mini-Project/ Skill DevelopmentCourses
9		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Minor Courses	-	1 or 2 Credit Courses (subset of HSMC)
11	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)

4.0 Course Registration

4.1 A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

4.2 The academic section of the college invites 'registration forms' from students before the beginning of the semester through 'on-line registration', ensuring 'date and time stamping'. The online registration requests for any 'current semester' shall be **completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'**.

4.3 A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor/counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor/ Counselor and the student.

4.4 A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA/ CGPA, and completion of the '**pre-requisites'** as indicated for various subjects/ courses, in the department course structure and syllabus contents.

4.5 Choice for '**additional subjects/courses**', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Mentor/HOD.

4.6 If the student submits ambiguous choices or multiple options or erroneous entries during **online** registration for the subject(s) / course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.

4.7 Subject/ course options exercised through **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered.

However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week** after the commencement of class-work for that semester.

4.8 Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.

4.9 **Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

4.10 **Professional Electives**: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

5.0 Subjects/ courses to be offered

5.1 A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.

5.2 More than **one faculty member** may offer the **same subject** (lab/ practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice for students will be based on - '**first come first serve** basis and CGPA criterion' (i.e. the first focus shall be on early **on-line entry** from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

5.3 If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject/ course for **two (or multiple) sections**.

5.4 In case of options coming from students of other departments/ branches/ disciplines (not considering **open electives**), first **priority** shall be given to the student of the '**parent department**'.

6.0 Attendance requirements:

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects/ courses (including attendance in mandatory courses and Additional courses if any) for that

semester. **Two periods** of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. **For Mandatory Course the Student has to acquire minimum attendance of 75% for securing satisfactory result. The student who fails to acquire minimum attendance of 75% has to re-register for the same as and when offered in subsequent semesters.**

6.2 Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3 A stipulated fee shall be payable for condoning of shortage of attendance.

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

6.5 **Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled,** including all academic credentials (internal marks etc.) of that semester. **They will not be promoted to the next semester**. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

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

7.0 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in Item No. **6**.

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 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 **'C'** grade or above in that subject/ course.

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Mini Project (or) Internship (or) Technical Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time ResearchProject (or) Field Based Research Project (or) Mini Project (or) Internship (or) Technical Seminar evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such 'one reappearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to Second year first semester	(i) Regular course of study of first year second semester. (ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester to Second year second semester	Regular course of study of second year first semester.
4	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to Third year second semester	Regular course of study of third year first semester.
6	Third year second semester to Fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester.

7.4 A student (i) shall register for all courses/subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA ≥ 5.0 (in each semester), and CGPA ≥ 5 (at the end of 8 semesters), (iv) **secured satisfactory grade in all the mandatory courses,** to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA **(at the end of undergraduate programme),** and shall be indicated in the consolidated grade cum credit sheet.

7.5 If a student registers for '**extra subjects'** (in the parent department or other departments/branches of Engg.) other than those listed subjects totaling to 160 credits as specified in the course structure of his department, the performances in those '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such '**extra subjects'** registered, percentage of marks and letter grade alone will be indicated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items 6 and 7.1 – 7.4 above.

7.6 A student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (thereby failing to secure **'C'** grade or above) may reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

7.7 A student **detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements**. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

7.8 A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits.** The academic regulations under which the student has been readmitted shall be applicable to him.

8.0 Evaluation - Distribution and Weightage of Marks

8.1 The performance of a student in every subject/course (including practicals and Project Stage – I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination).

8.2 In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 20 marks with a total duration of 2 hours as follows:

1. Mid Term Examination for 30 marks:
   a. Part - A : Objective/quiz/short answer paper for 10 marks.
   b. Part - B : Descriptive paper for 20 marks.

The objective/quiz/short answer paper is set with multiple choice, fill-in the blanks, match the following type of questions and short answer questions for a total of 10 marks (10 questions). The descriptive paper shall contain6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The **average of the two Mid Term Examinations** shall be taken as the final marks for Mid Term Examination (for 30 marks).

The remaining 10 marks of Continuous Internal Evaluation are distributed as:

2. Assignment for 5 marks. (**Average of 2 Assignments** each for 5 marks)
3. Subject Viva-Voce/PPT/Poster Presentation/ Case Study/quiz on a topic in the concerned subject for 5 marks.

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Over all 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

There is NO Computer Based Test (CBT)/onetime improvement test of mid examinations for R22 regulations.

The details of the end semester question paper pattern are as follows:

8.2.1 The semester end examinations (SEE), for theory subjects, will be conducted for 60 marks consisting of two parts viz. i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two

questions from each unit and the student should answer either of the two questions.

- The duration of Semester End Examination is 3 hours.

8.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks
2. **10 marks for viva-voce (**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the University.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
2. 15 for experiment/program
3. 15 for evaluation of results
4. 10 marks for presentation on another experiment/program in the same laboratory course and
5. 10 marks for viva-voce on concerned laboratory course.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Over all 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

8.4 The evaluation of courses having ONLY internal marks in I Year I Semester and II Year II Semester is as follows:

1. I Year I Semester course (*ex., Elements of CE/ME/EEE/ECE/CSE etc*): The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and

II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

2. II Year II Semester *Real-Time (or) Field-based Research Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

8.5 There shall be Industry training (or) Internship (or) Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Mini Project shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Mini Project (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be **NO internal marks** for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal.

8.6 There shall be a **Technical Seminar** presentation in the VIII Semester. For the Technical Seminar, the student shall collect the information on a specialized topic related to his branch other than the Real-Time (or) Field-based Research Project/ Mini project/ Internship/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar supervisor and a senior faculty member from the department. The Technical Seminar will be evaluated for 100 marks.

8.7 The UG project shall be initiated at the end of the IV Year I Semester and the duration of the project work is one semester. The student must present Project Stage – I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his project work.

8.8 UG project work shall be carried out in two stages: Project Stage – I for approval of

project before Mid-II examinations in IV Year I Semester and Project Stage – II during IV Year II Semester. Student has to submit project work report at the end of IV Year II Semester. The project shall be evaluated for 100 marks before commencement of SEE Theory examinations.

8.9 For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule.

A student who has failed may reappear once for the above evaluation, when it is 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.

8.10 For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks. The topics for Mini Project/ Internship/SDC etc. and the main Project shall be different from the topic already taken. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

For conducting viva-voce of project, The External Examiner shall be nominated by the Controller of Examinations from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

A student who has failed, may reappear once for the above evaluation, when it is scheduled again; if student 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.

8.11 A student shall be given only one time chance to re-register for a maximum of two subjects in a semester:

- If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Viva-voce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the class work in next academic year.

In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt

stand cancelled.

9.0 Grading Procedure

9.1 Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/Practicals/ Mini Project/Internship/SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

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

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

9.3 A student who has obtained an '**F**' grade in any subject shall be deemed to have '**failed**' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4 To a student who has not appeared for an examination in any subject, '**Ab**' grade will be allocated in that subject, and he is deemed to have '**Failed**'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

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

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

Credit Points (CP) = Grade Point (GP) x Credits …. For a course

9.7 A student passes the subject/ course only when **GP ≥ 5 ('C' grade or above)**

9.8 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 = $\{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \}$ **…. For each semester**,

where 'i' is the subject indicator index (considering all subjects in a semester), 'N' is the no. of subjects '**registered'** for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the i^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

9.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses (of 160) 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 II semester onwards at the end of each semester as per the formula

CGPA = $\{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \}$ **… for all S semesters registered**

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M'** is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered'** i.e., from the 1^{st} semester onwards up to and inclusive of the 8^{th} semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	2	C	5	2 x 5 = 10
Course 4	3	B	6	3 x 6 = 18
Course 5	1	A+	9	1 x 9 = 9
Course 6	1	C	5	1 x 5 = 5
Course 7	1	O	10	1 x 10 = 10
Course 8	2	A	8	2 x 8 = 16
Course 9	1	B^{+}	7	1 x 7 = 7

Course 10	1	B^+	7	1 x 7 = 7
	20			154

SGPA = 154/20 = 7.7

Illustration of Calculation of CGPA up to 3rd Semester:

Semester	Course/ Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	4	A	8	32
I	Course 2	4	O	10	40
I	Course 3	2	B	6	12
I	Course 4	3	A	8	24
I	Course 5	1	A+	9	9
I	Course 6	1	C	5	5
I	Course 7	1	B	6	6
I	Course 8	2	A	8	16
I	Course 9	1	C	5	5
I	Course 10	1	O	10	10
II	Course 11	2	B+	7	14
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
II	Course 15	1	A	8	8
II	Course 16	1.5	C	5	7.5
II	Course 17	1.5	O	10	15
II	Course 18	1.5	B+	7	10.5
II	Course 19	1.5	B	6	9
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
III	Course 22	3	A	8	24
III	Course 23	3	O	10	30
III	Course 24	3	A	8	24
III	Course 25	2	C	5	10
III	Course 26	1	O	10	10
III	Course 27	1	B+	7	7
	Total Credits	**60**		**Total Credit Points**	**467**

CGPA = 467/60 = 7.78

The calculation process of CGPA illustrated above will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. programme.

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

9.11 SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0 Passing Standards

10.1 A student shall be declared successful or 'passed' in a semester, if he secures a GP ≥ 5 (**'C'** grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA ≥ 5.00 (**'C'** grade or above) for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits earned. **There is NO exemption of credits in any case.**

11.0 Declaration of results

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

11.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of Degree

12.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 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 B.Tech. degree in the branch of Engineering selected at the time of admission.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 A student with final CGPA (at the end of the undergraduate programme) ≥ 8.00, and fulfilling the following conditions - shall be placed in '**First Class with Distinction'**. However, he

(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 first year first semester.

(ii) 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.

A student not fulfilling any of the above conditions with final CGPA ≥ 8 shall be placed in **'First Class'.**

12.4 Students with final CGPA (at the end of the undergraduate programme) ≥ 7.0 but < 8.00 shall be placed in **'First Class'.**

12.5 Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00, shall be placed in '**Second Class'**.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6, shall be placed in '**pass class**'.

12.7 A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

12.9 Award of 2-Year B.Tech. Diploma Certificate

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B.Tech. II Year II Semester, if the student want to exit the 4-Year B.Tech. program and *requests for the 2 -Year* B. Tech. (*UG) Diploma Certificate.*

2. The student **once opted and awarded 2-Year UG Diploma Certificate, the student will be permitted to join** in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. *However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.*

3. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech. program, must submit the 2 -Year B. Tech. (*UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.*

4. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0 Withholding of results

13.1 If the student has not paid the fees to the College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the

student may be withheld, and the student will 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

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of R18 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.
2. A student who has been detained in any semester of II to VIII semesters of R18 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

3. A student of R18 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of R22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in R22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case**.
6. If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the Board of Studies.
7. The total credits required are 160 including both R18 & R22 regulations, and if the total credits are less than 160 including both R18 & R22 Regulations then an additional course(s) suggested by the Board of Studies may be given to fulfill the minimum requirements of 160 credits.

Note: If a student readmitted to R22 Regulations and has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the remedial classes shall be conducted to cover those

subjects/topics for the benefit of the students.

15.0 Student Transfers

15.1 There shall be no Branch transfers after the completion of Admission Process.

15.2 Transfer of candidates from other Institutions will be governed by the regulations of Telangana State Government issued from time to time.

15.3 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the students have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

15.4 The transferred students from other Universities/Institutions to JNTUH affiliated colleges who are on rolls are to be provided one chance to write the CBT (for internal marks) in the equivalent subject(s) as per the clearance letter issued by the University.

15.5 The autonomous affiliated colleges have to provide one chance to write the internal examinations in the equivalent subject(s) to the students transferred from other universities/institutions to JNTUH autonomous affiliated colleges who are on rolls, as per the clearance (equivalence) letter issued by the University.

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 Principal/College Academic Council/Honourable Vice-Chancellor of JNTUH is final.

v) The College may change or amend the Academic Regulations, Course Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all Students with effect from the dates notified by the College Authorities.

****

ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME)

(Applicable for the students admitted into II Year B.Tech (Lateral Entry Scheme) from the Academic Year 2023-24 and onwards)

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

The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech. programme (LES) for the award of B.Tech. degree.

3. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

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

5. Promotion rule

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

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

7. **LES students are not eligible for 2-Year B. Tech. Diploma Certificate.**

****

MALPRACTICE RULES

Disciplinary Action for Malpractices/Improper Conduct in Examinations

	Nature of Malpractices/ Improper conduct	Punishment
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers, smart watches, electronic gadgets or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.
(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, pager, palm computers, smart watches, electronic gadgets with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers, cell phones, smart watches, electronic gadgets or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations excluding Project work/ Mandatory Courses /Technical Seminar and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate Who has been

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

	campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of That semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	If the student belongs to the college, expulsion from the examination performance in that subject and all other subjects shall and cancellation of the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a state of inebriated/drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for other remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during	Cancellation of the performance in that subject and all other subjects the

	special scrutiny.	candidate has appeared including practical examinations excluding Project work/ Mandatory Courses /Technical Seminar of that semester/year.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College Academic Committee for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

Punishments to the candidates as per the above guidelines.

Malpractice identified at Spot center during valuation

1) The following procedure is to be followed in the case of malpractice cases detected during valuation, scrutiny etc. at spot center. Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee will meet and discuss/question the candidate and based on the evidences, the committee will recommend suitable action on the candidate.
2) A notice is to be served to the candidate(s) involved through the Principal regarding the malpractice and seek explanations.
3) The involvement of staff who are in charge of conducting examinations, invigilators valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing in correct or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.
4) Based on the explanation and recommendation of the committee action may be initiated.

Malpractice committee:

(a) Chief Superintendent	Chairman
(b) Controller of Examinations	Member
(c) Dean Academics	Member
(d) Chief Examiner of the Course/ Subject Expert	Member
(e) Concerned Head of the Department	Member
(f) Observer	Member

******

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B. Tech- Civil Engineering

CBCS & OUTCOME BASED**I-YEAR** COURSE STRUCTURE & SYLLABUS

(Effective for the students admitted into I year from the Academic Year 2022-23)

SEMESTER - I									
S. No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400101	English for Skill Enhancement	HSMC	2	0	0	2	40	60
2	A400001	Matrices and Calculus	BSC	3	1	0	4	40	60
3	A400007	Applied Physics	BSC	3	1	0	4	40	60
4	A401501	Elements of Civil Engineering	ESC	0	0	2	1	50	-
5	A403201	Engineering Mechanics	ESC	3	0	0	3	40	60
6	A400503	English Language and Communication Skills Laboratory	HSMC	0	0	2	1	40	60
7	A400501	Applied Physics Laboratory	BSC	0	0	3	1.5	40	60
8	A403503	Engineering Workshop	ESC	0	1	3	2.5	40	60
9	A400505	Introduction to Social Innovation	HSMC	0	0	2	1	40	60
10	A400704	Universal Human Values	MC	2	0	0	0	-	-
		Total:		**13**	**3**	**12**	**20**		
		Total hours per Week:		**28**					
	SEMESTER - II								
S. No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400009	Engineering Chemistry	BSC	3	1	0	4	40	60
2	A400002	Ordinary Differential Equations and Vector Calculus	BSC	3	1	0	4	40	60
3	A401301	Building Materials, Construction and Planning	PCC	3	0	0	3	40	60
4	A405202	C Programming and Data Structures	ESC	3	0	0	3	40	60
5	A403202	Engineering Graphics	ESC	1	0	3	2.5	40	60
6	A400502	Engineering Chemistry Laboratory	BSC	0	0	2	1	40	60
7	A405503	C Programming and Data Structures Laboratory	ESC	0	0	2	1	40	60
8	A400506	Engineering Exploration & Practice	HMSC	0	0	3	1.5	40	60
9	A400703	Constitution of India	MC	2	0	0	0	-	-
		Total:		**15**	**2**	**10**	**20**		
		Total hours per Week		**27**					
	Total Credits in I Year: 40								

SEMESTER - III									
S. No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	A401302	Strength of Materials-I	PCC	3	0	0	3	40	60
2	A401303	Engineering Geology	PCC	2	0	0	2	40	60
3	A401304	Surveying	PCC	3	0	0	3	40	60
4	A401305	Fluid Mechanics	PCC	3	0	0	3	40	60
5	A402204	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60
6	A405506	Python Programming Laboratory	ESC	0	1	2	2	40	60
7	A401502	Surveying Laboratory	PCC	0	0	2	1	40	60
8	A401503	Strength of Materials Laboratory	PCC	0	0	2	1	40	60
9	A402504	Basic Electrical & Electronics Engineering Laboratory	ESC	0	0	2	1	40	60
10	A401504	Computer Aided Drafting Laboratory	PCC	0	0	2	1	40	60
11	A400702	Gender Sensitization	MC	2	0	0	0	-	-
		Total:		**16**	**1**	**10**	**20**		
		Total hours per Week:		**27**					
		SEMESTER - IV							
S. No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400005	Probability & Statistics	BSC	3	1	0	4	40	60
2	A401306	Concrete Technology	PCC	3	0	0	3	40	60
3	A401307	Strength of Materials - II	PCC	2	0	0	2	40	60
4	A401308	Hydraulics and Hydraulics Machinery	PCC	3	0	0	3	40	60
5	A401309	Structural Analysis - I	PCC	3	0	0	3	40	60
6	A401505	Concrete Technology Lab	PCC	0	0	2	1	40	60
7	A401506	Fluid Mechanics and Hydraulics Machinery Laboratory	PCC	0	0	2	1	40	60
8	A400505	Social Innovation in Practice	HSMC	0	0	2	1	40	60
9	A401801	Real-time Research Project/ Field-Based Project	PROJ	0	0	4	2	50	-
10	A400701	Environmental Science	MC	2	0	0	0	-	-
		Total:		**16**	**1**	**10**	**20**		
		Total hours per Week		**28**					
		Total Credits in I Year: 40							

SEMESTER - V								
Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
			L	T	P		CIE	SEE
A401310	Structural Analysis - II	PCC	3	0	0	3	40	60
A401311	Geotechnical Engineering	PCC	3	0	0	3	40	60
A401312	Structural Engineering -I (RCC)	PCC	3	0	0	3	40	60
	Professional Elective - I	PEC	3	0	0	3	40	60
A401313	Professional Course Core	PCC	3	0	0	3	40	60
A401314	Project Management	PCC	2	0	0	2	40	60
A401507	Professional Core Laboratory	PCC	0	0	2	1	40	60
A401508	Professional Core Laboratory	PCC	0	0	2	1	40	60
A400504	Advanced English Communication Skills Laboratory	HSMC	0	0	2	1	40	60
Total:			**17**	**0**	**6**	**20**		
Total hours per Week:			**23**					

SEMESTER - VI								
Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
			L	T	P		CIE	SEE
A401315	Environmental Engineering	PCC	3	0	0	3	40	60
A401316	Foundation Engineering	PCC	3	0	0	3	40	60
A401317	Professional Course Core	PCC	3	0	0	3	40	60
A401318	Professional Course Core	PCC	3	0	0	3	40	60
A4XX404	Professional Elective - II	PEC	3	0	0	3	40	60
A401509	Professional Core Laboratory	PCC	0	0	2	1	40	60
A401510	Professional Core Laboratory	PCC	0	0	2	1	40	60
A401511	Professional Core Laboratory	PCC	0	0	2	1	40	60
A401802	Industrial Oriented Mini Project / Internship	PROJ	0	0	4	2	-	100
	Intellectual property rights	MC	2	0	0	0	-	-
Total:			**17**	**0**	**10**	**20**		
Total hours per Week			**27**					
Total Credits in III Year: 40								

SEMESTER - VII								
Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
			L	T	P		CIE	SEE
A401319	Professional Course Core	PCC	2	0	0	2	40	60
A4XX407	Professional Elective - III	PEC	3	0	0	3	40	60
A4XX410	Professional Elective – IV	PEC	3	0	0	3	40	60
A4XX413	Professional Elective - V	PEC	3	0	0	3	40	60
A4XX601	Open Elective - I	OEC	3	0	0	3	40	60
A4XX604	Open Elective - II	OEC	3	0	0	3	40	60
A401803	Project Stage -I	PROJ	0	0	6	3	40	60
Total:			**17**	**0**	**6**	**20**		
Total hours per Week:			**23**					

SEMESTER - VIII								
Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
			L	T	P		CIE	SEE
A4XX416	Professional Elective - VI	PEC	3	0	0	3	40	60
A4XX607	Open Elective - III	OEC	3	0	0	3	40	60
	Business Management & Financial Analysis	HSMC	3	0	0	3	40	60
A401804	Project Stage –II	PROJ	0	0	20	9	40	60
A401805	Technical Seminar	PROJ	0	0	4	2	-	100
Total:			**9**	**0**	**24**	**20**		
Total hours per Week			**33**					
Total Credits in IV Year: 40								

ENGLISH FOR SKILL ENHANCEMENT
(Common to all branches)

Course: B.Tech (CE): I-Sem.	**L**	**T**	**P**	**C**
Subject Code: A400101	**2**	**0**	**0**	**2**

UNIT - I

Chapter entitled 'Toasted English' by R.K. Narayan from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes -Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives -Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.

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

UNIT – II

Chapter entitled 'Appro JRD' by Sudha Murthy from " English Language , Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning

UNIT – III

Chapter entitled 'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et. al., from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

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

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled 'Art and Literature' by Abdul Kalam from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: Standard Abbreviations in English Grammar: Redundancies and Clichés in Oraland Written Communication.

Reading: Writing: Survey, Question, Read, Recite and Review(SQ3R Method) - Exercises for Practice Writing Practices

Essay Writing-Writing Introduction and Conclusion -Précis Writing

UNIT - V

Grammar: Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Writing: Reading Comprehension-Exercises for Practice Technical Reports- Introduction.

NOTE: Listening and Speaking Skills which are given under in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.

- NOTE 1: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is Open-ended, besides following the prescribed textbook, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

- NOTE 2: Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40percent of each topic from the syllabus in blended mode.

TEXT BOOK:

1. "English: Language, Context and Culture" by Orient Black Swan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing,(2nd edition) by Liss and Davis (OUP)2014.
2. Richards, Jack C. Interchange Series. Introduction, ,(4th edition), Cambridge University Press 2022
3. Remedial English Grammar by Wood F.T, Macmillan.2007
4. Learn English: A Fun Book of Functional Language ,Grammar and Vocabulary, (2nd edition) Chaudhuri, Santanu Sinha,. Sage Publications India Pvt. Ltd.2018
5. Technical Communication,(1st edition), Wiley India Pvt. Ltd.2019
6. English for Technical Communication for Engineering, Vishwamohan, Aysha 2013

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

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known passages.
5. Acquire basic proficiency in reading and writing modules of English and take an active part in drafting paragraphs, letters, essays, abstracts, precis, and reports in various contexts.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	3	-	-
CO2	-	-	-	-	-	-	-	-	-	2	2	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	2
CO5	-	-	-	-	-	-	-	-	-	2	-	3

MATRICES AND CALCULUS
(Common to All branches)

Course: B.Tech (CE): I-Sem.	**L**	**T**	**P**	**C**
Subject Code: A400001	**3**	**1**	**0**	**4**

UNIT-I

Matrices: Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous equations and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II

Eigen values and Eigen vectors: Linear Transformation and Orthogonal transformation: Eigen values, Eigen vectors and their properties, Diagonalization of a square matrix, Cayley -Hamilton theorem (without proof) -Inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and nature of the quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformations.

UNIT-III

Calculus:
Mean value theorems: Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation and applications, Cauchy's mean value theorem, Taylor's series, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates),
Improper Integral: Beta, Gamma functions and their applications.

UNIT-IV

Multivariable calculus (Partial Differentiation and applications):
Partial differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V

Multivariable Calculus (Integration):

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

TEXT BOOKS:

1. Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics, (5thEdition), R.K. Jain and S.R.K Iyengar, Narosa Publications,2016.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics,(9th Edition), Erwinkreyszig, John Wiley& Sons,2006.
2. Calculus and Analytic geometry, (9thEdition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A text book of Engineering Mathematics, (10th Edition), N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2019.
4. Higher Engineering Mathematics, (11thReprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010.

COURSE OUTCOMES: On completion of the course students will be able to

1. Solve linear system of equations represented by matrices
2. Obtain Eigen values, Eigen vectors and perform diagonalization of a square matrix.
3. Verify mean value theorems & evaluation of improper integrals by using Beta and Gamma functions.
4. Develop the skill of determining optimal values of multivariable functions using classical methods.
5. Evaluate the multiple integrals and apply the concept to find areas, volumes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

APPLIED PHYSICS
(Common to all branches)

Course: B.Tech (CE): I-Sem.	L	T	P	C
Subject Code: A400007	3	1	0	4

UNIT – I

QUANTUM MECHANICS: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect – de Broglie hypothesis- Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

ELECTRIC PROPERTIES OF SOLIDS: Free electron theory (Drude& Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT – II

SEMICONDUCTORS AND DEVICES: Intrinsic and extrinsic semiconductors, Variation of Fermi level with temperature – Hall Effect - Construction, principle of operation and characteristics of P-N Junction diode, Zener diode

PHOTONIC DEVICES

Direct and indirect band gap semiconductors –LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT – III

LASERS: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations-lasing action - pumping methods- ruby laser, He-Ne laser , CO_2 laser - semiconductor laser-applications of laser.

FIBER OPTICS: Introduction to optical fiber - advantages of optical fibers - total internal reflection-construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers-losses in optical fiber - optical fiber for communication system - applications.

UNIT - IV

DIELECTRIC MATERIALS: Dielectric Materials: Basic definitions- types of polarizations (qualitative) –Local field, Clasius- Mossoti Equation ferroelectric, piezoelectric, and pyro electric materials – applications

MAGNETIC MATERIALS: Introduction to magnetic materials - Hysteresis-soft and hard magnetic materials- magnetostriction, magneto resistance - applications - bubble memory devices, magnetic field sensors and multiferroics.

UNIT - V

ENERGY MATERIALS: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

NANOTECHNOLOGY: Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapour deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nonmaterial's.

TEXT BOOKS:

1. Engineering Physics(3rd edition), PK Palanisamy, SciTech Publications, 2015.
2. Essentials of Nan science & Nano-technology(1st Edition), Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 2021.

REFERENCES:

1. Fundamentals of Physics.(6th edition), Halliday, R.Resnick and J.Walker,John Wiley and Sons, 2001.
2. Quantum Physics,(2nd edition), H.C. Verma, TBS Publication, 2012
3. Introduction to Solid State Physics, (7th edition), Charles Kittel, Wiley Eastern, 2019.
4. Physics of Semiconductor devices (4th edition), Simon.MSze and Kwok K . Ng, Wiley Student Edition, 2006.

COURSE OUTCOMES: On completion of the course students will be able to

1. Understand the concepts of Quantum mechanics and visualize the differences between the solids by their classification.
2. Identify and analyse the importance of semiconductors and semiconductor devices in Science and Engineering Applications.
3. Appreciate the features and applications of Lasers and Optical fibres.
4. Applying the fundamental properties of dielectric and magnetic materials in different engineering fields.
5. Evaluate various aspects of Energy Materials and Nano-materials and their applications in diverse fields.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO5	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

ELEMENTS OF CIVIL ENGINEERING

Course: B.Tech (CE): I-Sem. **L T P C**
Subject Code: A401501 **0 0 2 1**

Pre-requisites: Nil

List of Experiments:

1. **Identification of Minerals :** Silica Group, Feldspar Group, Crystalline Group, Carbonate Group, Pyroxene Group, Mica Group, Amphibole Group.
2. **Identification of Rocks:** Igneous Petrology, Sedimentary Petrology, Metamorphic Petrology.
   a. Study of topographical features from Geological maps. Identification of symbols in maps.
   b. Simple structural Geology Problems (Folds, Faults & Unconformities)
3. **Tests on Cement:**
   a. Fineness test & Norma Consistency test.
   b. Specific gravity test, Initial and Final setting time of cement.
4. **Tests on Fine Aggregates**
   a. Specific Gravity test.
   b. Bulking of sand & Fineness modulus of Fine aggregate.
5. **Tests on Coarse Aggregate**
   a. Specific Gravity test.
   b. Fineness modulus of Coarse aggregate

TEXT BOOKS:

1. IS 383:1993"Specificationfor Coarse and Fine Aggregates from Natural Sources for Concrete".

COURSE OUTCOMES: On completion of the course students will be able to

1. Identify minerals based on geological classifications
2. Identify the rocks based on geological classifications
3. Identify topographical features from Geological maps
4. Assess the properties of cement
5. Analyze properties of coarse and fine aggregates

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	-	1	1	1	1	2	-	2
CO2	3	2	-	2	-	1	1	1	1	2	-	2
CO3	3	2	-	2	-	1	1	1	1	2	-	2
CO4	3	3	-	-	3	2	1	3	1	2	-	2
CO5	3	3	-	-	-	2	1	3	1	2	-	2

ENGINEERING MECHANICS
(Common to Mechanical & Civil)

Course: B.Tech (CE): I-Sem. **L T P C**
Subject Code: A403201 **3 0 0 3**

UNIT - I:

Introduction to Engineering Mechanics: Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D, Rigid Body equilibrium, System of Forces: Coplanar Concurrent Forces, Components in Space – Resultant - Moment of Forces and its Application; Couples and Resultant of Force System.
Equilibrium of System of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems.

UNIT - II:

Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies
Applications of friction: Wedge friction, Screw jack & differential screw jack;

UNIT - III:

Centroid and Centre of Gravity: Centroid of Lines, Areas and Volumes from first principle, Centroid of Composite sections
Centre of Gravity: Centre of gravity of simple bodies, Composite bodies – Theorem of Pappus

UNIT - IV:

Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Parallel Axis Theorem, Perpendicular Axis Theorem
Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

UNIT - V:

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected Systems. Fixed Axis Rotation and Plane Motion, Impulse momentum method

TEXT BOOKS:

1. Reddy Vijay Kumar K. and J. Suresh Kumar (2011), Engineering Mechanics – Statics & Dynamics, Singer's, 3rd Edition.
2. Bhavikatti S.S (2019), Engineering Mechanics, New age international publishers, 7th Edition,

REFERENCE BOOKS:

1. Dumir P.C, Sengupta, Srinivas (2020), Engineering Mechanics- Universities Press, 1st edition.
2. Hibbeler R.C, Engineering Mechanics, Pearson, 14th Edition.
3. Arshad Noor, Zahid & Goel (2018), Engineering Mechanics, Cambridge University Press, 1st edition
4. Khurmi R.S, Khurmi N. (2018), Engineering Mechanics, S. Chand publishing, 22nd edition.
5. Shames and Rao (2016), Engineering Mechanics, Pearson Education, 4th edition

COURSE OUTCOMES: At the end of the course, students will be able to

1. Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
2. Solve problem of bodies subjected to friction.
3. Find the location of Centroid and Centre of gravity of a given section.
4. Calculate moment of inertia and mass moment of inertia of a given section.
5. Solve problems using work energy equations for translation, fixed axis rotation and plane motion.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	-	3	-	-	2	1	-	-	-	-	1
CO2	3	-	3	-	-	2	1	-	-	-	-	1
CO3	3	-	3	-	-	2	1	-	-	-	-	1
CO4	3	-	3	-	-	2	1	-	-	-	-	1
CO5	3	-	3	-	-	2	1	-	-	-	-	1

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY
(Common to all branches)

Course: B.Tech (CE): I-Sem. **L T P C**
Subject Code: A400503 **0 0 2 1**

The English Language and Communication Skills (ELCS) Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

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

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Listening Skills Objectives:

1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions. Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills Objectives:

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

The following course content is prescribed for the English Language and Communication Skills Lab

EXERCISE – I:

CALL Lab: Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs - Past Tense Marker and Plural Marker- Testing Exercises

ICS Lab: Understand: Spoken vs. Written language- Formal and Informal English. Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

EXERCISE – II:

CALL Lab: Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation. Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - Testing Exercises.

ICS Lab: Understand: Features of Good Conversation – Strategies for Effective Communication. Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

EXERCISE – III:

CALL Lab: Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI). Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -Testing Exercises

ICS Lab: Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding –

EXERCISE – IV:

CALL Lab: Understand: Listening for General Details. Practice: Listening Comprehension Tests - Testing Exercises

ICS Lab: Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication Presentation Skills. Practice: Making a Short Speech – Extempore- Making a Presentation.

EXERCISE – V:

CALL Lab: Understand: Listening for Specific Details. Practice: Listening Comprehension Tests –Testing exercises

ICS Lab: Understand: Group Discussion Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:** The Computer Assisted Language Learning Lab has to accommodate 30 students with 30 systems, with one Master Console, LAN facility and English language learning software for self- study by students. System Requirement (Hardware component): Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications: i) Computers with Suitable Configuration ii) High Fidelity Headphones
2. **Interactive Communication Skills (ICS) Lab :** The Interactive Communication Skills Lab: A Spacious room with movable chairs and audiovisual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc. Source of Material (Master Copy): • Exercises in Spoken English. Part 1,2,3. CIEFL and Oxford University Press Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus

REFERENCE BOOKS:

1. English Language Communication Skills Lab Manual cum Workbook,(1st edition) ,by Rajesh Kumar Cengage Learning India Pvt. Ltd,2022
2. Communicative English - A workbook, (Revised Edition) by Shobha, KN & Rayen, J. Lourdes, Cambridge University Press, 2019.
3. Communication Skills: A Workbook. Kumar, (2nd edition) by Sanjay & Lata, Pushp, Oxford University Press, 2019.
4. ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities,(Board of Editors), Orient Black Swan Pvt. Ltd, 2016
5. English Language Skills: A Practical Approach, Mishra, Veerendra et al., Cambridge University Press, 2020.

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

1. Understand the nuances of English language through audio- visual experience and group activities.
2. Neutralise their accent for intelligibility.
3. Speak with clarity and confidence which in turn enhances their employability skills
4. Students will learn public speaking skills and overcome stage fear.
5. Express clarity of thoughts, capability to hold the discussion with everyone and develop analytical thinking.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-		2	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	3	2	-
CO4	-	-	-	-	-	-	-	-	-	3	-	2
CO5	-	-	-	-	-	-	-	-	-	2	-	2

APPLIED PHYSICS LABORATORY
(Common to all branches)

Course: B.Tech (CE): I-Sem. **L T P C**
Subject Code: A400501 **0 0 3 1.5**

(Any 8 experiments are to be performed)

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. a) V-I and L-I characteristics of light emitting diode (LED)b)V-I Characteristics of solar cell
6. Determination of Energy gap of a semiconductor.
7. Determination of the resistivity of semiconductor by two probe method.
8. Study of B-H curve of a magnetic material.
9. Determination of dielectric constant of a given material
10. a) Determination of the beam divergence of the given LASER beam)Determination of Acceptance Angle and Numerical Apertureof an optical fiber.
11. Understanding the method of least squares – torsional pendulum as an example.
12. Diffraction grating: Determination of wavelength of a source (LASER).

LABORATORY MANUAL:

1. Applied Lab (2nd Edition) Dr M Chandra Shekhar Reddy, Dr NeelimaPatnaik, Jaya Prakash Reddy Kasu, Skytech Publications, 2022.
2. "A Text book of Practical Physics"(2nd Edition) - S. Balasubramanian, M.N. Srinivasan S Chand Publishers, 2017.

COURSE OUTCOMES: On completion of the course students will be able to

1. Appreciate quantum physics in optoelectronics.
2. Determine the Planck's constant using Photo electric effect
3. Determine energy gap of a semiconductor diode and magnetic fields.
4. Identify the material whether it is n-type or p-type by Hall experiment.
5. Evaluate the basic properties of lasers and optical fibers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	-	-	-	-	-	-	1
CO2	3	3	1	1	-	-	-	-	-	-	-	1
CO3	3	3	1	1	-	-	-	-	-	-	-	1
CO4	3	3	1	1	-	-	-	-	-	-	-	1
CO5	3	3	1	1	-	-	-	-	-	-	-	1

ENGINEERING WORKSHOP
(Common to Mechanical & Civil)

Course: B.Tech (CE): I-Sem. | **L T P C**
Subject Code: A403503 | **0 1 3 2.5**

Pre-requisites: Practical skill

1. TRADES FOR EXERCISES:
At least two exercises from each trade:

I. Carpentry
II. Fitting
III. Tin-Smithy
IV. Foundry
V. Welding Practice
VI. House-wiring
VII. Black Smithy

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Lathe, Power tools

TEXT BOOKS:

1. Workshop Practice, B. L. Juneja, Cengage, 2016
2. Workshop Manual, K. Venugopal, Anuradha Pub, 2012

REFERENCE BOOKS:

1. Work shop Manual, 2nd Edition, P. Kannaiah & K.L. Narayana, Scitech Publishers, 2008
2. Workshop Manual, 6th Edition, Venkat Reddy, BS Publications, 2008

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

1. Study and practice on trade tools and their operations
2. Practice and prepare components using workshop trades including carpentry, fitting, Tin smithy.
3. Practice and prepare components using workshop trades including Foundry, welding.
4. Practice and prepare components using workshop trades including House wiring, black smithy and Plumbing.
5. Acquire knowledge by exposure to modern Tools.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	3	1	3	1	1	-	3
CO2	3	2	1	1	-	2	1	3	2	1	1	3
CO3	3	2	1	1	-	2	1	3	2	1	1	3
CO4	3	2	1	1	-	2	1	3	2	1	1	3
CO5	3	-	1	1	2	2	1	3	2	1	2	3

INTRODUCTION TO SOCIAL INNOVATION
(Common to all branches)

Course: B.Tech (CE): I-Sem. **L T P C**
Subject Code: A400505 **0 0 2 1**

WEEK-1: Types and features of community- Rural, Suburban, Urban and Regional

WEEK-2: Service based learning; Aims of Community based projects, Sustainable Development Goals

WEEK-3: Community visit, Report Writing, Resource Diagram, Chapati Diagram, Transect Walk

WEEK-4: The non-profit sector, public sector, the private sector, the informal sector

WEEK-5: Poster presentation on four sectors

WEEK-6: Process of Design Thinking

WEEK-7: Social organizations and enterprises, social movements

WEEK-8: Social softwares and open-source methods

WEEK-9: Introduction to Ethics, moral values, significance of professional ethics code of conduct for engineers

WEEK-10: Identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas

WEEK-11: Case studies on Engineering Ethics

WEEK-12: Documentation, Steps for Patent filing and Startups, Poster presentation

TEXT BOOKS:

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public Sectors; Georgia Levenson Keohane; Tata McGraw Hill
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, Yeheskel Hasenfeld; Palgrave Macmillan
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.
4. Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author)
5. Engineering Ethics: An Industrial Perspective; Gail Baura; Elsevier
6. Intellectual Property and Financing Strategies for Technology Startups; Gerald B. Halt, Jr., John C. Donch, Jr., Amber R. Stiles, Robert Fesnak; Springer
7. Fundamentals of Intellectual Property (English) 1st Edition (Paperback, Dr. Kalyan C. Kankanala) Publisher: Asia Law House ISBN: 9789381849514, 938184951X Edition: 1st Edition, 2012.
8. Indian Patent Law (English, Paperback, Kalyan C. Kankanala) Publisher: Oxford University Press- New Delhi, ISBN: 9780198089605, 0198089600 Edition: 2012.

COURSE OUTCOMES: On Completion of the course, the students will be able to

1. Identify community issues through community Interaction
2. Illustrate the factors affecting social innovation in various sectors
3. Apply design thinking concept to analyze the community problems
4. Adopt the ethical values in implementing the Social innovation
5. Describe the process of property rights and patent filing.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	1	2	-	3	2	-	-
CO2	-	-	-	-	-	2	2	-	3	3	-	-
CO3	-	-	-	2	-	2	3	-	2	3	-	-
CO4	-	-	-	-	-	2	3	3	2	2	-	-
CO5	-	2	-	2	-	2	3	-	2	3	-	-

UNIVERSAL HUMAN VALUES
(Mandatory Course-Common to all branches)

Course: B.Tech (CE): I-Sem. | **L T P C**
Subject Code: A400704 | **2 0 0 0**

UNIT - I

Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- 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.

  Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

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' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) • Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT – III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence • Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals • Visualizing a universal harmonious order in society- Undivided Society, Universal Orderfrom family to world family.

  Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc., Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT - IV

Understanding Harmony in the Nature and Existence – Whole existence as Coexistence

- 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 of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT – V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis 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 technologies 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
- Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

TEXT BOOKS:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019.

REFERENCE BOOKS:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amar kantak, 1999.
2. Tripathi, A. N. "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"

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

1. Students are expected to become more aware of themselves and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. •
3. They would have better critical ability about various issues in life.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	2	-	-	-
CO4	-	-	-	-	-	-	-	2	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	2

ENGINEERING CHEMISTRY

(Common to all branches)

Course: B.Tech (CE): II-Sem.	**L**	**T**	**P**	**C**
Subject Code: A400009	**3**	**1**	**0**	**4**

UNIT-I:

Electrochemistry: Electrode potential, Standard electrode potential and E.M.F of the cell. Electrochemical cell, Nernst equation- derivation and applications, Types of electrodes- Quinhydrone electrode, Calomel electrode and Glass electrode.Electro chemical series and its applications.

Batteries- primary (Lithium cell), secondary (Lead acid storage battery and Lithium-ion battery) and Fuel cells (H_2-O_2 and methanol-oxygen), Solar cells - Introduction and applications of Solar cells.

Corrosion: Introduction, Definition, Causes and effects of corrosion, Theories of chemical and electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion- Galvanic, Waterline and Pitting corrosion, Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection, Sacrificial anode and Impressed current cathodic methods, Surface coatings- Metallic coatings, hot dipping, galvanizing and tinning, Electroplating- Copper plating and electrolessplating - Nickel plating.

UNIT-II:

Material Chemistry-High Polymers: Types of polymerizations (addition, condensation and copolymerization).

Plastics: Thermoplastic and Thermosetting resins, Compounding and fabrication of plastics (compression and injection moulding). Preparation, properties, Engineering applications of PVC, Teflon and Bakelite.

Fibers: Characteristics of fibers - preparation, properties and uses of Nylon-6,6 and Dacron, Fiber Reinforced Plastics (FRP) - applications.

Rubbers: Natural rubber and its vulcanization. Elastomers: Buna-s, Butyl rubber and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Preparation and applications of Polyvinyl acetate, Polylactic acid and poly vinyl alcohol.

UNIT-III:

Energy Sources: Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification-solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages

UNIT-IV:

Water Technology: Sources of water, Impurities in water, Hardness of water, Temporary and permanent hardness, Units of hardness, Estimation of temporary and permanent hardness of water, EDTA method, Numerical problems, Potable water Treatment-Specifications, Steps involved in Treatment-Sedimentation, Coagulation, Filtration, Sterilization, Desalination of Brackish Water, Reverse Osmosis and Electro dialysis.

Industrial water treatment, Boiler Troubles-Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming. Hot lime and cold lime soda Process-Numerical problems, Zeolite process and Ion exchange process. Internal conditioning methods like Phosphate, Carbonate, Calgon and Colloidal conditioning.

UNIT-V:

Engineering Materials:

Cement: Portland cement, its composition, setting and hardening.

Smart materials: Smart materials and their engineering applications

Advanced Glass Technology: Structure and nature of glasses, transformation range behaviour, dependence of physico-chemical characteristic of glasses on their constituents. Strength of glass and glass articles.

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

Text Books:

1. Engineering chemistry (1st edition), B. Rama Devi & Ch. VenkataRamana Reddy; Cengage Learning, 2012.
2. Engineering Chemistry (1st edition), P. C. Jain and M. Jain, DhanapatRai& Sons.
3. Engineering chemistry (1st edition), Dr. Bharathikumari, Dr. Jyotsna.
4. Engineering chemistry (1st edition), Thirumala chary, E. Laxminyarana, SCITECH Publications (India) Pvt. Ltd.

Reference Books:

1. Engineering Chemistry (2nd edition), ShikhaAgarwal; Cambridge University Press, 2015.
2. Engineering Chemistry (2nd edition), Wiley India Pvt. Ltd., Vairam and others, 2014.
3. Engineering Chemistry (1st edition), PrasanthRath, Cengage Learning, 2015.
4. Applied Chemistry (1st edition), H.D. Gesser, Springer Publishers.
5. Engineering Chemistry (3rd edition), B. Siva Shankar, Tata McGraw Hill Publishing Limited, 2015.
6. Text of Engineering Chemistry (12th edition), S. S. Dara, Mukkanti, S. Chand & Co, New Delhi, 2006.
7. Chemistry of Engineering Materials (5th edition), C. V. Agarwal, C. P. Murthy, A. Naidu, Wiley India, 2013.
8. Chemistry of Engineering Materials (3rd edition), R. P. Mani, K. N. Mishra, Cengage Learning, 2015

Course Outcomes: After completion of the course students will be able to

1. Apply the concept of electrochemistry and corrosion science in various practical applications.
2. Predict the different engineering applications by preparing various polymers.
3. Summarize the manufacturing process of various fuels and their applications in daily life.
4. Understand the benefits of treated water as source in steam generation in industrial application.
5. Illustrate the importance and applications of various advanced engineering materials.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	-	-	-	2
CO5	3	2	-	-	-	-	-	-	-	-	-	2

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to all branches)

Course: B.Tech (CE): II-Sem.	**L**	**T**	**P**	**C**
Subject Code: A400002	**3**	**1**	**0**	**4**

UNIT - I

First Order ODE: Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's differential equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT - II

Ordinary Differential Equations of Higher Order: Second and higher order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x, $e^{a}(x)$and $xV(x)$, method of variation of parameters.

UNIT - III

Laplace transforms: Laplace Transforms: Laplace Transform of standard functions, First shifting theorem and Second shifting theorem.Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't'. Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions. Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT - IV

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

UNIT-V

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

TEXT BOOKS:

1. Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2. AdvancedEngineeringMathematics, (5thEdition),R.K.JainandS.R.K.Iyengar,NarosaPublications,2016.

REFERENCE BOOKS:

1. AdvancedEngineeringMathematics, (9th Edition),Erwinkreyszig,JohnWiley& Sons,2006.
2. Calculus and Analytic geometry, (9thEdition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A text book of Engineering Mathematics, (10thEdition), N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2019.
4. HigherEngineeringMathematics, (9thEdition), H. K. Dassand Er. Rajnish Verma, S Chand and company Limited, NewDelhi, 2011.

COURSE OUTCOMES: On completion of the course students will be able to

1. Determine first order differential equations and obtain solutions.
2. Solve the Higher order differential equations and apply the differential equation concepts to real world problems.
3. Use the Laplace transforms techniques for solving ODE's.
4. Evaluate Gradient – Divergence – Curl, Directional derivatives.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	2
CO4	3	3	-	-	-	-	-	-	-	-	-	2
CO5	3	3	-	-	-	-	-	-	-	-	-	2

BUILDING MATERIALS, CONSTRUCTION AND PLANNING

Course: B. Tech (CE): II-Sem. **L T P C**
Subject Code: A401301 **3 0 0 3**

Pre-requisites: Nil

UNIT–I: Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing.
Bricks: Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics.
Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties – seasoning– defects; alternate materials for Timber – GI / fiber– reinforced glass bricks, steel & aluminum, Plastics.

UNIT–II: Cement & Admixtures: Ingredients of cement – manufacture – Chemical composition – Hydration -field & lab tests.

Admixtures: Mineral & chemical admixtures – uses.

UNIT–III: Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs –flat, curved, trussed; foundations – types; Damp Proof Course; Joinery – doors – windows – materials– types.

Building Services: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations:Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics –characteristic – absorption – Acoustic design; Fire protection – Fire Hazards – Classification of fireresistant materials and constructions.

UNIT–IV: Mortars, Masonry and Finishing's Mortars: Cement Mortar, Brick masonry – types – bonds; Stonemasonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick.

Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.
Form work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT–V: Building Planning: Classification of buildings ,functional Planning of buildings: Sustainability andconcept of Green building, General aspects to consider for planning, bye-laws and regulations,Selection of site for building construction, Principles of planning, Orientation of building and its relationto outside environment.

TEXT BOOKS:

1. Building Materials and Construction – Arora &Bindra, Dhanpat Roy Publications.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

REFERENCE BOOKS:

1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Building Construction by PC Varghese PHI.

COURSE OUTCOMES: On completion of the course students will be able to
1. Understand the different construction material.
2. Understand the different component parts of building and their construction practices and techniques
3. Understand the functional requirements to be considered for design and construction of building
4. Identify the factors to be considered in planning and construction of buildings
5. Plan a building based on the factors and principles of planning.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

C PROGRAMMING & DATA STRUCTURES
(Common to ECE, EEE, Mechanical and Civil)

Course: B. Tech (CE): II-Sem.	**L**	**T**	**P**	**C**
Subject Code: A405202	**3**	**0**	**0**	**3**

UNIT-I

Overview of C: Basic structure of C programs, programming style, executing a C program.

Constants, Variables, and Data Types: Introduction, Character set, C-Tokens, keywords and identifiers, constants, variables, Data types, declaration of variables, declaration of Storage class, assigning values to variables, defining symbolic constant.

Operators& Expressions: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment & Decrement Operators, Conditional Operators, Bitwise Operator, Special Operators. Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators.

UNIT-II

Decision Making: Introduction, Decision making with *if* statement, simple *if* statement, the *if---else---* statement, Nesting of ***if---else---***statements.the ***else-if*** ladder, the ***switch*** statement, the ?: operator, the go to statement. **Looping:** Introduction, the ***while*** statement, the ***do -while*** statement, ***for*** statement, break and continue statements.

Arrays: Introduction, One-Dimensional Arrays, Declaration of One-Dimensional Arrays, Initialization of One-Dimensional Arrays, Two-Dimensional Arrays, Initializing two dimensional arrays.

UNIT-III

Character Arrays and Strings: Introduction, declaring and initializing string variables, reading strings from terminal, writing strings to screen, string-handling functions. **Functions:** Introduction, definition of functions, return values, function calls, function declaration, scope, visibility and lifetime of variables. **Pointers:** Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation)

UNIT-IV

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Operations, array and linked representations of stacks, stack applications, Queues- operations, array, and linked representations.

UNIT-V

Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs.

TEXTBOOKS:

1. Programming in ANSI C, 8th Edition, E. Balagurusamy Mc Graw Hill Educationpublication,2019.
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.

REFERENCE BOOKS:

1. C Programming Absolute Beginner's Guide, 3rd Edition, Pearson Education, 2014
2. Learn C the Hard Way,1st Edition,Zed A.Shaw, Pearson Education,2018
3. The C-Programming Language, 2nd Edition, Brian Kernighan and Dennis Ritchie, Pearson Education, 2014
4. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

COURSE OUTCOMES: On completion of the course students will be able to

1. Describe the structure of C program and explain the various components of it.
2. Use iterative statements for writing the C programs.
3. Organize data in Arrays and perform operations on data stored in Arrays.
4. Define & describe user defined functions in C language.
5. Differentiate structures, unions and manipulate data using pointers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	-	-	-	-	-	-	-	-	-
CO2	3	1	3	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-

ENGINEERING GRAPHICS
(Common to Mechanical and Civil)

Course: B. Tech (CE): II-Sem. **L T P C**
Subject Code: A403202 **1 0 3 2.5**

UNIT – I:

Introduction to Engineering Drawing: Principles of Engineering Drawing and their Significance, Introduction to Computer aided drafting – views, commands.

Computer aided drafting of conic Sections: Ellipse, Parabola and Hyperbola – General Method (eccentricity) only.

Computer aided drafting of Cycloid, Epicycloids and Hypocycloid.

Computer aided drafting of Scales – Plain & Diagonal.

UNIT- II:

Orthographic Projections: Introduction to Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.
Computer aided orthographic projections – points, lines and planes

UNIT – III:

Projections of Regular Solids: Introduction to Regular Solids – Prism, Cylinder, Pyramid, Cone
Computer aided projections of solids – Regular views

UNIT – IV:

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone, and Computer aided projections of solids – sectional views
Development of Surfaces: Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT – V:

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines, Isometric Projection of Spherical Parts using computer aided drafting.
Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions
Conversion of orthographic projection into isometric view and vice versa using computer aided drafting.

TEXT BOOKS:

1. Engineering Drawing, 51st Edition, N.D. Bhatt, Charotar Pub, 2012
2. Computer Aided Engineering Drawing, 2nd Edition, K. Balaveera Reddy et al, CBS Publishers, 2015

REFERENCE BOOKS:

1. Engineering Drawing, 2nd Edition, Basant Agrawal and C M Agrawal, McGraw Hill, 2014
2. Engineering Drawing, 1st Edition, M. B. Shah, B.C. Rane, Pearson, 2015
3. Engineering Drawing, 1st Edition, N. S. Parthasarathy and Vela Murali, Oxford, 2015
4. Engineering Drawing and graphics Using AutoCAD, 3rd Edition, T. Jeyapoovan, Vikas, S.Chand and Company Ltd, 2000

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

1. Apply computer aided drafting tools to create 2D objects like Conic section and Cycloidal curves
2. Sketch the Orthographic projection of Point, Line and Plane objects by drafting tools
3. Create, read and interpret engineering drawings of Solids by computer tools
4. Create and interpret 2D and 3D Isometric objects by drafting tools
5. Conversion of orthographic projection into isometric view and vice versa by using computer aided drafting tools

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	-	3	-	-	2	3	3	1	2
CO2	3	1	3	-	3	-	-	2	3	3	1	2
CO3	3	1	3	-	3	-	-	2	3	3	1	2
CO4	3	1	3	-	3	-	-	2	3	3	1	2
CO5	3	1	3	-	3	-	-	2	3	3	1	2

ENGINEERING CHEMISTRY LABORATORY

(Common to all Branches)

Course: B. Tech (CE): II-Sem. **L T P C**
Subject Code: A400502 **0 0 2 1**

Lab Experiments:

1. Estimation of Hardness of water by EDTA Method.
2. Estimation of Alkalinity of Water.
3. Estimation of Copper by Colorimetric Method.
4. Conductometric Titration of aStrong Acid vs a Strong Base.
5. Conductometric Titration of aWeak Acid vs a Strong Base.
6. Potentiometric Titration of aStrong Acid vs a Strong Base.
7. PotentiometricTitration of Ferrous Ammonium Sulphate (FAS) vs Potassium Dichromate.
8. Preparation of Thiokol Rubber.
9. Determination of Viscosity of a Liquid.
10. Determination of Surface Tension of a liquid.
11. Adsorption of acetic acid on Activated charcoal.
12. Estimation of Iodine in Table Salt (by potentiometric)
13. Thin Layer Chromatography (Ortho-Nitro phenol &Para-Nitro phenol).
14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

Virtual lab experiments:

1. Construction of Fuel Cell and its working.
2. Smart Materials for biomedical applications.
3. Batteries for Electrical Vehicles.
4. Functioning of Solar Cell and its applications.

Reference Books

1. Engineering Chemistry Lab Manual (1st edition), Glaze Publishers 2018.
2. Engineering chemistry (1st edition), B. Rama Devi & Ch. Venkata Ramana Reddy; Cengage Learning, 2012.
3. A Textbook of Engineering Chemistry (1st edition), Sashi Chawla, Dhanapath Rai& Sons.

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

1. Determine the extent of hardness present in water and its consequences in industrial operations
2. Prepare polymer like Thiokol Rubber
3. Estimate the strength of solutions, p^H of various solutions
4. Determine the viscosity and surface tension of various liquids
5. Apply the electrochemical concepts in conductometric and potentiometric titrations

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	1
CO2	3	-	-	-	-	-	-	-	-	-	-	1
CO3	3	-	-	-	-	-	-	-	-	-	-	1
CO4	3	-	-	-	-	-	-	-	-	-	-	1
CO5	3	-	-	-	-	-	-	-	-	-	-	1

C PROGRAMMING & DATA STRUCTURES LABORATORY
(Common to ECE, EEE, Mechanical and Civil)

Course: B. Tech (CE): II-Sem.	**L**	**T**	**P**	**C**
Subject Code: A405503	**0**	**0**	**2**	**1**

[Note: The programs may be executed using any available Open Source/ Freely available IDE
Some of the Tools available are: CodeLite: https://codelite.org/
Code Blocks: http://www.codeblocks.org/
Dev Cpp: http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

I. OPERATORS AND EVALUATION OF EXPRESSIONS

Demonstration

1. Write a C program to print greetings message on the screen.
2. Write a C program to illustrate usage of comments in C.
3. Write a simple program that prints the results of all the operators available in C
4. (Including pre/post increment, bitwise and/or/not. etc), Read required operand values from standard input)
5. Write a C program that converts given data type to another using auto conversion and casting. Take the values from standard input.
6. Write a program for finding the max and min from the three numbers (using ternary operator).

Experiment

7. Write a C program to compute simple, compound interest.
8. Write a C program that declares Class awarded for a given percentage of marks, where mark = 70% = Distinction. (Read percentage from standard input.)

II. Expression Evaluation

Demonstration

1. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula $s = ut+(1/2)at^2$ where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
2. Write a program that asks the user to enter the highest rainfall ever in one season for a country, and the rainfall in the current year for that country, obtains the values from the user, checks if the current rainfall exceed the highest rainfall and prints an appropriate message on the screen. If the current rainfall is higher, it assigns that value as the highest rainfall ever. Use only the single-selection form of the if statement.

Experiment

3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a Quadratic equation.

III. Iterative statements

Demonstration

1. Write a program that reads an integer (5 digits or fewer) and determines and prints how many digits in the integer are 9s.
2. Write a program that keeps printing the powers of the integer 3, namely 3, 9, 27, 91, 273, and so on. Your loop should not terminate (i.e., you should create an infinite loop). What happens when you run this program?
3. Write a program that reads the radius of a circle (as a float value) and computes and prints the diameter, the circumference and the area. Use the value 3.14159 for π

Experiment

1. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.
2. Write a C program to construct a pyramid of numbers as follows:

```
1                    1
1  2                 2  2
1  2  3              3  3  3
1  2  3  4           4  4  4  4
1  2  3  4  5        5  5  5  5  5
```

IV. Arrays, Pointers, and Functions

Demonstration

1. Write a C program to find the minimum, maximum and average in an array of integers.
2. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimension array.
3. Write a C program that uses functions to perform the following:
   i. Addition of Two Matrices, ii. Multiplication of Two Matrices, iii. Transpose of a matrix.

Experiment

4. Write a C program to find the GCD (greatest common divisor) of two given integers.
5. Write a C program to compute x^n

V. Strings

Demonstration

1. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
2. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent c.
3. Write a C program that uses functions to perform the following operations:
   - To insert a sub-string into a given main string from a given position.
   - To delete n Characters from a given position in a given string.

Experiment

1. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
2. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't ontain ch.
3. Write a C program to count the lines, words and characters in a given text.

VI Data Structures

Demonstration

1. Write a program that uses functions to perform the following operations on singly linked list
   i) Creation, ii) Insertion, iii) Deletion and iv) Traversal
2. Write a program that implement stack (its operations) using
   i) Arrays, ii) Pointers
3. Write a program that implement Queue (its operations) using
   i) Arrays, ii) Pointers

Experiment

4. Write a program that uses functions to perform the following operations on doubly linked List.
   i) Creation ii) Insertion iii) Deletion iv) Traversal
5. Write a program that uses functions to perform the following operations on circular linked List.
   i) Creation ii) Insertion iii) Deletion iv) Traversal

VII Searching & Sorting

Demonstration

1. Write a C program that uses non recursive function to search for a Key value in a given list of integers using linear search method.
2. Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using binary search method.
3. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

Experiment

4. Write a C program that sorts the given array of integers using selection sort in descending order
5. Write a C program that sorts the given array of integers using insertion sort in ascending order

TEXTBOOKS:

1. Programming in ANSI C, 8th Edition, E. Balagurusamy McGraw Hill Education publication, 2019
2. Fundamentals of Data Structures in C, 2 nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.

REFERENCE BOOKS:

1. C Programming Absolute Beginner's Guide, 3rd Edition, Pearson Education, 2014
2. Learn C the Hard Way,1st Edition, Zed A. Shaw, Pearson Education,2018
3. The C-Programming Language, 2nd Edition, Brian Kernighan and Dennis Ritchie, Pearson Education, 2014.
4. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

COURSE OUTCOMES: On completion of the course students will be able to

1. Formulate the algorithms for simple problems and translate given algorithms to a working and correct program
2. Correct syntax errors as reported by the compilers identify and correct logical errors encountered during execution
3. Represent and manipulate data with arrays, strings and structures and
4. Develop applications using pointer concept.
5. Develop reusable code with the help C-functions

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1	-	-	-	-	-	-	-
CO2	-	-	3	3	1	-	-	-	-	-	2	2
CO3	3	3	-	2	-	-	-	-	-	-	-	-
CO4	-	-	3	-	2	-	-	-	-	-	2	-
CO5	2	2	3	-	-	-	-	-	-	-	1	1

ENGINEERING EXPLORATION & PRACTICE

(Common to all branches)

Course: B. Tech (CE): II Semester **L T P C**

Subject Code: A400506 **0 0 3 1.5**

Week-1: Difference between Science and Engineering, Scientist and Engineer needs and wants various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer. Significance of teamwork, Importance of communication in engineering profession

Week-2: Engineering Design Process, Need statement to Problem conversion, Pair wise comparison chart, decision matrix, Concepts of reverse engineering

Week-3: Project management tools: Checklist, Timeline, Gantt chart, Requirement Analysis

Week-4: Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism

Week-5: 3-D Modelling of a Box with two holes and curvature

Week-6: 3-D Modelling of Electronic Enclosure and Assembly of two parts

Week-7: Introduction to various platform-based developments, Introduction to basic components, transducers, actuators and sensors, Introduction to Tinkercad

Week-8: Introduction to Arduino, basics of programming

Week-9: Interfacing Arduino with actuators and transducers

Week-10: Interfacing Arduino with Sensors, Liquid Crystal Display (LCD)

Week-11: Assembly and Crafting the Prototype

Week-12: Test and Validate the Prototype, Documentation, and Panel Presentation

TEXT BOOKS:

1. Engineering Fundamentals: An Introduction to Engineering (Mind Tap Course List) 5th Edition by Saeed Moaveni
2. Software Project Management (SIE), (Fifth Edition); Bob Hughes, Mike Cotterell, Rajib Mall; Published by Tata McGraw-Hill Education Pvt. Ltd (2011) ; ISBN 10: 0071072748 ISBN 13: 9780071072748
3. A Ghosh and AK Malik: Theory of Mechanism and Machine; East West Press (Pvt) Ltd., New Delhi.
4. Arduino Cookbook, 2nd Edition by Michael Margolis: O'Reilly Media
5. Introduction to autocad®2017-2D and 3D design by Bernd S. Palm and Alf Yarwood, Routledge (Taylor and Francis group)
6. Concepts in Engineering Design – 2016; by Sumesh Krishnan (Author), Dr.Mukul Shukla (Author), Publisher: Notion Press.

COURSE OUTCOMES: On Completion of the course, the students will be able to

1. Explain the importance of engineering profession in the world.
2. Identify multi-disciplinary approach required in solving an engineering problem
3. Build a mechanism for a given application
4. Create basic 3D models and animations
5. Design a mechatronic system using Arduino and electronic components

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	3	3	2	-	3	-
CO2	-	3	1	3	2	-	-	-	3	-	3	-
CO3	3	-	2	-	3	-	-	-	3	-	3	-
CO4	2	3	2	-	3	-	-	-	3	2	3	-
CO5	-	-	2	1	2	-	3	-	3	-	3	-

CONSTITUTION OF INDIA
(Common to all branches)

Course: B. Tech (CE): II Semester | **L T P C**
Subject Code: A400703 | **2 0 0 0**

UNIT – 1:

History of Making of the Indian Constitution - History of Drafting Committee

UNIT - 2

Philosophy of the Indian Constitution - Preamble Salient Features

UNIT - 3

Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT - 4

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT - 5

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zilla Panchayat. Elected officials and their roles, CEO Zilla Panchayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

REFERENCE BOOKS:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. B. R. Ambedkar framing of Indian Constitution, Dr. S. N. Busi, 1st Edition, 2015.
3. Indian Constitution Law (7th Edition), M. P. Jain, Lexis Nexis, 2014.
4. Introduction to the Constitution of India, D.D. Basu, Lexis Nexis, 2015.

COURSE OUTCOMES: On completion of the course students will be able to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru.
4. Discuss the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
5. Discuss the passage of the Hindu Code Bill of 1956.

STRENGTH OF MATERIALS - I

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A401302 **3 0 0 3**

Unit I

Simple Stresses and Strains: Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Elastic constants. Introduction to Strain energy and types.

Unit II

Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M 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 contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

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 and T sections – Design of simple beam sections.
Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, I and T sections.

Unit IV

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

Unit V

Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.
Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum shear stress theory.

TEXT BOOKS:

1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.
2. Mechanics of Materials by Dr. B.C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
3. Strength of Materials by R. Subramanian, Oxford University Press

REFERENCE BOOKS:

1. Mechanics of material by R.C. Hibbeler, Prentice Hall publications
2. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall publications
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Presss

COURSE OUTCOMES: On completion of the course students will be able to

1. Determine the stress and strain of various materials
2. Sketch the shear force and bending moment diagrams for beams of various supports and loads
3. Analyze flexural and shear stresses in a beam
4. Determine the deflections in beams under various loading and support conditions
5. Evaluate principal stresses, strains and various theories of failure

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	-	-	-	-	-	-	3
CO2	3	3	-	3	-	-	-	-	-	-	-	3
CO3	3	3	-	3	-	-	-	-	-	-	-	3
CO4	3	3	-	3	-	-	-	-	-	-	-	3
CO5	3	3	-	3	-	-	-	-	-	-	-	3

ENGINEERING GEOLOGY

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A401303 **2 0 0 2**

UNIT - I

Introduction: 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: 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. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT - III

Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and case studies. Their importance In-situ 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

Earth Quakes: 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 Geophysical Studies: Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric 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, and Tunnels: Types of dams and bearing of Geology of site in their selection, 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 Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e., Tithological, structural and ground water) in tunneling over break and lining in tunnels.

TEXT BOOKS:

1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005.
2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
3. Engineering Geology by S K Duggal, H K Pandey McGraw Hill Education Pvt Ltd 2014.

4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S Publications.

REFERENCE BOOKS:

1. F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.
4. Engineering Geology for Civil Engineers – P.C. Varghese PHI

COURSE OUTCOMES: On completion of the course students will be able to

1. Explain weathering process and mass movement
2. Classify the different minerals and rocks
3. Identify the geological structures of the rocks and ground water potential
4. Adapt geophysical principles for site selection
5. Apply geological principles in natural hazards assessment and selection of sites for mass structures

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		3								3
CO2	3	3		3								3
CO3	3	3		3								3
CO4	3	3		3								3
CO5	3	3		3								3

SURVEYING

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A401304 **3 0 0 3**

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.
Measurement of Distances and Directions: Linear distances- Approximate methods, Direct Methods, Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.
Prismatic Compass: Bearings, included angles, Local Attraction, Magnetic Declination and dip.

UNIT - II

Levelling: Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.
Contouring: Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

UNIT - III

Areas: Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.
Volumes: 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.
Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

UNIT - IV

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.
Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.
Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves,

UNIT - V

Modern Surveying Methods: Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory, electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS–space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

Textbooks:

1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi.
2. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
3. Hoffman. B, H. Lichtenegga and J. Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers,2001.

References:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill – 2000.
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004.
3. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
4. Chandra A M, "Plane Surveying", New Age International Pvt. Ltd., New Delhi, 2002.
5. Surveying by Bhavikatti; Vikas publishing house ltd.
6. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
7. Surveying and leveling by R. Agor Khanna Publishers 2015.

COURSE OUTCOMES: On completion of the course students will be able to

1. Apply the concepts of surveying to measure the distances and directions
2. Identify different methods of leveling to draw levels and contour maps
3. Solve problems on areas and volumes; measure angles by Theodolite
4. Extend methods of trigonometry & tacheometry and design the simple curves
5. Acquaint with EDM, GPS and Total Station

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

FLUID MECHANICS

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A401305 **3 0 0 3**

UNIT – I

Properties of Fluid: Distinction between a fluid and a solid; Properties of fluids – Viscosity, Newton lawof viscosity; vapourpressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of lasticity, compressibility.
Fluid Statics: Fluid Pressure: Pressure at a point, Pascals law, Hydrostatic law, Piezometer, U-Tube Manometer,Single Column Manometer, U-Tube Differential Manometer, Micro-manometers. Pressure gauges,Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

UNIT - II

Fluid Kinematics:
Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar andturbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and realfluid flow; One, two- and three-dimensional flows; Streamline, path line, streak line and streamtube; stream function, velocity potential function , flow net , One, two- and three-dimensionalcontinuity equations in Cartesian coordinates applications.
Fluid Dynamics:
Surface and Body forces -Euler's and Bernoulli's equation; Momentum equation. Correction factors.Bernoulli's equation to real fluid flows.

UNIT - III

Flow Measurement in Pipes:
Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube, applicationsof Momentum equations; Forces exerted by fluid flow on pipe bend, sudden enlargement in pipes.
Flow Over Notches & Weirs: Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity ofapproach. Broad crested weir.

UNIT – IV

Flow through Pipes:
Reynolds experiment, Reynolds number, Loss of head through pipes, Darcy-Wiesbatch equation,minor losses, total energy line, hydraulic grade line, Pipes in series, equivalent pipes, pipes in parallel,siphon, branching of pipes, three reservoir problem, power transmission through pipes. Analysis ofpipe networks: Hardy Cross method and EPA NET, water hammer in pipes and control measures.

UNIT - V

Laminar & Turbulent Flow: Laminar flow through circular pipes, and fixed parallel plates.
Boundary Layer Concepts: Prandtl contribution, Assumption and concept of boundary layer theory. Boundary-layer thickness,displacement, momentum & energy thickness concepts of laminar and turbulent boundary layers on aflat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients.Separation and Control. Drag and Lift and types of drag, magnus effect.

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015.
3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.

REFERENCE BOOKS:

1. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, McGraw Hill Education (India) Private Limited
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.
3. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar DhanpatRai & Co
4. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publication Pvt Ltd.

COURSE OUTCOMES: On completion of the course students will be able to

1. identify properties and influences of fluids on motion
2. derive the stream function from a velocity field
3. apply the principles of fluid dynamics and its measurement
4. determine energy and losses of closed conduit flow
5. analyze boundary layer concept on fluid flow

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A402204 **3 0 0 3**

UNIT - I:

D.C. Circuits:
Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.
A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Threephase balanced circuits, voltage and current relations in star and delta connections.

UNIT - II:

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

UNIT - III:

Electrical Machines: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

UNIT - IV:

P-N Junction and Zener Diode: Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications. Rectifiers and Filters: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT - V:

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.
Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, SatyabrataJit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2 nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011. 8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
8. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Course Outcomes: Upon the completion of the course the students will be able to

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

PYTHON PROGRAMMING LABORATORY

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A405506 **3 0 0 3**

Week 1.

(Python Language Fundamentals-Installation -Identifiers, Reserved Words, Data Types,Type Casting,Immutability)

Demonstration

Experiment-1: Install Anaconda open-source framework for python.
Experiment-2: Write a program to display 'Hello World'.

Experimentation

Experiment-3: Explore various IDEs for python program development.
Experiment-4: The volume of a sphere with radius r is 4/3 πr^3. Write a Python program to find the volume of a sphere with radius 5?

Week 2.

(Arithmetic Operators, Relational Operators, Logical operators, Bitwise operators, Assignment operators, Special operators)

Demonstration

Experiment-1; Write a python program to find minimum and maximum of given three numbers.
Experiment-2: Suppose the cover price of a book is $24.95, but bookstores get a 40% discount.
Shipping costs $3 for the first copy and 75 cents for each additional copy. Write a python program to compute
the total wholesale cost for 60 copies?.

Experimentation

Experiment-3: Write a Python Program to Find the Square Root of a number with out using sqrt function.
Experiment-4: Python Program to Convert Celsius To Fahrenheit.
Experiment-5: Python program to find themaximum of two numbers using ternary operator

Week 3.

(Mathematical Functions, Input and Output statements, Command Line Arguments, String Functions)
Demonstration
Experiment-1: Write a Python program to find area of circle.
Experiment-2: Write a program to read Employee data from the keyboard and print that data.
Experimentation
Experiment-3: Write a program to read 3 float numbers from the keyboard with comma separator and print their sum.
Experiment-4: Write a Program to display Command Line Arguments.

Week 4.

(Flow Control Statements-Conditional Statements, Transfer Statements, Iterative Statements)
Demonstration
Experiment-1. Write a Python program to take a single digit number from the key board and print is value in English word?.
Experiment-2. Write a Python Program to check whether an n-digit integer is an Armstrong number or not.
Experimentation
Experiment-3. Write a Python program to display *'s in pyramid style(also known as equivalent triangle).
Experiment-4. Write a Python Program to Display the multiplication Table.

Week 5.

(Functions-Built in functions,user defined functions,Parameters,return statement,returning multiple values from function,type of arguments,Types of variables-global,local.Recursive functions,Lambda functions,filter function,reduce function,Function aliasing,Function decorators,Generators)

Demonstration

Experiment-1: Write a python function to find factorial of given number?
Experiment-2: Write a program to create a lambda function to find square of given number?

Experimentation

Experiment-3: Lambda Function to find biggest of given values.
Experiment-4:Program to filter only even numbers from the list by using filter() function?

Week 6.

(Working with Strings-Defining String, Multi-line Strings,Accessing characters of a string, Mathematical operators for strings, Membership operator, Comparison of Strings, Removing spaces from the string, Finding Substring, String replacement, Splitting of Strings, Changing cases of a string, Formatting the strings)

Demonstration

Experiment-1: Write a program to accept some string from the keyboard and display its characters by index wise(both positive and negative index).
Experiment-2: Write a program to access each character of string in forward and backward direction by using while loop?

Experimentation

Experiment-3: Program to display all positions of substring in a given main string.
Experiment-4: Write a program to reverse the given String.

Week 7.

(Python Data Structures-List:Creating a list-Accessing elements of a List, Traversing the List, List Manipulation, Ordering the elements of a List, Mathematical Operators for List objects, Membership Operator, Nested Lists, List Comprehensions)

Demonstration

Experiment-1:Write a Python program to display unique vowels present in the given word.
Experiment-2: Write a Python program to Count the Occurrence of an Item in a List.

Experimentation

Experiment-3: Write a Python program to segregate even and odd numbers from the given list of numbers.
Experimnet-4: Write a Python program to find the cumulative sum of elements of the list.

Week 8.

(Python Data Structures-Tuple: Creating a Tuple, Accessing the elements of a tuple, mathematical operators for tuple,
Tuple packing and Unpacking)

Demonstration

Experiment-1: Python program for adding a Tuple to List and Vice-Versa.
Experiment-2: Write a Python program to perform the summation of all elements of each tuple from the list of tuples.

Experimentation

Experiment-3: Write a Python program to multiply adjacent elements of a tuple.
Experiment-4: Write a Python program to find the maximum element in the tuple list.

Week 9.

(Python Data Structures-Set: Creating a Set object, functions of set, Mathematical operations on set, Membership Operators,Set Comprehension,Python Data Structures-Dictionary: Creating a Dictionary Object, accessing data from the dictionary, updating dictionaries, Deleting from dictionary, Functions on dictionary, dictionary comprehension)

Demonstration

Experiment-1.Write a Python program to perform set operations.
Experiment-2:Write a program to print different vowels present in the given word?
Experiment-3:Write a Python program to generate powers of 2 using set comprehensions.
Experiment-4: Write a program to eliminate duplicates present in the list using set

Experiment-5:Write a Python program to enter name and percentage marks in a dictionary and display information on the console.

Experimentation

Experiment-6: Write a program to take dictionary from the keyboard and print the sum of values?
Experiment-7: Write a program to find number of occurrences of each letter present in the given string using dictionary.
Experiment-8: Write a program to accept student name and marks from the keyboard and creates a dictionary. Also display student marks by taking student name as input?

Week 10.

(Python Modules-Creating Modules, Accessing members, module aliasing,member aliasing,reloading a module,
The special variable: __name___. Working with Math,random modules, Python Packages.Python-File Handling-Types of Files, Opening a file, closing a file, properties of File object, writing data to text file, Reading character data from text files, seek (), tell() functions.)

Demonstration

Experiment-1:Create a module **fibo.py** containing Fibonacci(**n**) function(s) and import fibo module in a python script to print Fibonacci series upto **n**.
Experiment-2: Write a python program to print all the contents of a given module.
Experiment-3:Write a python program to create a package containing two or modules.
Experiment-4: Write a python program to import module from a package created in Experiment-3.

Experimentation

Experiment-5: Write a program to check whether the given file exists or not. If it is available then print its content?
Experiment-6: Write a python Program to print the number of lines,words and characters present in the given file?
Experiment-7: Program to read image file and write to a new image file?
Experiment-8: Write a python program to read and write to a CSV file.

Note: ***Experiments under Demonstration section are to be demonstrated by the concerned faculty and the experiments under Experimentation section must be performed by the students individually.***

Reference Books:

1.Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
3. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.
4. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019.

Web links:

1. https://docs.python.org/3/tutorial/modules.html#packages
2. https://www.includehelp.com/python/programs.aspx.
3. https://www.anaconda.com/products/individual
4. https://www.jetbrains.com/pycharm/

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

1. Students shall be able to:
2. CO1Design solutions to computational problems using Python programming language constructs.
3. CO2Write python programs to manipulate string objects.
4. CO3Use appropriate Data structures to organize and manipulate data items.
5. CO4Design modular application using python module & package concepts.
6. CO5Develop application to read and write from various file formats.

SURVEYING LABORATORY

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A401502 **0 0 2 1**

List of Experiments

1. Surveying of an area by chain& compass survey (closed traverse) & plotting.
2. Radiation and intersection methods by plane table survey.
3. Leveling – Longitudinal & Cross-Sectioning and Plotting
4. Measurement of Horizontal angle & vertical angle by theodolite.
5. Trigonometric leveling using theodolite
6. Height and distances using principles of tachometric surveying.
7. Determine the area using total station.
8. Traversing and Contouring using total station.
9. Determination of remote height using total station.
10. Distance, gradient, differential height between two inaccessible points using total station.
11. Curve settling using total station.
12. Stake out using total station.
13. Resection using total station.
14. Finding the position of stations using GPS

COURSE OUTCOMES: On completion of the course students will be able to

1. find the distances, directions and positions of stations
2. identify reduced levels for L.S and C.S of road profiles
3. measure the distance, height between two inaccessible points, horizontal and vertical angles
4. determine the area, traverse, elevation , contour and stakeout
5. develop curve and resection for various item of work

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

STRENGTH OF MATERIALS LABORATORY

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A401503 **0 0 2 1**

List of Experiments

1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges
12. Continuous beam – deflection test.

COURSE OUTCOMES: On completion of the course students will be able to

1. analyze stress-strain relationship for given material
2. determine torsion and stiffness of shaft and spring
3. assess the flexural strength for given member
4. find the hardness and compressive strength of given material
5. measure the strain in material using electrical resistance strain gauge

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A402504 **0 0 2 1**

List of Experiments / Demonstrations:

PART A: ELECTRICAL

1. Verification of KVL and KCL
2. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS

1. Study and operation of (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator 4. Input & Output characteristics of Transistor in CB / CE configuration
4. Full Wave Rectifier with & without filters
5. Input and Output characteristics of FET in CS configuration

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, SatyabrataJit, TMH, 2/e, 1998.

COMPUTER AIDED DRAFTING LABORATORY

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A401504 **0 0 2 1**

List of Experiments:

1. Planning Aspects of Building systems as per National Building Code (NBC).
2. Brick bonds: English bond & Flemish bond – Odd and Even courses.
3. Developing plan and section of dog-legged staircase.
4. Developing plan of single storied residential building.
5. Developing section and elevation of single storied residential building.
6. Developing plan of single /two storied Residential building as per Building by-laws.
7. Developing plan of public building as per building by-laws.
8. Developing section and elevation of public building.
9. Development of working drawing of building –Electrical Layout.
10. Development of working drawing of building – Plumbing Layout.

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. SeshaPraksh& Dr. G. S. Servesh –Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.
3. Civil Engineering Drawing-I by N. Sreenivasulu, S. Rama Rao – Radiant Publishing House.
4. Civil Engineering Drawing-II by N. Sreenivasulu – Radiant Publishing House.

REFERENCE BOOKS:

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

GENDER SENSITIZATION

Course: B. Tech (CE): III Semester **L T P C**
Subject Code: A400702 **2 0 0 0**

UNIT-I:

UNDERSTANDING GENDER: Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood-Growing up Male, First lessons in Caste.

UNIT – II:

GENDER ROLES AND RELATIONS: Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences, Declining Sex Ratio-Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III:

GENDER AND LABOUR: Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.–Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT – IV:

GENDER - BASED VIOLENCE: The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights, Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking Out Is Home a Safe Place? –When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for myLife…."

UNIT – V:

GENDER AND CULTURE: Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature Gender Development Issues-Gender Issues- Gender Sensitive Language-Gender and Popular Literature – Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters-Mothers and Fathers- Rosa Parks The Brave Heart.

REFERENCE BOOKS:

1. Towards a World of Equals: A Bilingual Textbook on Gender, A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu published by Telugu Akademi, Telangana Government, 2015.

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

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. (This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film).
3. Students will attain a finer grasp of how gender discrimination works in our society and acquire insight into the gendered division of labour and its relation to politics and economics.
4. Men and women students and professionals will be better equipped to work and live together as equals.
5. Students will develop a sense of appreciation of women in all walks of life by going through accounts of studies and movements as well as the new laws that provide protection and relief to women.

PROBABILITYANDSTATISTICS

Course: B. Tech (CE): IV Semester **L T P C**
Subject Code: A400005 **3 1 0 4**

UNIT – I:

Probability: Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence and the Product Rule, Baye's Rule. Random Variables: Concept of a Random Variable, Discrete and Continuous random Variables.

UNIT – II:

Expectation and discrete distributions: Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem. Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT – III:

Continuous Distributions and Sampling Distributions: Uniform Distribution, Normal Distribution, Area sunder the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distribution.

Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distribution: Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F-Distribution.

UNIT - IV

Estimation & Tests of Hypotheses: Introduction, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate. Two samples: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions.

Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning single mean, Two samples :tests on two means, One sample: test on single proportion. Two samples: tests on two proportions, Two-sample tests concerning variances.

UNIT-V

Curve fitting, Correlation and regression: Curve fitting by the method of least squares, fitting of straight lines, second degree parabolas and more general curves, Correlation and regression, Rank correlation.

TEXT BOOKS:

1. Probability & Statistics For Engineers & Scientists, (9thEdition), Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Pearson Publishers, 2011.
2. Fundamentals of Mathematical statistics, S C Gupta and V K Kapoor Khanna publications.

REFERENCE BOOKS:

1. Fundamentals of Probability and Statistics For Engineers, T .T. Soong, John Wiley & Sons,Ltd,2004.
2. Probability and statistics for Engineers and scientists, (5thEdition), Sheldon M Ross, Academic press, 2014.
3. Probability and Statistics for Engineers, (8th Edition), Miller and Freund's, Pearson Educations, 2015.

CONCRETE TECHNOLOGY

Course: B. Tech (CE): IV Semester **L T P C**
Subject Code: A401306 **3 0 0 3**

UNIT I

Aggregate: Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size, Properties Recycled aggregate.

UNIT - II

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

UNIT – III

Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio – Gain 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.

UNIT - IV

Elasticity, Creep & Shrinkage: Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT – V

Admixtures: Types of admixtures – mineral and chemical admixtures.
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 of mix design.
Special Concretes: Introduction to Light weight concrete – Cellular concrete – No-fines concrete, High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete, Self compacting concrete, Nano silica and Nano Alumina concrete.

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2 nd Edition, Oxford university Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, 5THEdition,New Delhi

REFERENCE BOOKS:

1. Properties of Concrete by A. M. Neville – Low priced Edition – 4th edition
2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, McGraw Hill Publishers

IS Codes:

1. IS 383 : 2016
2. IS 516 : 2018 (Part -1 - 4)
3. IS 10262 - 2019

COURSE OUTCOMES: On completion of the course students will be able to

1. explain properties of cement and aggregate as per IS codes
2. determine the properties of fresh concrete
3. examine hardened concrete properties using various methods
4. Use advanced laboratory techniques to characterize cement-based materials

5. design concrete mix as per standard codes and make use of special concretes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

STRENGTH OF MATERIALS - II

Course: B. Tech (CE): IV Semester **L T P C**
Subject Code: A401307 **2 0 0 2**

UNIT – I

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equation –Assumptions made in the theory of pure torsion – Polar section modulus – Power transmitted by shafts – Combined bending and torsion – Design of shafts according to theories of failure.
Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

UNIT – II

Columns and Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions, derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column, slenderness ratio – Euler's critical stress – Limitations of Euler's theory– Long columns subjected to eccentric loading – Secant formula – Empirical formulae — Rankine – Gordon formula- Straight line formula – Prof. Perry's formula.
Beam Columns: Laterally loaded struts – subjected to uniformly distributed and concentrated loads.

UNIT – III

Direct and Bending Stresses: Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of retaining walls, chimneys and dams – conditions for stability-Overturning and sliding – stresses due to direct loading and bending moment about both axis.

UNIT – IV

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders – Thin spherical shells.
Thick Cylinders: Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae, distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage.

UNIT – V

Unsymmetrical Bending: Introduction, Centroidal principal axes of section, Moments of inertia referred to any set of rectangular axes, Stresses in beams subjected to unsymmetrical bending, Principal axes, Resolution of bending moment into two rectangular axes through the centroid, Location of neutral axis.
Shear Centre: Introduction - Shear center for symmetrical and unsymmetrical (channel, I, T and L) sections.

Textbooks:

1. Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd.
2. Strength of Materials by R.K Rajput, S.Chand& Company Ltd.
3. Strength of Materials by S. Ramamrutham, Oxford University Press.

References:

1. Fundamentals of Solid Mechancis by M.L.Gambhir, PHI Learning Pvt. Ltd
2. Strength of Materials by R.Subramanian, Oxford University Press.

Upon completion of course the students will be able to

1. determine torsion in springs and shafts
2. evaluate crippling load of columns using various end conditions
3. analyze direct and bending stresses of various structures
4. find the stresses and deformations in thick and thin cylinders
5. compute stresses and deflection under unsymmetrical bending and shear centre for various sections

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

HYDRAULICS AND HYDRAULIC MACHINERY

Course: B. Tech (CE): IV Semester **L T P C**
Subject Code: A401308 **3 0 0 3**

UNIT - I

Open Channel Flow-I: Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristicsof uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning'sRoughness Coefficient. Most economical sections. Computation of Uniform flow, Normal depth.
Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

UNIT - II

Open Channel Flow–II: Non-uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles, Computation of water surface profiles by Numerical and Analytical approaches. Direct step method. **Rapidly varied flow:** Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses, Positive and Negative Surges (Theory only).

UNIT - III

Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity, Rayleigh's method andBuckingham's π methods, Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problems. Distorted models. 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.

UNIT - IV

Hydraulic Turbines–I: Elements 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 – Classification, functions and efficiency.
Hydraulic Turbines–II: Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity, Cavitation. Selection of turbines.

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 – NPSH – Cavitation.Reciprocating pumps – Working, discharge, and slip indicator diagrams.

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Pvt. Ltd., 2015
3. Open channel flow by V.T. Chow (McGraw Hill Book Company).

REFERENCE BOOKS:

1. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria& Sons Publications Pvt.Ltd.).
2. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, SumanChakraborthy, McGraw Hill Education (India) Private Limited
3. Hydraulic Machines by Banga& Sharma (Khanna Publishers).

Upon completion of course the students will be able to

1. determine torsion in springs and shafts
2. evaluate crippling load of columns using various end conditions
3. analyze direct and bending stresses of various structures
4. find the stresses and deformations in thick and thin cylinders
5. compute stresses and deflection under unsymmetrical bending and shear centre for various sections

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

STRUCTURAL ANALYSIS – I

Course: B. Tech (CE): IV Semester **L T P C**
Subject Code: A401309 **3 0 0 3**

UNIT – I

Analysis of Perfect Frames: Types of frames- Perfect, Imperfect and Redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT – II

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's theorem-Unit Load Method – Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.
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 and bending moment - Geometrical properties of parabolic and circular arches – Three hinged parabolic circular archeshaving supports at different levels.

UNIT - III

Propped Cantilever and Fixed Beams: Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia - subjected to uniformly distributed load - point loads - uniformly varying load, couple and combination of loads - Shear force, Bending moment diagrams and elastic curve 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 – IV

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 - eeffect of sinking of supports.
Slope Deflection Method: Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports -Determination of static and kinematic indeterminacies for frames-Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method including Side Sway-Shear force and bending moment diagrams and Elastic curve.

UNIT – V

Moving Loads and Influence Lines: Introduction maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load ,uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length, Definition of influence line for shear force and bending moment - load position for maximum shear forceand maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span.

TEXT BOOKS:

1. Structural Analysis Vol –I & II by V.N. Vazirani and M.M. Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G. S. Pandit and S.P. Gupta, Tata McGraw Hill Education Pvt. Ltd.
3. Structural analysis T. S Thandavamoorthy, Oxford university Press

REFERENCE BOOKS:

1. Basic Structural Analysis by K.U. Muthu et al., I.K. International Publishing House Pvt. Ltd
2. Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill Education Pvt. Ltd.
3. Fundamentals of Structural Analysis by M.L. Gamhir, PHI Learning Pvt. Ltd

Upon completion of course the students will be able to

1. evaluate degree of indeterminacy and forces in the frames
2. apply the energy theorems for trusses and analyze three hinged arches
3. analyze the propped cantilever and fixed beam under various load combination
4. analyze continuous beams by slope deflection method
5. sketch the influence line diagrams for moving loads

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

CONCRETE TECHNOLOGY LABORATORY

Course: B. Tech (CE): IV Semester **L T P C**
Subject Code: A401505 **0 0 2 1**

List of Experiments

1. Tests on Cement:

a) Soundness.
b) Compressive strength.

2. Tests on Aggregates:

a) Specific gravity of fine aggregate.
b) Specific gravity of coarse aggregate.
c) Bulking of fine aggregate.
d) Grading of fine aggregate

3. IS method of mix design of normal concrete as per IS : 10262

4. Tests on Fresh Concrete:

a) Slump cone test.
b) Compacting factor test.
c) Vee-Bee consistometer test.

5. Tests on Hardened Concrete:

a) Compressive & Tensile strength tests.
b) Modulus of elasticity of concrete.
c) Non-destructive testing of concrete

Upon completion of course the students will be able to

assess the properties of cement

1. analyze properties of aggregates
2. examine the properties of fresh concrete
3. determine the strength of hardened concrete
4. conduct non-destructive tests on concrete elements

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

FLUID MECHANICS AND HYDRAULICS MACHINERY LABORATORY

Course: B. Tech (CE): IV Semester **L T P C**
Subject Code: A401506 **0 0 2 1**

List of Experiments

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipe line
7. Determination of Energy loss in Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton wheel turbine
11. Performance Characteristics of Francis turbine
12. Performance characteristics of Keplan Turbine
13. Performance Characteristics of a single stage / multi stage Centrifugal Pump
14. Study of Water Hammer due to sudden closure of valve

Course Outcomes: Upon completion of course the students will be able to

1. determine the coefficient of discharge for venture meter, orifice meter and small orifice meter
2. perform the various notches and assess the losses in pipes
3. verify the Bernoulli's equation and study the flow in open channel
4. analyze the performance of pumps, various turbines and effect of water hammer
5. calculate impact of force of Jet on different types of Vanes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

ENVIRONMENTAL SCIENCES

Course: B. Tech (CE): IV Semester **L T P C**
Subject Code: A400701 **2 0 0 0**

UNIT-I

Environmental Studies: Introduction, Definition, scope and importance, Ecosystems: Introduction, types, characteristic features, structure and functions of ecosystems, Bio-geo chemical cycle, Classification of Eco system.

UNIT-II

Natural Resources: Classification of Resources, Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer – pesticide problems, Forest resources, Use and over-exploitation. Mining and dams – their effects on forest and tribal people, Water resources, Use and over- utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Dams –benefits and costs, Conflicts over Water, Energy resources.

UNIT-III

Bio-diversity and its conservation, Value of bio-diversity-consumptive and productive use, social, ethical, aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity– In-situ and Ex-situ conservation.

UNIT-IV

Environmental Pollution–Local and Global Issues, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion, Environmental case studies.

UNIT-V

Environmental Problems in India, Drinking water, sanitation and public health, Effects of the activities on the quality of environment, Water scarcity and groundwater depletion, Controversies on major dams – resettlement and rehabilitation of people: problems and concerns, Rain water harvesting, cloud seeding and watershed management. Economy and Environment, The economy and environment interaction, Economics of development, preservation and conservation, Sustainability: theory and practices, Limits to growth, Equitable use of resources for sustainable life styles, Environmental Impact Assessment.

Text Books

1. Environmental Science (1st edition), Y.Anjaneyulu, B S Publications.
2. Environmental studies (1st edition), Deekshadave, Cengage learning India Pvt. Ltd.

Reference books

1. Environmental sciences and Engineering (1st edition), P. VenugopalRao, PHI learning Pvt. Ltd.,
2. Environmental Science and Technology (1st edition), M. Anji Reddy, B S Publications.
3. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
4. Environmental Encyclopedia (Cunningham, W.P., et al., Jaico Publishing House, Mumbai, 2003.

Course Outcomes: Upon completion of course the students will be able to

1. Acquire the knowledge on environmental science
2. Acquire the knowledge of various natural resources
3. Understand the importance of conservation and preserve the biodiversity
4. Understand the hazardous effects of environmental pollution
5. Develop skills in understanding various environmental problems

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	-	-	-	3	-	-	-	-	1
CO2	-	-	2	-	-	-	3	-	-	-	-	1
CO3	-	-	2	-	-	-	3	-	-	-	-	1
CO4	-	-	2	-	-	-	3	-	-	-	-	1
CO5	-	-	2	-	-	-	3	-	-	-	-	1