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.

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 studentis deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

For CSE/IT and allied branches the Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts i) Part – A for 20 marks, ii) Part – B for 20 marks with a total duration of 2 hours.

Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks.

Part B: Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce/PPT/Poster Presentation/ Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

For all other branches, the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

a) **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.**

b) **10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.**

c) **Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 15 marks.**

d) **The remaining 15 marks are for Laboratory Report/Project and Presentation, 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.**

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. Studentsshall register for this immediately after II-Year II Semester Examinations and pursue itduring 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 can re-register for 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.

They may seek re-registration for all those subjects registered in that semester in which the student is failed. The student has to re-appear for CIE and SEE as and when offered.

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork in next academic year. His Continuous Internal Evaluation marks for 40 obtained in the previous attempt stand cancelled. The student has to obtain fresh set of marks for 40 allotted for CIE (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). Head of the Dept. will take care of this.

8.12 For mandatory courses, a student has to secure 40 marks out of 100 marks (i.e. 40% of the 100 marks allotted) in the Continuous Internal Evaluation for passing the subject/course.

8.13 No marks or letter grades shall be allotted for mandatory/non-credit courses. Only Pass/Fail shall be indicated in Grade Card.

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

$$\textbf{SGPA} = \{ \textstyle\sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \}$$ **…. 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

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

(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.

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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.**

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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

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B. Tech- Civil Engineering
CBCS & OUTCOME BASED COURSE STRUCTURE & SYLLABUS

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	A400008	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	HSMC	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 and 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 Laboratory	PCC	0	0	2	1	40	60
7	A401506	Fluid Mechanics and Hydraulics Machinery Laboratory	PCC	0	0	2	1	40	60
8	A400507	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			**27**					
	Total Credits in II Year: 40								

SEMESTER - V								
Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
			L	T	P		CIE	SEE
A401310	Structural Engineering -I (RCC)	PCC	3	0	0	3	40	60
A401311	Geotechnical Engineering	PCC	3	0	0	3	40	60
A401312	Transportation Engineering	PCC	3	0	0	3	40	60
A4014XX	Professional Elective - I	PEC	3	0	0	3	40	60
A401313	Hydrology and Water Resources Engineering	PCC	3	0	0	3	40	60
A401314	Structural Analysis - II	PCC	2	0	0	2	40	60
A401507	Geotechnical Engineering Laboratory	PCC	0	0	2	1	40	60
A401508	Transportation Engineering Laboratory	PCC	0	0	2	1	40	60
A400504	Advanced English Communication Skills	HSMC	0	0	2	1	40	60
A400705	Intellectual Property Rights	MC	3	0	0	0		
Total:			**20**	**0**	**6**	**20**		
Total hours per Week:			**26**					

SEMESTER - VI								
Course Code	Course Title	Category	Hours per Week			Cred :	Maximum Marks	
			L	T	P		CIE	SEE
A401315	Structural Engineering -II (Steel Structures)	PCC	3	0	0	3	40	60
A401316	Environmental Engineering	PCC	3	0	0	3	40	60
A401317	Foundation Engineering	PCC	3	0	0	3	40	60
A401318	Pavement Analysis and Design	PCC	3	0	0	3	40	60
A401XXX	Professional Elective - II	PEC	3	0	0	3	40	60
A401509	Environmental Engineering Laboratory	PCC	0	0	2	1	40	60
A401510	Computer Aided Design Laboratory	PCC	0	0	2	1	40	60
A401511	Civil Engineering Software Laboratory	PCC	0	0	2	1	40	60
A401802	Industrial Oriented Mini Project / Internship	PROJ	0	0	4	2	-	100
Total:			**15**	**0**	**10**	**20**		
Total hours per Week			**25**					
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	Quantity Survey & Valuation	PCC	2	0	0	2	40	60
A4XX407	Professional Elective - III	PEC	3	0	0	3	40	60
A401XXX	Professional Elective – IV	PEC	3	0	0	3	40	60
A401XXX	Professional Elective - V	PEC	3	0	0	3	40	60
A400102	Business Economics and Financial Analysis	HSMC	3	0	0	3	40	60
A4XX604	Open Elective - I	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
A4XX604	Open Elective - II	OEC	3	0	0	3	40	60
A4XX607	Open Elective - III	OEC	3	0	0	3	40	60
A4XX601	Professional Elective - VI	OEC	3	0	0	3	40	60
A401804	Project Stage –II	PROJ	0	0	18	9	40	60
A401805	Technical Seminar	PROJ	0	0	4	2	-	100
Total:			**9**	**0**	**22**	**20**		
Total hours per Week			**31**					
Total Credits in IV Year: 40								

List of Professional Electives

Professional Elective-I		
S.No.	**CourseCode**	**CourseName**
1	A401401	Airports, Railways and Waterways
2	A401402	Smart Cities Planning and Management
3	A401403	Computer Applications In Civil Engineering
Professional Elective-II		
1	A401404	Elements of Earthquake Engineering
2	A401405	Prestressed Concrete
3	A401406	Advanced Structural Analysis
Professional Elective-III		
1	A401407	Ground Improvement Techniques
2	A401408	Earth Retaining Structures
3	A401409	Stability Analysis of Slopes
Professional Elective-IV		
1	A401410	Design of Hydraulic Structures
2	A401411	Advanced Water Resources Engineering
3	A401412	Ground Water Hydrology
Professional Elective-V		
1	A401413	Solid Waste Management
2	A401414	Green Building Technologies
3	A401415	Watershed Management
Professional Elective-VI		
1	A401416	Pavement Asset Management
2	A401417	Project Management
3	A401418	Rehabilitation and Retrofitting of Structures

List of Open Electives

Open Elective-I		
S. No.	**Course Code**	**Course Name**
1	A404601	Fundamentals of Internet of Things
2	A404602	Principles of Digital Signal Processing
3	A402601	Renewable Energy Sources
4	A402602	Basics of Power Electronics & Drives
5	A405604	Java Programming
6	A405602	Fundamentals of Operating Systems
7	A403601	Fundamentals of Engineering Materials
8	A403602	Basics of Thermodynamics
9	A400601	Basics of Logistics and Supply Chain Management
10	A400602	Industrial Relations
11	A401601	Disaster Preparedness & Planning Management
12	A401602	Environmental Impact Assessment
Open Elective -II		
1	A404603	Sensors and Transducers
2	A404604	Image Processing
3	A402603	Electrical Vehicle Technology
4	A402604	Basics of Power Plant Engineering
5	A405601	Fundamentals of Database management Systems
6	A405605	Web programming
7	A403603	Fundamentals of Manufacturing Processes
8	A403604	Fundamentals of Automobile Engineering
9	A400603	Entrepreneurship
10	A400604	Ethics in Business & Corporate Governance
11	A401603	Remote Sensing & Geo-graphical Information Systems
12	A401604	Solid Waste Management
OpenElective-III		
1	A404605	Fundamentals of Embedded Systems
2	A404606	Data Communications
3	A402605	Nanotechnology
4	A402606	EV Batteries & Charging System
5	A405603	Fundamentals of Computer networks
6	A405606	Fundamentals of Devops
7	A403605	Industrial Safety Engineering
8	A403606	Waste to Energy
9	A400605	Basics of Marketing
10	A405607	Cloud Computing
11	A401605	Energy Efficient Buildings
12	A401606	Environmental Pollution

(A400101) ENGLISH FOR SKILL ENHANCEMENT
(Common to all branches)

B.Tech (CE) I Semester

L	T	P	C
2	0	0	2

UNIT - I

Chapter entitled 'Toasted English' by R.K.Narayan from "English: Language, Contextand Culture" published by Orient BlackSwan, 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 ofProper Punctuation- Techniques for writing precisely – Paragraph Writing – Types, Structuresand Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs inDocuments.

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 andSubject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning

UNIT – III

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

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

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

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

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter ofRequisition, 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 BlackSwan, 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 Introductionand Conclusion -Précis Writing

UNIT - V

Grammar: Common Errors in English (Covering all the other aspects of grammar which werenot covered in the previous units)

Reading: Writing: Reading Comprehension-Exercises forPractice 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 FirstYear is Open-ended, besides following the prescribed textbook, it is required to prepareteaching/learning materials by the teachers collectively in the form of handouts based on theneeds 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 flexibleto 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 BlackSwan 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, (2ndedition) 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: 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

(A400001) MATRICES AND CALCULUS
(Common to All branches)

B. Tech (CE) I Semester

L	T	P	C
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 (onlyCartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and(Cartesianto Spherical and Cylindricalpolarcoordinates)fortripleintegrals.

TEXT BOOKS:

1. Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics, (5th Edition), 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 textbook 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. Evaluatethemultipleintegralsandapplytheconcept tofindareas, volumes.

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

(A400008) APPLIED PHYSICS
(Common to all branches)

B. Tech (CE) I Semester

L	T	P	C
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: Introductionto 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.

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**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**1**	**-**	**2**
CO3	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**1**	**-**	**2**
CO4	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**
CO5	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**-**	**1**	**-**	**2**

(A401501) ELEMENTS OF CIVIL ENGINEERING

B. Tech (CE) I Semester

L	T	P	C
0	0	2	1

Pre-requisites: Nil

ListofExperiments:

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 Fine Aggregates**
   a. Specific Gravity test.
   b. Fineness modulus of Coarse aggregate

TEXT BOOKS:

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

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

1. Identifymineralsbasedon geological classifications
2. Identifytherocks basedon geological classifications
3. Identify topographicalfeaturesfromGeologicalmaps
4. Assess the properties of cement
5. Analyze properties of coarse and fine aggregates

CO-PO MAPPING:

	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

(A403201) ENGINEERING MECHANICS
(Common to Mechanical & Civil)

B. Tech (CE) I Semester

L	T	P	C
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 ofgravity 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.

CO-PO MAPPING:

	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

(A400503) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

(Common to all branches)

B. Tech (CE) I Semester

L	T	P	C
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 CommunicationPresentation 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)byShobha, 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.

CO-PO MAPPING:

	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

(A400501) APPLIED PHYSICS LABORATORY

(Common to all branches)

B. Tech (CE) I Semester

L	T	P	C
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.

CO-PO MAPPING:

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

(A403503) ENGINEERING WORKSHOP
(Common to Mechanical & Civil)

B. Tech (CE) I Semester

L	T	P	C
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.

CO-PO MAPPING:

	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

(A400505) INTRODUCTION TO SOCIAL INNOVATION

(Common to all branches)

B. Tech (CE) I Semester

L	T	P	C
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. 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)

REFERENCE BOOKS:

1. Fundamentals of Intellectual Property (English) 1st Edition (Paperback, Dr. Kalyan C. Kankanala) Publisher: Asia Law House ISBN: 9789381849514, 938184951X Edition: 1st Edition, 2012.
2. Indian Patent Law (English, Paperback, Kalyan C. Kankanala) Publisher: Oxford University Press-New Delhi, ISBN: 9780198089605, 0198089600 Edition: 2012.
3. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; Palgrave Macmillan
4. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.
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

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.

CO-PO MAPPING:

	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	-	-

(A400704) UNIVERSAL HUMAN VALUES

(Mandatory Course-Common to all branches)

B. Tech (CE) I Year I Semester

L	T	P	C
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:
- Ability to utilize the professional competence for augmenting universal human order
- Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,
- 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.

CO-PO MAPPING:

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

(A400009) ENGINEERING CHEMISTRY

(Common to all branches)

B. Tech (CE) II Semester

L	T	P	C
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.

CO-PO MAPPING:

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

(A400002) ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to all branches)

B. Tech (CE) II Semester

L	T	P	C
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. Advanced Engineering Mathematics, (5thEdition), R. K. Jainand S.R.K. Iyengar, Narosa Publications,2016.

REFERENCE BOOKS:

1. AdvancedEngineeringMathematics, (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, (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.

CO-PO MAPPING:

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

(A401301) BUILDING MATERIALS, CONSTRUCTION AND PLANNING

B. Tech (CE) II Semester

L	T	P	C
3	0	0	3

Pre-Requisite : 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, byelaws and regulations, Selection of site for building construction, Principles of planning, Orientation of building and its relationto outside environment.

TEXTBOOKS:

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.

CO-PO MAPPING:

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

(A405202) C PROGRAMMING & DATA STRUCTURES
(Common to ECE, EEE, Mechanical and Civil)

B. Tech (CE) II Semester

L	T	P	C
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, ArithmeticOperators, RelationalOperators, LogicalOperators, 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 goto 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.

CO-PO MAPPING:

	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	-	-	-	-	-	-	-	-	-

(A403202) ENGINEERING GRAPHICS
(Common to Mechanical and Civil)

B. Tech (CE) II Semester

L	T	P	C
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

CO-PO MAPPING:

	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

(A400502) ENGINEERING CHEMISTRY LABORATORY

(Common to all Branches)

B. Tech (CE) II Semester

L	T	P	C
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

CO-PO MAPPING:

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

(A405503) C PROGRAMMING & DATA STRUCTURES LABORATORY
(Common to ECE, EEE, Mechanical and Civil)

B. Tech (CE) II Semester

L	T	P	C
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

CO-PO MAPPING:

	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

(A400506) ENGINEERING EXPLORATION & PRACTICE

(Common to all branches)

B. Tech (CE) II Semester

L	T	P	C
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 (MindTap Course List) 5th Edition by Saeed Moaveni
2. Concepts in Engineering Design – 2016; by Sumesh Krishnan (Author), Dr.Mukul Shukla (Author), Publisher, Notion Press.

REFERENCE BOOKS:

1. A Ghosh and AK Malik: Theory of Mechanism and Machine; East West Press (Pvt) Ltd., New Delhi.
2. Arduino Cookbook, 2nd Edition by Michael Margolis: O'Reilly Media
3. Introduction to autocad®2017-2D and 3D design by Bernd S. Palm and Alf Yarwood, Routledge (Taylor and Francis group)
4. Software Project Management (SIE), (Fifth Edition); Bob Hughes,MikeCotterell,Rajib Mall; Published by Tata McGraw-Hill Education Pvt. Ltd (2011) ; ISBN 10: 0071072748 ISBN 13: 9780071072748

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

CO-PO MAPPING:

	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	-

(A400703) CONSTITUTION OF INDIA
(Common to all branches)

B. Tech (CE) II Semester

L	T	P	C
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 ZillaPanchayat: 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.

CO-PO MAPPING:

	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

(A401302) STRENGTH OF MATERIALS - I

B. Tech (CE) III Semester

L	T	P	C
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

CO-PO MAPPING:

	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

(A401303) ENGINEERING GEOLOGY

B. Tech (CE) III Semester

L	T	P	C
2	0	0	2

UNIT - I

Introduction: Importance of geology from Civil Engineering point of view. Brief study of case historiesof failure of some Civil Engineering constructions due to geological draw backs. Importance of Physicalgeology, Petrology and Structural geology.

Weathering of Rocks: Its effect over the properties of rocks importance of weathering with referenceto 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 withthe rocks such as folds, faults unconformities, and joints - their important types and case studies. Theirimportance In-situ and drift soils, common types of soils, their origin and occurrence in India, Stabilizationof 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 EnvironmentalGeology.

UNIT - V

Geology of Dams, Reservoirs, and Tunnels: Types of dams and bearing of Geology of site in theirselection, 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 andlife 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 intunnels.

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

CO-PO MAPPING:

	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

(A401304) SURVEYING

B. Tech (CE) III Semester

L	T	P	C
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.

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

CO-PO MAPPING:

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

(A401305) FLUID MECHANICS

B. Tech (CE) III Semester

L	T	P	C
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 elasticity, compressibility.

Fluid Statics: Fluid Pressure: Pressure at a point, Pascal's 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, applications of 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, SumanChakraborthy, 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&DomkundwarDhanpatRai&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

CO-PO MAPPING:

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

(A402204) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

B. Tech (CE) III Semester

L	T	P	C
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.

CO-PO MAPPING:

	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

(A405506) PYTHON PROGRAMMING LABORATORY

B. Tech (CE) III Semester

L	T	P	C
0	1	2	2

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 $4/3\ \pi r^3$. 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

CO1: Design solutions to computational problems using Python programming language constructs.
CO2: Write python programs to manipulate string objects.
CO3: Use appropriate Data structures to organize and manipulate data items.
CO4: Design modular application using python module & package concepts.
CO5: Develop application to read and write from various file formats.

CO-PO MAPPING:

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

(A401502) SURVEYING LABORATORY

B. Tech (CE) III Semester

L	T	P	C
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

CO-PO MAPPING:

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

(A401503) STRENGTH OF MATERIALS LABORATORY

B. Tech (CE) III Semester

L	T	P	C
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

CO-PO MAPPING:

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

(A402504) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

B. Tech (CE) III Semester

L	T	P	C
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. Half Wave Rectifier with & without filters

COURSE OUTCOMES: On completion of the course 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.

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.

CO-PO MAPPING:

	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

(A401504) COMPUTER AIDED DRAFTING LABORATORY

B. Tech (CE) III Semester

L	T	P	C
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.

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

1. make use of basic Auto CAD commands for drafting
2. prepare the plans for single and multistoried buildings
3. develop sections and elevations for various buildings
4. draw the detailing of building components
5. construct the building drawing as per standards in various phases of a project

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.

REFERENCE BOOKS:

1. Civil Engineering Drawing-I by N. Sreenivasulu, S. Rama Rao – Radiant Publishing House.
2. Civil Engineering Drawing-II by N. Sreenivasulu – Radiant Publishing House.
3. Engineering Graphics by P. J. Sha - S. Chand & Co
4. Civil Engineering Drawing-I by S. MahaboobBasha – Falcon Publishers
5. Building drawing by M. G. Shah - Tata McGraw-Hill Education
6. Structural Engineering Drawing by S. MahaboobBasha – Falcon Publisher

CO-PO MAPPING:

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

(A400702) GENDER SENSITIZATION

B. Tech (CE) III Semester

L	T	P	C
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.–GenderDevelopment Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender andMainstreaming

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 EverydayHarassment- Further Reading: "Chupulu". Domestic Violence: SpeakingOutIs 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 LiteratureGender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature – JustRelationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters-Mothers and Fathers- Rosa ParksThe Brave Heart.

REFERENCE BOOKS:

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

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

1. develope a better understanding of important issues related to gender in contemporary India.
2. sensitize to basic dimensions of the biological, sociological, psychological and legalaspects of gender. (This will be achieved through discussion of materials derived from research, facts,everyday life, literature and film).
3. 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. 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.

CO-PO MAPPING:

	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

(A400005) PROBABILITY AND STATISTICS

B. Tech (CE) IV Semester

L	T	P	C
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 ProbabilityandStatisticsForEngineers, T.T. Soong, JohnWiley&Sons, Ltd,2004.
2. ProbabilityandstatisticsforEngineersandscientists, (5thEdition), Sheldon M Ross, Academicpress, 2014.
3. ProbabilityandStatisticsforEngineers, (8th Edition), MillerandFreund's, PearsonEducations, 2015.

COURSE OUTCOMES: After learning the contents of this course, the student must be able to

1. Apply the concepts of Probability and Random Variables to case studies.
2. Formulate and solve problems involving Random Variables and apply statistical methods for analyzing experimental data.
3. Apply concepts of estimation and testing of hypothesis to case studies.
4. Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
5. Taylor's and Laurent's series expansions of complex function.

CO-PO MAPPING:

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

(A401306) CONCRETE TECHNOLOGY

B. Tech (CE) IV Semester

L	T	P	C
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, coarse Aggregates and 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 re-vibration 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, 5th Edition,New Delhi

REFERENCE BOOKS:

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

IS Codes:

1. IS 383: 2016 Coarse and Fine Aggregate for Concrete
2. IS 516 : 2018 (Part -1 - 4) Hardened Concrete
3. IS 10262 – 2019 Concrete mix proportioning- Guide lines

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

CO-PO MAPPING:

	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	-	1	-	-	-	3	-	-	-	3
CO4	3	3	-	2	-	-	-	3	-	-	-	3
CO5	3	3	2	-	-	-	-	3	-	-	-	3

(A401307) STRENGTH OF MATERIALS - II

B. Tech (CE) IV Semester

L	T	P	C
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 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
4. Strength of Materials by S. Ramamrutham, Oxford University Press.

References:

1. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
2. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.
3. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Presss

Course Outcome: 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

CO-PO MAPPING:

	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

(A401308) HYDRAULICS AND HYDRAULIC MACHINERY

B. Tech (CE) IV Semester

L	T	P	C
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).

Course Outcome: 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

CO-PO MAPPING:

	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

(A401309) STRUCTURAL ANALYSIS – I

B. Tech (CE) IV Semester

L	T	P	C
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 - effect 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

Course Outcome: 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

CO-PO MAPPING:

	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

(A401505) CONCRETE TECHNOLOGY LABORATORY

B. Tech (CE) IV Semester

L	T	P	C
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

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

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

1. Assess the properties of cement
2. Analyze properties of aggregates
3. Examine the properties of fresh concrete
4. Determine the strength of hardened concrete
5. Conduct non-destructive tests on concrete elements

CO-PO MAPPING:

	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

(A401506) FLUID MECHANICS AND HYDRAULICS MACHINERY LABORATORY

B. Tech (CE) IV Semester

L	T	P	C
0	0	2	1

List of Experiments

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

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.

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. Calculate impact of force of Jet on different types of Vanes.
5. Analyze the performance of pumps, various turbines and effect of water hammer.

CO-PO MAPPING:

	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

(A400505) SOCIAL INNOVATION IN PRACTICE

B. Tech (CE) IV Semester

L	T	P	C
0	0	2	1

Week-1 : Identify community issues to be addressed, Requirements Analysis: Extensive User requirements analysis

Week-2 : Generating effective System Requirement document

Week-3 : Social Innovation – Case Studies

Week-4 : Impact of Social Innovation on communities

Week-5 : Process of Social Innovation Prompts – identifying needs,Proposals –generating ideas,Prototyping – testing the ideain practice,

Week-6 : Sustaining-developing a business model, Scaling and diffusion-growing social innovations, Systematic change

Week-7: Introduction to sustainability, Sustainability leadership, Life cycle assessment

Week-8: Carbon footprint Calculation

Week-9: Types of Start-Ups, Types of business models, Market risksand Marketing strategies

Week-10: Verification of Business Model and Validation

Week-11: Business Model Development

Week-12: Documentation and Panel presentation

TEXTBOOKS:

1. Requirements Analysis: From Business Views to Architecture; David C. Hay; Prentice Hall Professional
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; Palgrave Macmillan

REFERENCE BOOKS:

1. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean
2. Introduction to Sustainability by Robert Brinkmann, Wiley-Blackwell

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

1. Identify several social issues to be addressed
2. Analyze the impact of social innovations on the society
3. Illustrate the process of social innovation for a community problem
4. Demonstrate the solution from sustainability perspectives.
5. Develop a scalable business model.

CO-PO MAPPING:

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

(A401801) REAL-TIME RESEARCH PROJECT/ FIELD BASED PROJECT

B. Tech (CE) IV Semester

L	T	P	C
0	0	4	2

(A400701) ENVIRONMENTAL SCIENCE

B. Tech (CE) IV Semester

L	T	P	C
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

CO-PO MAPPING:

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

(A401310) STRUCTURAL ENGINEERING -I (RCC)

B. Tech (CE) V Semester

L	T	P	C
3	0	0	3

UNIT - I

Introduction- Structure - Components of structure - Different types of structures - Equilibrium and compatibility– Safety and Stability - Loads – Different types of Loads – Dead Load, Live Load, Earthquake Load and Wind Load– Forces – What is meant by Design? – Different types of materials – RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method – Load combinations as per Limit state method Materials - Characteristic Values – Partial safety factors – Behaviour and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 - 2000.Limit state Analysis and design of sections in Flexure – Behaviour of RC section under flexure -Rectangular, T and L-sections, singly reinforced and doubly reinforced Beams – Detailing ofreinforcement.

UNIT – II

Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear usinglimit state concept – Design for Bond –Anchorage and Development length of bars - Design of sectionsfor torsion - Detailing of reinforcement.

UNIT - III

Design of Slabs: design of one-way, design of two-way slabs with different end conditions and continuous slab Using ISCoefficients– Limit state design for serviceability for deflection,cracking and codal provisions.

UNIT – IV

Design of compression members - Short Column - Columns with axial loads, uni-axial and bi-axialbending – Use of design charts- long column – Design of long columns - I S Code provisions.

UNIT – V

Design of foundation - Different types of footings –Design of flat isolated square,rectangular and combined footings for two columns.

TEXT BOOKS:

1. Limit state designed of reinforced concrete – P.C. Varghese, PHI Learning Pvt. Ltd.
2. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill.
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers.

REFERENCE BOOKS:

1. Reinforced concrete structures, Vol. 1, by B.C. Punmia, Ashok Kumar Jain and Arun KumarJain, Laxmi, publications Pvt. Ltd.
2. Fundamentals of Reinforced concrete design by M. L. Gambhir, Prentice Hall of India Pvt.Ltd.,
3. Design of Reinforced Concrete Structures by N. Subramanian, Oxford University Press
4. Design of Reinforced Concrete Foundations – P.C. Varghese Prentice Hall of India

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

1. Explain the various design concepts of RC structures
2. Design RC beams using limit state method
3. Design various types of RC slabs
4. Design various RC Columns based on loading conditions
5. Design various RC footings and stair cases

CO-PO Mapping:

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

(A401311) GEOTECHNICAL ENGINEERING

B. Tech (CE) V Semester

L	T	P	C
3	0	0	3

UNIT - I

Introduction: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity-Field density by core cutter and sand replacement methods-Relative density. **Index Properties of Soils:** Grain size analysis – consistency limits and indices – I.S. Classification of soils.

UNIT –II

Permeability: Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils.
Effective Stress & Seepage Through Soils: Total, neutral and effective stress – principle of effective stress - quicksand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT –III

Stress Distribution in Soils: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.
Compaction: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

UNIT – IV

Consolidation: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre-consolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

UNIT - V

Shear Strength of Soils: Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International PvtLtd,
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
3. Foundation Engineering by P.C. Varghese, PHI

Reference Books:

1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
2. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.
3. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K-Tata McGraw-Hill Publishers Delhi

5. Soil Mechanics and Foundation by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi.

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

1. Explain engineering properties of soil and their applications
2. Describe permeability and seepage of soils
3. Analyze various theories of stress distribution and compaction mechanism in soils
4. Determine consolidation characteristics of soils
5. Estimate the shear strength of soils under different drainage conditions

CO-PO MAPPING:

	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	-	2	-	-	-	-	-	3
CO4	3	3	-	3	-	2	-	-	-	-	-	3
CO5	3	3	-	3	-	2	-	-	-	-	-	3

(A401312) TRANSPORTATION ENGINEERING

B. Tech (CE) V Semester

L	T	P	C
3	0	0	3

UNIT - I

Introduction: History and Importance of Highways, Characteristics of road transport, Current roaddevelopment plans in India, Highway development in India, Highway planning, Highway alignment,Engineering surveys for Highway alignment, Highway projects, Highway drawings and reports, DetailedProject Report preparation, PPP schemes of Highway Development in India, Government of Indiainitiatives in developing the highways and expressways in improving the mobility and village roaddevelopment in improving the accessibility.

UNIT - II

Introduction to Highway Geometric Design: Width of Pavement, Formation and Land, Cross Slopesetc., Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances:Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontalalignment: Design of horizontal curves, super elevation, extra widening of pavement at curves; VerticalAlignment: Gradients, Compensation in Gradient, Design of summit curves and valley curves usingdifferent criteria; Integration of Horizontal and Vertical Curves

UNIT - III

Basic Traffic Characteristics: Speed, volume and concentration, relationship between flow, speedand concentration; Highway capacity and Level of service (LOS) concepts: Factors affecting capacityand LOS, relationship between V/C ratio and LOS; Traffic volume and spot speed studies: Methods;Road Safety; Traffic Signals: Types, warrants for signalization, design of isolated traffic signal by IRCmethod; Parking and road accidents: Types of parking facilities – on-street and off street, introductionto parking studies; Accident studies, road safety auditing; Introduction to street lighting; RoadIntersections: Design considerations of at-grade intersections, introduction to interchanges

UNIT - IV

Tests on Soils: CBR, Field CBR, modulus of sub-grade reaction, Tests on Aggregates: specific gravity,shape (flakiness and elongation indices), angularity number, water absorption, impact, abrasion,attrition, crushing resistance, durability (weathering resistance), stone polishing value of aggregates;Tests on bitumen: spot, penetration, softening point, viscosity, ductility, elastic recovery, flash and firepoints, Introduction to modified bituminous binders like crumb rubber modified, natural rubber modifiedand polymer modified bitumen binders; Bituminous Concrete: Critical parameters controlling bituminousconcrete mixture design, aggregate blending concepts viz. Rothfuch's method, trial and errorprocedure. Introduction to advanced concretes for road applications.

UNIT -V

Introduction to Pavement Design: Types of pavements and their typical cross sections: flexible, rigidand composite; Flexible Pavement analysis and design: Introduction to multi layered analysis, IRC 37-2012 method of flexible pavement design; Rigid pavement analysis and design: Factors controlling rigidpavement design, types of stresses in rigid pavements, critical load positions, load stresses andtemperature stresses in interior, corner and edge locations of jointed plain cement concrete pavementslabs, IRC 58-2015 method of rigid pavement design; Overlay Designs: Types of overlays on flexibleand rigid pavements.

Text Books:

1. Khanna, S.K, Justo, A and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros.Revised Tenth Edition, 2014

2. KadiyaliL.R. and Lal N B, Principles and Practices of Highway Engineering; Seventh Edition,First Reprint; Khanna Publishers, New Delhi, 2018

Code of Provisions:

Design Codes: IRC 37-2012, IRC 58-2015, IRC 81-1997

Reference Books:

1. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition,Third Impression; Pearson Education, 2018.
2. Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, Third Edition, 1st Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi 2017.
3. Subhash C Saxena, Text Book of Highway and Traffic Engineering; First Edition; CBSPublishers and Distributors. New Delhi, 2014
4. C Venkatramaih, Transportation Engineering Volume 1 – Highway Engineering, 1st EditionUniversities Press, 2016

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

1. Develop the plan and alignment of highway networks
2. Design highway geometrics
3. Apply the traffic rules & regulations for free flow of traffic
4. Find various properties of soil.
5. Select the suitable materials for construction and maintenance of highways

CO-PO MAPPING:

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

(A401401) AIRPORTS, RAILWAYS AND WATERWAYS
(Professional Elective – I)

B. Tech (CE) V Semester

L	T	P	C
3	0	0	3

UNIT – I

Introduction to Railways: Role of Indian Railways in national development – Railways for UrbanTransportation – LRT, Mono Rail, Metro Rail &MRTS. Permanent Way: Components and their Functions: Rails- Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers –Functions, Materials, Density – Ballast, Functions, Materials, Ballast less Tracks, Subgrade andEmbankments –Functions and Materials.

UNIT – II

Geometric Design of Railway Track: Gradients and Grade Compensation, Super-Elevation, Wideningof Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

UNIT – III

Track maintenance and Operation: Points and Crossings - Turnouts, Stations and Yards – LevelCrossings. Signalling and Interlocking - Track Circuiting - Track Maintenance.

UNIT - IV

Airport Engineering: Introduction to Air Transportation - Aircraft Characteristics - Factors AffectingSelection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of RunwayLength, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram

UNIT - V

Dock & Harbour Engineering: Water Transportation: Ports and Harbours - Types of watertransportation, water transportation in India, Ports and harbours: requirements, classification. Harbourworks: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lockgates: materials, size, Dredging: classification, dredgers, uses of dredged materials.

Text Books:

1. Venkataramaiah C (2016), "Transportation Engineering Vol II – Railways, Airports, Docks,
2. Harbors, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad
3. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017

Reference Books:

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers andDistributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, CharotarPublishingHouse Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning& Design of Airports, McGraw-Hill Professional.
5. Transportation Engineering by R. Srinivasa Kumar, University Press India.

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

1. Identify components of railway track.
2. Design super elevation and transition curve for railway horizontal curves.
3. Identify various crossings turnout and signals in railway projects and its maintenance.
4. Design of runways and taxiways.
5. Plan the harbours and ports projects including the infrastructure required for new ports and harbours.

CO-PO Mapping:

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

(A401402) SMART CITIES PLANNING AND MANAGEMENT
(Professional Elective – I)

B. Tech (CE) V Semester

L	T	P	C
3	0	0	3

UNIT - I

Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to CityPlanning - Understanding Smart Cities - Dimensions of Smart Cities - Global Experience of Smart CitiesSmart Cities – Global Standards and Performance Benchmarks, Practice Codes -Indian scenario – India "100 Smart Cities" Policy and Mission.

UNIT – II

Smart Cities Planning and Development: Introduction to Smart Community – Smartcommunity concepts: Concept of Smart Community - Smart Transportation - Smart Building and HomeDevice - Smart Health - Smart Government - Smart Energy and Water – Cyber Security, Safety, andPrivacy - Internet of Things, Block chain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT – III

Smart Urban Energy Systems – I: Conventional vs. Smart, City components, Energydemand, Green approach to meet Energy demand, Index of Indian cities towards smartness – astatistical analysis -Meeting energy demand through direct and indirect solar resources - Efficiency ofindirect solar resources and its utility, Capacity limit for the indirect solar resources - Effectiveness inresponsive environment in smart city; Smart communication using green resources.

UNIT – IV

Smart Urban Energy Systems - II: Introduction to PV technology - PV of various scale forsmart city applications - Energy efficiency - Policies of Solar PV in smart domains (RPO, REC, Carbon credit, etc.) Definition - Structure of Smart Grid - Indian Perspective - Advantage & limitation - Definition,Structure of Smart Grid- Indian Perspective Advantage & limitation.

UNIT – V

Smart Urban Transportation Systems: Smart Transportation Technologies – Driverlessand connected vehicles - ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems.

Text Books:

1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R.Kanagachidambaresan, R. Maheswar,
2. V. Manikandan, K. Ramakrishnan, Springer, 2020 2. Society 5.0: A People-centric Super-smartSociety, Hitachi-UTokyo Laboratory (HUTokyo Lab), Springer, 2020
3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, RoutledgeInternational Handbooks, 2020

Reference Books:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity YuminJoo, YuMin Joo, Teck- Boon Tan, Edward Elgar Pub, 2020.
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, YoshikiYamagata, Perry P. J. Yang, Elsevier, 2020.
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, andOperations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier. 2020.

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

1. Recognize smart city concepts and their international and national standards.
2. Identify smart community, transportation and building concepts.
3. Create and calibrate energy demand and their capacity limits.
4. Design and calibrate energy demand and their capacity limits
5. Predict the various smart urban transportation systems and the transition from existing city towards a smart city

CO-PO Mapping:

	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

(A401403) COMPUTER APPLICATIONS IN CIVIL ENGIJNEERING

B. Tech (CE) V Semester

L	T	P	C
3	0	0	3

UNIT – I

Fluid Mechanics Applications: Flowcharts – Algorithms – Flow through pipes – Computation of friction factor– Hardy Cross method of water supply distribution– Determination of efficient channel section in rectangular channels – Computation of water surface profiles in open channel flows – Estimation of Run off for a Catchment – Estimation of Friction factor for Laminar and Turbulent flows – Minor losses in pipe flow.

UNIT – II

CPM and Survey Applications: Flowcharts – Algorithms – Determination of earliest expected time for an activity – Network analysis and determination of critical path – Survey adjustments – Determination of RL of various points by Rise & Fall and HI methods – Quantity estimation of Civil Engineering Structures and Construction Management.

UNIT – III

Structural Analysis Applications: Flowcharts – Algorithms – Computation of SF & BM at any desired section of a simply supported beam for any loading conditions – Analysis of portal frames by moment distribution method – Determination of Bending Moment Diagram – Deflections for different loading conditions for a Simply Supported Beam and Cantilever Beam.

UNIT – IV

Structural Design Applications: Flowcharts – Algorithms – Design of Beams by using Limit state method – Design of columns subjected to axial load and Uni-axial Moment – Design of Isolated Footing – Design of rolled steel columns – built up columns – Beams and built up Beams.

UNIT – V

Geotechnical Engineering Applications: Flowcharts – Algorithms – Classification of Soils – Determination of effective stress at any given depth for any soil profile – Mohr circle of stress, Bearing capacity of soil for given soil– Foundations settlement – Hydraulic conductivities for anisotropic soils – Degree of Consolidation and Shear Strength – Earth Pressures stability analysis of slopes. Environmental and Transportation Applications: Application of problems in Environmental Engineering – Hardy cross method Transportation Engineering – Preparation of Contour Maps and Alignment fixing of Roads.

TEXT BOOKS

1. Computer aided design, software and analytical tools by C.S. Krishnamoorthy & S.Rajesh
2. Computer applications in Civil Engineering by S.K. Parikh
3. Computer aided design in Reinforced concrete by V.L. Shah

REFERENCES:

1. Flow in Open Channels by K Subramanya, Tata McGraw-Hill Publishing CompanyLtd, New Delhi, 2017
2. Engineering Hydrology by K. Subramanya, McGraw Hill Education (India) Pvt. Ltd,Chennai, 2016
3. Hydraulics and Fluid Mechanics by PN Modi and SM Seth, Standard Book House,New Delhi, 2017
4. Irrigation Engineering and Hydraulic Structures by SK Garg, Khanna Publisher, New Delhi, 2018

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

1. Compute the water surface profiles and estimation of minor losses
2. Make use of project management and control techniques
3. Analyze portal frame using various methods
4. Design various components of RCC and steel structures
5. Explain engineering properties of soil and their applications

CO-PO Mapping:

	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

(A401313) HYDROLOGY AND WATER RESOURCES ENGINEERING

B. Tech (CE) V Semester

L	T	P	C
3	0	0	3

UNIT - I

Introduction: Concepts of Hydrologic cycle, Precipitation: Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area- duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

UNIT - II

Abstractions from precipitation: Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney & Criddle Methods, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.
Run off: Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis, concepts of watershed management.

UNIT - III

Hydrographs: Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow- Base Flow Separation - Unit Hydrograph, definition, limitations and applications and Unit hydrograph, S-hydrograph, Synthetic Unit Hydrograph.

UNIT - IV

Groundwater Hydrology: Occurrence, movement and application of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law. Well Hydraulics - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants. Crop water requirements – Water requirements of crops – crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zones oil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, Micro irrigation.

UNIT - V

Canal systems: alignment of canals, canal losses, estimation of design discharge. Design of channels rigid boundary channels, alluvial channels. canal outlets: non-modular, semi-modular and modular outlets. Canal outlets non-modular, semi-modular and modular outlets. Waterlogging: causes, effects, and remedial measures. Lining of canals-Types of lining-Advantages and disadvantages. Drainage of irrigated lands- necessity, methods.

Textbooks:

1. Hydrology by K. Subramanya (Tata McGraw-Hill).
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers.
3. G L Asawa, Irrigation Engineering, Wiley Eastern .

Reference Books:

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill).
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications.
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K.N. Duggal and J.P. Soni (New Age International)
5. Manual on Storm Water Drainage System- 2019, CPH EO New Delhi.

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

1. Illustrate the process of hydrological cycledesign highway geometrics.
2. analyze ground water occurrence and radial flow into wells
3. Explain various types of intersections and its limitations
4. Describe the irrigation system
5. design irrigation canals and cross drainage works

CO-PO Mapping:

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

(A401314) STRUCTURAL ANALYSIS - II

B. Tech (CE) V Semester

L	T	P	C
2	0	0	2

UNIT -I

Two Hinged Arches: Introduction – Classification of Two hinged Arches – Analysis of two hingedparabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

Moment Distribution Method: Analysis of continuous beams with and without settlement of supportsusing - Analysis of Single Bay Single Storey Portal Frames including side Sway - Analysis of inclinedframes -Shear force and Bending moment diagrams, Elastic curve.

UNIT – II

Kani's Method: Analysis of continuous beams including settlement of supports - Analysis of single baysingle storey and single bay two Storey Frames including Side Sway using Kani's Method - Shear forceand bending moment diagrams - Elastic curve.

Cables and suspension bridges: Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads -Length of a cable - Cable with different support levels - Suspension cable supports – SuspensionBridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.

UNIT – III

Matrix Methods -Flexibility Matrix Method: Introduction to Flexibility matrix methods of analysis; Analysis of continuous beams including settlement of supports ; Analysis of pin-jointed determinateplane frames

UNIT – IV

Matrix Methods-Stiffness Matrix Method: Introduction to Stiffness matrix methods of analyses using'system approach' up-to three degree of indeterminacy– Analysis of continuous beams includingsettlement of supports- Analysis of pin-jointed determinate plane frames; Analysis of single bay singlestoreyportal frames using stiffness method - Shear force and bending moment diagrams - Elastic curve.

UNIT- V

Influence Lines for Indeterminate Beams: Introduction – Influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia -influence line diagram for shear force and bending moment for propped cantilever beams.

Text Books:

1. Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S. Pandit S.P. Gupta Tata McGraw Hill Education Pvt. Ltd.
3. Indeterminate Structural Analysis by K.U. Muthu et al., I.K. International Publishing House Pvt.Ltd

Reference Books:

1. Structural analysis T. S Thandavamoorthy, Oxford university Press
2. Mechanics of Structures Vol –II by H.J. Shah and S.B. Junnarkar, Charotar Publishing HousePvt. Ltd.
3. Basic Structural Analysis by C.S. Reddy., Tata McGraw Hill Publishers.
4. Structural Analysis by R. C. Hibbeler, Pearson Education
5. Structural Analysis by Devdas Menon, Narosa Publishing House.

6. Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros.

Online Resources:

1. https://nptel.ac.in/courses/105/105/105105166/

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

1. Analyze two hinged arches
2. Analyze portal frame using various methods
3. Solve statically indeterminate beams and portal frames using classical methods
4. Formulate the stiffness matrix and analyze the beams by matrix methods
5. Sketch the shear force and bending moment diagrams for indeterminate structures

CO-PO Mapping:

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

(A401507) GEOTECHNICAL ENGINEERING LABORATORY

B. Tech (CE) V Semester

L	T	P	C
0	0	2	1

List Of Experiments:

1. Atterberg Limits (Liquid Limit, Plastic Limit, and shrinkage limit)
2. Field density by (a) Core cutter method (b) Sand replacement method
3. Determination of Specific gravity of soil
4. Grain size distribution by sieve analysis
5. Permeability of soil by constant and variable head test methods
6. Standard Proctor's Compaction Test
7. Determination of Coefficient of consolidation (square root time fitting method)
8. Unconfined compression test
9. Direct shear test
10. Vane shear test
11. Differential free swell index (DFSI) test

REFERENCE BOOKS:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International, 2002.
2. Manual of Soil Laboratory Testing, K. H., Head, CRC Press, 2006, 3rd Edition.

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

1. Determine the index properties of soils
2. Analyze the grain size of soil
3. Measure the water flow through soil media
4. Find the strength properties of soils
5. Assess the compaction characteristics of soil

CO-PO Mapping:

	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

(A401508) TRANSPORTATION ENGINEERING LABORATORY

B. Tech (CE) V Semester

L	T	P	C
0	0	2	1

Tests on Aggregates

1. Determination of Aggregate Crushing value
2. Determination of Aggregate Impact Value
3. Determination of Specific Gravity and water absorption.
4. Determination of Aggregate Attrition value
5. Determination of Aggregate Abrasion Value
6. Determination of Flakiness Index and Elongation Index of C.A.

Tests on Bitumen

7. Penetration Test on Bitumen.
8. Ductility Test on Bitumen.
9. Softening point of Bitumen.
10. Flash and Fire points (Demo)

Mix preparation (Demo)

11. Marshall's Stability sample preparation
12. Marshall's Stability sample testing

Traffic Lab

13. Traffic Volume Counts-Mid Blocks
14. Traffic Volume Counts-Junctions
15. Speed Studies using Spot speeds.
16. Speed Studies using Moving car method.
17. Parking Studies
18. Road safety Audit with respect to Geometric design (video demonstration only)

Textbooks:

1. Highway Material Testing manual, Khanna, Justo and Veeraraghavan, Nemchand Brothers

Reference Books:

1. Khanna, S.K, Justo, A and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros.Revised Tenth Edition, 2014
2. KadiyaliL.R. and Lal N B, Principles and Practices of Highway Engineering; Seventh Edition,First Reprint; Khanna Publishers, New Delhi, 2018

Code of Provisions:

Design Codes: IRC 37-2012, IRC 58-2015, IRC 81-1997

IS CODES:

1. IS 1201 -1220 (1978) "Methods for testing tars and bituminous materials"
2. IRC SP 53 -2010 "Guidelines on use of modified bitumen"
3. MS-2 Manual for Marshalls Mix design 2002.

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

1. Determine various properties of aggregates
2. Find various properties of bitumen
3. Test strength of bitumen using marshal stability apparatus
4. Estimate the traffic volume count at mid blocks and junctions
5. Measure the speed of vehicles and area for parking.

CO-PO Mapping:

	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

(A400504) ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

B. Tech (CE) V Semester

L	T	P	C
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:

c. Computer Assisted Language Learning (CALL) Lab
d. Interactive Communication Skills (ICS) Lab

Listening SkillsObjectives

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 SkillsObjectives

3. To involve students in speaking activities in various contexts
4. 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 – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

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 CommunicationPresentation 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:

3. **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
4. **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 Work book,(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.

CO-PO Mapping:

	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

(A400705) INTELLECTUAL PROPERTY RIGHTS
(Mandatory Course)

B. Tech (CE) V Semester

L	T	P	C
3	0	0	0

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trademarks: Purpose and function of trademarks, acquisition of trademark rights, protectable matter, selecting, and evaluating trademark, trademark registration processes.

UNIT – III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copyright registration, notice of copy right, international copy right law.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.
Unfair competition: Misappropriation of right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trademark law; copyright law, patent law, intellectual property audits. International overview on intellectual property, international – trademark law, copyright law, international patent law, and international development in trade secrets law.

TEXT & REFERENCE BOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata Mc Graw Hill Publishing company ltd

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

1. Skill to understand the concept of intellectual property rights.
2. Develops procedural knowledge of the Legal System and solving problems relating to Patents.
3. Gain knowledge on the development and owning of Trademarks, Copy Rights, and Patents.
4. Develops conceptual exposure on legal aspects related to IPR
5. Knowledge on different types of competition and ethical and unethical practices of advertising

CO-PO Mapping:

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

(A401315) STRUCTURAL ENGINEERING -II (Steel Structures)

B. Tech (CE) VI Semester

L	T	P	C
3	0	0	3

UNIT -I

Materials – Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design –Different Limit States – Load combinations for different Limit states - Design Strengths - deflection limits– serviceability – stability check.

Design of Connections– Different types of connections – Bolted connections – Design strength –efficiency of joint– prying action - Welded connections – Types of welded joints – Design requirements- Design of Beam- column connections - Eccentric connections - Type I and Type II connection.

UNIT – II

Design of tension members –Simple and built up members - Design strength – Design procedure for splicing - lug angle.

Design of compression members – Buckling class – slenderness ratio – Design of simple compression members - laced – battened columns – splice – column base – slab base.

UNIT – III

Plastic Analysis: Plastic moment – Plastic section modulus - Plastic analysis of continuous beams Design of Flexural Members – Design of laterally supported beams - Bending and shear strength/buckling – Built-up sections - Beam splice

UNIT – IV

Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener– intermediate stiffeners – Design of web splice and flange splice.

UNIT – V

Design of Industrial Structures: Types of roof trusses - loads on trusses – wind loads - Purlin design – truss design.

TEXT BOOKS:

1. Design of steel structures by S.K. Duggal, Tata McGraw-Hill publishers, 2000, 2nd Edition.
2. Design of steel structures by N. Subramanian, Oxford University press, 2008.
3. Design of steel structures by K.S. Sairam, Pearson Educational India, 2nd Edition, 2013.

REFERENCE BOOKS:

1. Design of steel structures by Edwin H. Gayrold and Charles Gayrold, Tata McGraw hill publishers, 1972
2. Design of steel structures by L.S. Jaya Gopal, D. Tensing, Vikas Publishing House

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

1. Explain the properties of structural steel and calculate the strength of various joints
2. Design the members subjected to tension and compression
3. Design the members subjected to flexure
4. Design plate girder and roof truss elements
5. Design of various roof trusses

CO-PO Mapping:

	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

(A401316) ENVIRONMENTAL ENGINEERING

B. Tech (CE) VI Semester

L	T	P	C
3	0	0	3

UNIT – I

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

UNIT – II

Layout and general outline of water treatment units: sedimentation – principles – design factors –coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory –working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation -comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

UNIT - III

Characteristics of sewage: wastewater collection–Estimation of wastewater and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers –shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming –self-purification of rivers.

UNIT – IV

Wastewater treatment plant: Flow diagram, primary treatment, Design of screens, grit chambers, skimming tanks, sedimentation tanks, principles of design, Biological treatment, trickling filters, ASP, Construction and design of oxidation ponds. Sludge digestion, factors effecting, design of digestion tank, Sludge disposal by drying, septic tanks working principles and design,soak pits.

UNIT – V

Air pollution: Classification of air pollution– Effects air pollution–Global effects– Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior – Control of particulates –Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants– automobile pollution and control.

Text Books:

1. Environmental Engineering, I and II by BC Punmia, Std. Publications
2. Environmental Engineering, I and II by SK Garg, Khanna Publications.
3. Environmental Pollution and Control Engineering CS Rao,Wiley Publications

Reference Books:

1. Wastewater engineering by Metcalf and Eddy, McGraw Hill, 2015.
2. Water and Wastewater Engineering by Fair Geyer and Okun, Wiley, 2011
3. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.Wiley, 2007.
4. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
5. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan,Thompson /Brooks/Cole; Second Edition 2008.
6. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication.

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

1. Assess characteristics of water and wastewater
2. Outline the water treatment units and various water treatment systems
3. Estimate quantities of sewage waste water.
4. Design components of wastewater treatment plants
5. Identify the issues of air pollution and control.

CO-PO Mapping:

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

(A401317) FOUNDATION ENGINEERING

B. Tech (CE) VI Semester

L	T	P	C
3	0	0	3

UNIT – I

SOIL EXPLORATION: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs and preparation of soil investigation report.

UNIT – II

SLOPE STABILITY: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices– Taylor's Stability Number- stability of slopes of earth dams under different conditions.

UNIT – III

EARTH PRESSURE THEORIES: Active, Passive and at rest soil pressures Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory.
RETAINING WALLS: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

UNIT – IV

SHALLOW FOUNDATIONS: Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

UNIT - V

PILE FOUNDATION: Types of piles – load carrying capacity of piles based on static pile formulae –dynamic pile formulae – Pile Capacity through SPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao, New age International Publishers, 2016.
2. Soil Mechanics and Foundation Engineering by V. N. S. Murthy, CBS Publishers and Distributors, 2007.
3. Bowles, J.E., (2001) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, New York.
4. Principals of Foundation Engineering by Braja, M. Das, Cengage Learning Publishers, 8th Edition, 2016

Reference Books:

1. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt. Ltd (1998).
2. Geotechnical Engineering by S. K. Gulhati & Manoj Datta – Tata McGraw Hill Publishing company New Delhi. 2005.
3. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design john Wiley & sons inc (1980)

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

1. Explain the various processes of soil exploration and its bearing capacity
2. Determine the slope failures using various methods
3. Analyze earth retaining structures using various theories
4. analyse and design the shallow foundations
5. analyse and design the deep foundations

CO-PO Mapping:

	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

(A401318) PAVEMENT ANALYSIS AND DESIGN

B. Tech (CE) VI Semester

L	T	P	C
3	0	0	3

UNIT – I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT – II

Stresses in Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements.
Stresses in Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two- and Three-Layered Systems, Fundamental Design Concepts
Stresses in Rigid Pavements: Westergaard ‘s Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars.

UNIT – III

Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute‘s Methods with HMA and other Base Combinations, AASHTO, IRC Methods.
Design of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

UNIT – IV

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Effects and Methods of Stabilization and Use of Geo Synthetics.

UNIT – V

Design of Pavement for Low Volume Roads: Pavement design for low volume roads, rural road designs - code of practices.
Design of Over Lays: Types of Overlays, Suitability, Design of Overlays.

Textbooks:

1. Highway Engineering, S.K.Khanna, Justo and Veeraragavan. A, Nem Chand and Brothers.
2. Pavement Design, R. Srinivasa Kumar, Universities Press.

References:

1. Principles and Practice of Highway Engineering, L.R. Kadiyali and N.B.Lal, Khanna Publ..
2. IRC: 37& 58 Codes for Flexible and Rigid Pavements Design.
3. IRC: SP: 72 & 62 Codes for Design of Low volume Flexible and Rigid Pavements.

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

1. Identify various factors affecting the pavement design
2. Analyze the stresses in pavements
3. Design the flexible and rigid pavements using various methods
4. Determine the characteristics of materials for pavement design
5. Design pavement for low volume roads and over lays

CO-PO Mapping:

	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

(A401404) ELEMENTS OF EARTHQUAKE ENGINEERING
(Professional Elective – II)

B. Tech (CE) VI Semester

L	T	P	C
3	0	0	3

UNIT - I

Engineering Seismology: Earthquake phenomenon - cause of earthquakes-Faults- Plate tectonicsSeismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scalesEnergy Released- Earthquake measuring instruments seismogram - Seismoscope, Seismograph, -strong ground motions- Seismic zones of India.

Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous systemLumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degreeof freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forcedvibrations-Harmonic excitation- Dynamic magnification factor-Excitation by rigid based translation forSDOF system-Earthquake ground motion.

UNIT - II

Conceptual design: Introduction-Functional Planning-Continuous load path-Overall form-simplicityand symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical Members-Twisting ofbuildings- Ductility-definition-ductility relationships-flexible buildings-framing systems-choice ofconstruction materials- unconfined concrete-confined concrete-masonry-reinforcing steel.

Introduction to earthquake resistant design: Seismic design requirements-regular and irregularconfigurations- basic assumptions-design earthquake loads-basic load combinations-permissiblestresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

UNIT - III

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members-Structuralmodels for frame buildings- Seismic methods of analysis- IS code-based methods for seismic designVertical irregularities- Plan configuration problems- Lateral load resisting systems-Determination ofdesign lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateraldistribution of base shear.

UNIT - IV

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonrybuildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls-Box action andbands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinationsand permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT - V

Ductility: Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact ofDuctility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility-Ductiledetailing considerations as per IS 13920-2016 -Behaviour of beams, columns and joints in RC buildingsduring earthquakes.

Text Books:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, PrenticeHall of India Pvt. Ltd.

Reference Books:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly,John Wiley & Sons.
2. Earthquake Resistant Design of Building structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N. Iyengar, I.K. International Publishing House Pvt. Ltd.
4. Masonryand Timber structures including earthquake Resistant Design –Anand S.Arya,NemChand& Bros
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy

BIS Codes: 1. IS 1893(Part-1):2016. 2. IS 13920:2016. 3. IS 4326. 4. IS 456:200

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

1. Explain and derive fundamental equations in structural dynamics
2. Discuss and explain causes and theories on earthquake, seismic waves, measurement of earthquakes
3. Evaluate base shear using IS methods
4. Design and detail the reinforcement for earthquake forces
5. Analyse the building to sustain large deflections without failure.

CO-PO Mapping:

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

(A401405) PRESTRESSED CONCRETE
(Professional Elective – II)

B. Tech (CE) VI Semester

L	T	P	C
3	0	0	3

Pre-Requisites: Reinforced Concrete Design

UNIT - I

Introduction: Historic development- General principles of prestressing pre-tensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSCClassification and types of prestressing- Materials- high strength concrete and high tensile steel theircharacteristics.

UNIT - II

Methods and Systems of prestressing: Pre-tensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall SystemLee McCall system. Losses of Prestress: Loss of prestress in pretensioned and posttensionedmembers due to various causes like elastic shortage of concrete, shrinkage of concrete, creep ofconcrete, relaxation of stress in steel, slip in anchorage, frictional losses.

UNIT – III

Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bentand parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and Isection- Kern line – Cable profile and cable layout.
Shear: General Considerations- Principal tension and compression- Improving shear resistance ofconcrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis ofrectangular and I beam for shear – Design of shear reinforcements- IS Code provisions.

UNIT - IV

Transfer of Prestress in Pretensioned Members: Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in posttensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski andRowe's methods – Anchorage zone reinforcement- IS Provisions

UNIT - V

Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.
Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

Reference Books:

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.
4. Prestressed Concrete by N. Rajagopalan Narosa Publishing House

Reference Codes:

1. IS 1343:2016

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

1. Illustrate concepts of pre-stressed concrete
2. Determine losses of pre-stressed concrete
3. Analysis and design of PSC members for flexure and shear
4. Identify transmission of pre-stressing force in pre-tensioned members
5. Analyze composite members and calculate the deflection

CO-PO Mapping:

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

(A401406) ADVANCED STRUCTURAL ANALYSIS
(Professional Elective – II)

B. Tech (CE) VI Semester

L	T	P	C
3	0	0	3

UNIT - I

Introduction to matrix methods of analysis statically indeterminacy and kinematics indeterminacy degree of freedom-coordinate system-structure idealization stiffness and flexibility matrices-suitability element stiffness equations-elements flexibility equations-mixed force-displacement equations-for truss element, beam element and tensional element Transformation of coordinates-element stiffness matrix-and load vector-local and global coordinates.

UNIT - II

Assembly of stiffness matrix from element stiffness matrix-direct stiffness method-general procedure bank matrix-semi bandwidth-computer algorithm for assembly by direct stiffness matrix method.

UNIT - III

Analysis of plane truss-continuous beam-plane frame and grids by Flexible methods.

UNIT - IV

Analysis of plane truss-continuous beam-plane frame and grids by stiffness methods.

UNIT - V

Special analysis procedures-static condensation and sub structuring-initial and thermal stresses. Shear Walls Necessity-structural behavior of large frames with and without shear walls-approximate methods of analysis of shear walls.

TEXT BOOKS:

1. Advanced Structural Analysis by A.K. Jain Nemchand Publishers.
2. Matrix methods of structural analysis by Pandit and Gupta.

REFERENCE BOOKS:

1. Advanced Structural Analysis by Devdas Menon, Narosa publishing house.
2. Matrix methods of structural analysis by Willam Weaver and gere, CBS Publishers.
3. Matrix methods of structural analysis by J Meek
4. Structural Analysis by Ghali and Neyveli.

Course Outcomes: After the completion of the course student should 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

CO-PO Mapping:

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

(A401509) ENVIRONMENTAL ENGINEERING LABORATORY

B. Tech (CE) VI Semester

L	T	P	C
0	0	2	1

List of Experiments:

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Acidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD
12. Determination of Residual Chlorine
13. Noise level measurement

Text Books:

1. Environmental Engineering, I and II by BC Punmia, Std. Publications.
2. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

REFERENCE BOOKS:

1. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
2. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication

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

1. Assess characteristics of water and wastewater.
2. determine optimum dosage of coagulant
3. identify break - point chlorination
4. examine the biological characteristics of water and waste water
5. measure the noise level

CO-PO Mapping:

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

(A401510) COMPUTER AIDED DESIGN LABORATORY

B. Tech (CE) VI Semester

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS

1. Analysis & Design determinate structures using software.
2. Analysis & Design of fixed & continuous beams using software.
3. Analysis & Design of Plane Frames
4. Analysis & Design of space frames subjected to DL & LL
5. Analysis & Design of residential building subjected to all loads (DL, LL, WL, EQL)
6. Analysis & Design of Roof Trusses
7. Design and detailing of built-up steel beam.
8. Developing an excel template for foundation design.
9. Detailing of RCC beam and RCC slab.
10. Detailing of RCC column and RCC footing

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

1. Make use of STAAD Pro software for analysis and design
2. Design various components of building
3. Design the single and multistoried building
4. Design the overhead tank of various shapes
5. Analyze and design trusses and plane frames

CO-PO Mapping:

	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	-	-

(A401511) CIVIL ENGINEERING SOFTWARE LABORATORY
(Using Open Building DesignerSoftware by Bentley)

B. Tech (CE) VI Semester

L	T	P	C
0	0	2	1

List of Experiments:

1. Introduction to Open Building Designer
2. View controls such as pan, zoom, rotate
3. Create detailed 3D building modelssuch as walls
4. Create detailed 3D building modelssuch as floors
5. Create detailed 3D building modelssuch as columns, and beams
6. Create detailed 3D building modelssuch as roofs
7. Create detailed 3D building modelssuch as stairs and railings
8. Modelling of parking ramp
9. Modelling of HVAC, plumbing, electrical, and fire protection systems

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

1. Make use of Open Building Designer software for analysis and design
2. Create 3D building models of various building components
3. Modelling the parking ramp
4. Modelling the HVAC, plumbing, electrical
5. Modelling the fire protection sys

CO-PO Mapping:

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

(A401802) INDUSTRIAL ORIENTED MINI PROJECT / INTERNSHIP

B. Tech (CE) VI Semester

L	T	P	C
0	0	4	2

(A401319) QUANTITY SURVEY & VALUATION

B. Tech (CE) VII Semester

L	T	P	C
2	0	0	2

UNIT - I

General items of work in Building – Standard Units Principles of working out quantities for detailed andabstract estimates – Approximate method of Estimating.

UNIT – II

Detailed estimation of single and multi storied building.

UNIT – III

Reinforcement bar bending and bar requirement schedules Earthwork for roads and canals.

UNIT – IV

Rate Analysis – Working out data for various items of work over head and contingent charges.

UNIT-V

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation - Standard specifications for different items of building construction.

NOTE: Number of Exercises Proposed:

1. Three in flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

Text Books:

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016

Reference Books:

1. Standard Schedule of rates and standard data book by public works department.
2. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineeringworks– B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.
4. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson EducationIndia, 2015.

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

1. Find the various quantities of building items
2. Estimate single and multi storied buildings.
3. Estimate eartwork for roads and canals.
4. Analyze the cost for various civil work items
5. How to create and review contract documents

CO-PO Mapping:

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

(A401407) GROUND IMPROVEMENT TECHNIQUES
(Professional Elective – III)

B. Tech (CE) VII Semester

L	T	P	C
3	0	0	3

UNIT - I

Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types,In situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical,Electrical, Thermal methods, and their applications.

UNIT - II

Mechanical Modification – Deep Compaction Techniques- Blasting Vibrocompaction, Dynamic Tamping and Compaction piles.

UNIT - III

Hydraulic Modification – Objectives and techniques, traditional dewatering methods and their choice,Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering. Filtration, Drainage andSeepage control with Geosynthetics, Preloading and vertical drains.

UNIT - IV

Physical and chemical modification: Stabilization with admixtures like cement, lime, calcium chloride,fly ash and bitumen; Grouting: Categories of grouting, Art of grouting, Grout materials, Groutingtechniques and control.

UNIT - V

Modification by Inclusions and Confinement - Soil reinforcement, reinforcement with strip, and gridreinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

Textbooks:

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hillpublications
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis
3. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey.

Reference Books:

1. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
2. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons,1994.
3. K. Krisch& F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press,Taylor and Francis.
4. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indianedition, 2012.

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

1. Identify the various ground improvement methods.
2. Assess different compaction methods for ground modification.
3. Design dewatering systems to reduce the settlements.
4. Apply chemical and grouting techniques for stabilizationing the soil
5. Propose the principles of soil reinforcement and confinement in engineering constructions

CO-PO Mapping:

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

(A401408) EARTH RETAINING STRUCTURES
(Professional Elective – III)

B. Tech (CE) VII Semester

L	T	P	C
3	0	0	3

UNIT - I

Earth Pressure Theories: Rankine's and Coulomb's Earth pressure theories for cohesive and cohesionless soils, stresses due to compaction and surcharge loads.

UNIT - II

Conventional Retaining Wall: Types of retaining walls, Stability (sliding, overturning, bearing capacity& overall) of gravity and cantilever walls, Proportioning of retaining walls, Backfill material and drainage.

UNIT - III

Flexible Walls: Sheet pile walls, Construction methods- Cantilever and Anchored (Free and Fixed support methods) sheet pile walls in coarse and fine grained soils, Rowe's moment reduction method.

UNIT - IV

Braced Cuts: Lateral earth pressure in braced cuts, Design of various components, Stability of bracedcuts, base heave and stability, yielding and settlement of ground surrounding excavation, Diaphragmwalls – slurry support.

UNIT - V

Reinforced Soil Walls/Mechanically Stabilized Earth: - Introduction to geosynthetics – Functions and applications - Failure mechanisms of Reinforced soil walls -bond and rupture failures- Internal andexternal stability by Static analyses -Soil Nailing.

Text Books:

1. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
2. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey

Reference Books:

1. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
2. Rowe, R. K. - Geotechnical & Geo-environmental Engineering Hand Book -Springer (2001)
3. Hans Friedrich Winterkorn, Hsai-Yang Fang - Foundation Engineering Handbook, VanNostr and Reinhold, 1975
4. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indianedition, 2012.
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers NewDelhi.

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

1. Calculate the earth pressures under different applied loads and ground conditions.
2. Assess stability of conventional retaining walls.
3. Design flexible retaining walls under different soil and fixity conditions.
4. Design the supporting systems for excavations.
5. Design geosynthetic reinforced earth walls.

CO-PO Mapping:

	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

(A401409) STABILITY ANALYSIS OF SLOPES
(Professional Elective – III)

B. Tech (CE) VII Semester

L	T	P	C
3	0	0	3

UNIT - I

Earth and Rock fill Dams: General features, Selection of site; Merits and demerits of the earth androck fill dams, Classification of earth dams, Causes of failure, Safe design criteria. Instrumentation inearth dams: Pore pressure measurements, Settlement gauges, Inclinometers, Stress measurements,Seismic measurements.

UNIT - II

Failures, Damages and Protection of Earth Dams: Nature and importance of failure, piping throughembankment and foundations, Methods of seepage control through embankments and foundations,Design Criteria for filters.

UNIT - III

Slope Stability Analysis: Types of Failure: Failure surfaces - Planar surfaces, Circular surfaces, Noncircular surfaces, Limit equilibrium methods, Total stress analysis versus effective Stress analysis, Useof Bishop's pore pressure parameters, Short term and Long term stability in slopes. Taylor Charts.

UNIT - IV

Methods of Slope Stability: Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Janbu Analysis, SlidingBlock Analysis, Introduction to Seismic stability, Stabilization of slopes: Soil reinforcement(geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection(vegetation/erosion control mats/shotcrete).

UNIT - V

Slope Protection and Rock fill Dams: Stabilization of slopes: Soil reinforcement (geosynthetics/soilnailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosioncontrol mats/shotcrete). Requirements of compacted rockfill, Shear strength of rockfill, Rockfill mixtures,Rockfill embankments, Earth-core Rockfill dams, Stability, Upstream & Downstream slopes.

Text Books:

1. Engineering for Embankment Dams, B. Singh and R. S. Varshney, A.A. Balkema, 1995.
2. Embankment Dams, H.D. Sharma, Oxford and IBH Publishing Co., 1991.

Reference Books:

1. Earth and Earth Rock Dams, J. L. Sherard, John Wiley & Sons Inc, 1963.
2. Earth and Rockfill Dams, Christian Kutzner, A.A. Balkema, 1997
3. Bharat Singh and Sharma, H. D. Earth and Rockfill Dams, 1999.
4. Sowers, G.F. and Salley, H.I.Earth and Rockfill Dams, Willams, R.C., and Willace, T.S. 1965.
5. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilization methods – JohnWiley & sons. (2002).
6. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional,London.

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

1. Select suitable site and materials for the construction of earth / rockfill dams.
2. Analyse seepage through a given earth / rockfill dam section and propose suitable seepagecontrol measures.
3. Analyse the stability of earthen dams.
4. Design the slopes by using different analytical methods.
5. Implement slope protection methods.

CO-PO Mapping:

	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

DESIGN OF HYDRAULIC STRUCTURES
(Professional Elective – IV)

	L	T	P	C
B. Tech VII-Semester				
Subject Code: A401410	**3**	**0**	**0**	**3**

UNIT - I

Storage Works-Reservoirs - Types of reservoirs, selection of site for reservoir, zones of storage of areservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation– Life of Reservoir. Types of dams, factors affecting selection of type of dam, factors governing selectionof site for a dam.

UNIT - II

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile,and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety – StabilityAnalysis, Foundation for a Gravity Dam, drainage and inspection galleries.

UNIT- III

Earth dams: types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam,seepage through earth dam-graphical method, measures for control of seepage. Spillways: types ofspillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling BasinsSignificance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of StillingBasins.

UNIT- IV

Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion headwork - components. Causes and failure of Weirs and Barrages on permeable foundations, - Silt Ejectorsand Silt ExcludersWeirs on Permeable Foundations – Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeablefoundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.

UNIT- V

Canal Falls - types of falls and their location, Design principles of Notch Fall and Sarada type Fall.Canal regulation works, principles of design of cross and distributary head regulators, types of Canalescapes - types of canal modules, proportionality, sensitivity, setting and flexibility. Cross Drainageworks: types, selection of suitable type, various types, design considerations for cross drainage works

TEXT BOOKS:

1. Irrigation Engineering and Hydraulic structures by Santhosh Kumar Garg, Khanna Publishers.
2. Irrigation engineering by K. R. Arora Standard Publishers.
3. Irrigation and water power engineering by Punmia & Lal, Laxmi publications Pvt. Ltd., NewDelhi

REFERENCE BOOKS:

1. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta
2. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers 2015.
3. Irrigation Theory and Practice by A. M. Micheal Vikas Publishing House 2015.
4. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers.

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

1. Knowledge of different reservoir types and their specific uses
2. Ability to design and analyze both elementary and practical profiles of gravity dams
3. Knowledge of different types of earth dams and their design criteria.
4. Design the cross drainage works
5. Identify the various types of canal, their functions and the canal design principles.

CO-PO Mapping:

	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

(A401411) ADVANCED WATER RESOURCES ENGINEERING
(Professional Elective – IV)

B. Tech (CE) VII Semester

L	T	P	C
3	0	0	3

UNIT - I

Statistics in Hydrology: Random variables, probability of hydrologic events, probability (Gumbel, LogPearson type-III distribution) and statistical methods for flood frequency, trend analysis for hydrologicevents.

Regression Analysis: Identification of appropriate models, parameters estimation by the least squaremethod, measures of goodness fit, uncertainty features of LS based model parameters, statisticalInferences of Regression Coefficients, confidence Interval. Multivariate linear regression andcorrelation.

UNIT - II:

Flood Routing: Mathematics of flood routing, various methods of flood routing, Hydrologic and Hydraulic routing. -Modified Puls Method- Muskhinghum Method-flood forecasting (unit hydrographmethod)

UNIT - III

Flood mitigation: flood ways, channel improvement, evacuation and flood proofing, land management,flood plain management, estimating benefits of flood mitigation.

Flood plain adjustments and regulations: Results of controlling floods, alternatives to controllingfloods, range of possible adjustments, practical range of choice, critical characteristics of flood hazards.

UNIT - IV

Climate System: Weather and Climate- Overview of earth-atmosphere- vertical structure of atmosphere- Radiation and Temperature- Temperature variation- vertical variation in Air temperature - temperature extremes. Causes of climate change - Modeling of climate change- General circulationmodels (GCMs) –IPCC scenarios - IPCC Assessment Report (AR5) - Physical Science basis.

UNIT - V

Optimization Techniques, Model Formulation, models, General L.P Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Model. Formulation of a LPP - revised simplexmethod - duality theory - dual simplex method - sensitivity analysis. Introduction and Applications ofANN, Machine and Deep Learning in water resources Engineering.

Text Books:

1. Vedula S. and. Mujumdar P.P. 'Water resources Systems', McGraw-Hill PublishingCompany,New Delhi. 2005
2. Ven TeChow, 'Hand book of Applied Hydrology' McGraw-Hill Book Company, New York.,1964
3. Subramanya, K. 'Hydrology for Engineers', Tata McGraw-Hill Publishing Company, New Delhi.(1984.
4. Raja Sekharan S. and Vijaya Laxmi Pai G. A., 'Neural Networks, Fuzzy Logic, and GeneticAlgorithm', Prentice-Hall of India, New Delhi. 2003

Reference Books:

1. Snedecor, G.W., and W.G. Cochran, 'Statistical Methods', East West Press, New Delhi. 1994
2. Alfredo, H.S. and Tang Wah, 'Probability Concepts in Engineering Planning and Design: Vol-I(Basic Principles), John Wiley & Sons, New York. 1975
3. RL Wilby, SP charles, E Zoritaa, B Timbal, P WHetton, LO Mearns - Guide lines for use ofclimate science from Statistical Modeling models. 2004
4. Physical science basis of AR 5 report of IPCC - working group I contribution to AssessmentReport- https://ipcc.ch/report/ar5/wg1/ 2013.

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

1. Apply statistical techniques for flood frequency studies and hydrological events
2. Analyse the flood routing, flood forecasting techniques for real time flood studies.
3. Identify the various mitigation measures for control of floods.
4. Explain of climate change using GCM models.
5. Formulate optimization models and soft computing applications

CO-PO Mapping:

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

(A401412) GROUND WATER HYDROLOGY
(Professional Elective – IV)

B. Tech (CE) VII Semester

L	T	P	C
3	0	0	3

UNIT- I

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock propertieseffecting ground water, Vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as aquifers, types of aquifers, porosity, specific yield and specific retention. GroundWater Movement- Permeability, Darcy's law, storage coefficient, Transmissivity, Differential equationgoverning ground water flow in three dimensions derivation, ground water flow equation in polarcoordinate system, ground water flow contours and their applications.

UNIT- II

Analysis of Pumping Test Data-I: Steady flow ground water flow towards a well in confined and unconfined aquifers-Dupit's and Theism's equations, assumptions, formation constants, yield of anopen well interface and well tests.

UNIT- III

Analysis of Pumping Test Data-II: Unsteady flow towards well-Non-Equilibrium equations, Thesissolution, Jocob and Chow's simplifications, Leak aquifers.

UNIT- IV

Surface and sub-surface Investigation: Surface methods of exploration-Electrical resistivity methodand Seismic refraction methods. Subsurface methods geophysical logging and resistivity logging. Concept of artificial recharge of ground water, recharge methods, Applications of GIS and RS in artificialrecharge of ground water along with case studies.

UNIT- V

Saline water intrusion in aquifer: Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of water intrusion. Ground water basin management-case studies.

TextBooks:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Ground water by H. M. Raghunath, Wiley Eastern Ltd.
3. Groundwater System Planning & Management, R. Willes & W.W.G. Yeh, Prentice Hall.

Reference Books:

1. Ground water by Bawvwr, John Wiley & Sons.
2. Applied Hydrogeology by C. W. Fetta, CBS Publishers & Distributors.
3. Ground Water Assessment, Development and Management by K R Karanth, McGraw Hill Publications.

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

1. Identify the different concepts and terms used in engineering hydrology.
2. Analyze the Steady flow ground water flow
3. Analyze the Unsteady flow ground water flow
4. Explain various formulae used in estimation of surface and Ground water hydrology components.
5. Demonstrate their knowledge to connect hydrology to the field requirement

CO-PO Mapping:

	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

(A401413) SOLID WASTE MANAGEMENT
(Professional Elective – V)

B. Tech (CE) VII Semester

L	T	P	C
3	0	0	3

UNIT- I

Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, andperspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid wastemanagement - Integrated solid waste management, Solid Waste Management Rules 2016.

UNIT - II

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauledcontainersystems – Route planning - transfer and transport; processing techniques.

UNIT - III

Engineering Systems for Resource and Energy Recovery: Processing techniques; materialsrecovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composing - recovery ofthermal conversionproducts; Pyrolisis, Gasification, RDF - recovery of energy from conversionproducts; materials andenergy recovery systems.

UNIT - IV

Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control –Monitoring landfills – Landfills reclamation.

UNIT - V

Hazardous waste Management: Sources and characteristics, Effects on environment, Riskassessment – Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedicalwaste disposal, E-waste management, Nuclear Wastes, Industrial waste Management

Text Books:

1. Tchobanoglous G, Theisen H and Vigil SA ‘Integrated Solid Waste Management, Engineering Principles and Management Issues’ McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, ‘Solid Waste Engineering’ Brooks/Cole ThomsonLearning Inc., 2002.

Reference Books:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, ‘Environmental Engineering’, McGraw HillInc., New York, 1985.
2. Qian X, Koerner RM and Gray DH, ‘Geotechnical Aspects of Landfill Design and Construction’Prentice Hall, 2002.

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

1. Explain the sources of solid waste and its impact
2. Describe the process of solid waste and its management
3. Identify engineering systems for resource and energy recovery.
4. Classify the types and Construction of landfills.
5. Identify and design various waste disposal systems

CO-PO Mapping:

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

(A401414) GREEN BUILDING TECHNOLOGIES
(Professional Elective – V)

B. Tech (CE) VII Semester

L	T	P	C
3	0	0	3

UNIT- I

Introduction: Environmental implications of buildings energy, carbon emissions, water use, waste Disposal.
Building materials: sources, methods of production and environmental Implications. Green cover and built environment.

UNIT- II

Implications of Resources: Implication of resources for Building Materials and alternative concepts. Recycling of Industrial and Building Wastes. Biomass Resources for buildings.

UNIT- III

Comforts in Building: Comforts in Building: Thermal Comfort in Buildings-Issues; Heat Transfer Characteristics of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings.

UNIT- IV:

Energy Conservation: Utility of Solar energy is buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT- V:

Green Composites for Buildings & Waste Management: Green Composites for buildings. Concepts of Green Composites. Water Utilization in Buildings.
Waste Management: Low Energy Approaches to Water Management, Management of Solid Wastes, Management of Sullage water and Sewage.

TEXT BOOKS:

1. K.S. Jagadish, B.U. Venkatarama Reddy and K.S. Nanjundarao. Alterative Building Materials and Technologies. New Age International, 2007.
2. Michael Bauer, Peter Mosle and Michael Schwarz “Green Building-Guide book for Sustainable Architecture” Springer, 2010.

REFERENCE BOOKS:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Michael F. Ashby Materials and the Environment, Elsevier, 2009.
3. Jerry Yudelson Green building Through Integrated Design McGraw Hill, 2009.
4. Mili M.Ajumdar (Ed) Energy Efficient Building in India. Teri and Mnes, 2001/2002
5. Low Energy Cooling for Sustainable Buildings John Wiley and Sons Ltd. 2009.
6. Green My Home’: 10 Steps to Lowering Energy Costs and Reducing Your Carbon Footprint by Dennis.
7. C. Brewer, ISBN: 97814227798411, Publisher: Kaplan Publishing. Publications Date
8. B. Givoni Man, Climate and Architecture Elsevier, 1969.

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

1. Relate safety to Green Technology.
2. Identify Renewable Energy systems.
3. Propose the impact of continued use of non-renewable energy resources.
4. Investigate renewable energy systems.
5. Identify energy consumption, efficiency & waste management.

CO-PO Mapping:

	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

(A401415) WATERSHED MANAGEMENT
(Professional Elective – V)

B. Tech (CE) VII Semester

L	T	P	C
3	0	0	3

UNIT- I

Introduction: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multi-disciplinary approach for watershed management.

Characteristics of Watershed: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basicdata on watersheds.

UNIT II

Principles of Erosion: Types of erosion, factors affectingerosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

UNIT III

Planning of Watershed Management Activities: Peoples participation, preparation of action plan, administrativerequirements. WATER HARVESTING: Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

UNIT IV

Land Management: Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

UNIT V

Ecosystem Management: Role of Ecosystem, crop husbandry, soil enrichment, Inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry andafforestation.

Text Book:

1. Watershed Management' by Das MM and M.D Saikia, PHI Learning Pvt. Ltd, 2013.
2. Land and Water Management' by Murthy.VVN, Kalyani Publications, 2007.
3. Watershed Management' by Murthy J V S, New Age International Publishers, 2006.

References:

1. Watershed Hydrology by R Suresh, Standard Publishers and Distributors, Delhi.
2. Watershed Management by Madan Mohan Das and M.D. Saikia, Prentice Hall of India.
3. Land and Water Management by VVN Murthy, - Kalyani Publications.
4. Irrigation and Water Management by D.K. Majumdar, Printice Hall of India

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

1. Illustrate concept of watershed and its sustainable development
2. Identify causes of soil erosion
3. Design rain water harvesting structure
4. Explain measures for reclamation of saline soils
5. Identify the eco system and its importance.

CO-PO Mapping:

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

(A400102) BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B. Tech (CE) VII Semester

L	T	P	C
3	0	0	3

UNIT - I

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

UNIT - II

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

UNIT - III

Production, Cost, Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV

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

UNIT - V

Financial Ratios Analysis: Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXTBOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

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

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

1. Apply principles of management in professional career
2. Make use of principles of economics for decision making
3. Solve problems in the areas of production, cost and price
4. Prepare balance sheet and maintain books of accounts
5. Analyze financial performance of an enterprise

CO-PO Mapping:

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

(A404601) FUNDAMENTALS OF INTERNET OF THINGS
(Open Elective – I) (Offered by ECE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT – I

Introduction to Arduino: Introduction to Arduino Uno, Features, Pin functionality, Basic Arduino Programming: Interfacing LEDs, Switches using Digital I/O Read/Write, Acquiring and generating signals using Analog I/O Read/Write, Serial functions.

UNIT – II

Introduction to Raspberry Pi: Introduction to Raspberry Pi, Pin functionality, Revision of Python Programming; Raspberry Pi commands, GPIO programming.
Other Open Source Devices: Features and pin functions of NodeMCU, ESP8266, ESP32.

UNIT - III

Introduction to IOT: Terms and definitions, Logical design of IoT, IOT Reference Model;
IOT and M2M: Introduction to M2M, Difference between IoT and M2M and other types;
IOT Servers and Cloud Offerings: IoT enabling technologies – Cloud Computing; Introduction to Cloud Storage/Services – Google, Microsoft Azure, IBM, Amazon Web services for IOT, Setting up to read and write using Thing speak

UNIT – IV

IOT & Communication Protocols: Serial –RS 485, IEEE1394 Firewire, I2C, SPI, USB, CAN; Wireless sensor networks and its technologies, IOT Protocols.

UNIT – V

Domain Specific IOT Applications & Case Studies: IOT Application & case studies for Agriculture, Smart Cities & Transport, Home Automation, Environment, Retail, Logistics, Health, Life style, Industry – Energy;

TEXT BOOKS:

1. Srinivasa K G, Siddesh G M, Hanumantha Raju R, Internet of Things, Cengage, 2019.

REFERENCE BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things: A Hands-on-Approach”, VPT, 1st Edition, 2014
2. Jeremy Blum, Exploring Arduino: Tools and Techniques for Engineering Wizardry, Wiley, 2013.
3. Simon Monk, Raspberry Pi Cookbook, O'Reilly 3rd Edition, 2019
4. Michael Margolis, Arduino Cookbook, 2nd Edition, December 2011, O'Reilly Media, Inc.
5. Rahul Dubey, An Introduction to Internet of Things – Connecting Devices, Edge Gateway, and Cloud with Applications, Cengage, 2019.

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

1. Understand the cyclical perspective of logistics and supply chain process.
2. Learn about the distribution, transportation, warehousing related issues and challenges in supply chain.
3. Appreciate the significance of network design in the supply chain.
4. Gain knowledge of various models / tools of measuring the Supply Chain Performance.
5. Appreciate the role of coordination and technology in supply chain management.

CO- PO MAPPING:

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

(A404602) PRINCIPLES OF DIGITAL SIGNAL PROCESSING
(Open Elective – I) (Offered by ECE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Signal and Systems: Basic Signals and Systems – properties and basic operations-1-D Signals and Filters – Random Signals - Multi-dimensional Signals – Analog and Digital signals and their conversion techniques Convolution process, Filtering process, Z-transform concepts.

UNIT-II

Time domain analysis and Characteristics: Correlation and Discrete sequences: notation, signal characteristics, and operations Discrete linear time invariant systems -Properties and analysis of discrete linear time invariant systems Periodic sampling: aliasing and lowpass filtering.

UNIT-III

Frequency domain Analysis: Discrete Fourier transforms (DFT) DFT properties: symmetry, linearity, magnitudes, frequency axis, and shifting Inverse DFT-Fast Fourier transform (FFT): relationship to DFT, implementation considerations, radix-2 algorithm, and input/output indexing FFT: butterfly algorithm structures.

UNIT-IV

FIR filter design: FIR filters–Introduction-Basic properties -Design using Hamming, Hanning Windows-Realization of FIR filters.

UNIT-V

IIR filter design: Review of design of analogue Butterworth Filters, - Design of IIR digital filters using impulse invariance technique-Realization using direct, cascade and parallel forms.

Text Books:

1. Richard G. Lyons, Understanding Digital Signal Processing, Third edition, Prentice-Hall, 2011.
2. Introduction to Digital Signal Processing, J.Proakis &E.Manolakis, MacMillan, 2007 (4thEdition)

References:

1. S.Salivahanan,A.Vallavaraj,C.Gnanapriya,DigitalSignalProcessing,TMH/McGrawHillInternational,2007
2. E.C.I feachor and B.W. Jervis, "Digitalsignal processing- Apractical approach", Second edition, Pearson, 2002.

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

1. Characterize discrete time signals and LTI signal processing systems mathematically.
2. Analyze the functions performed by simple discrete-time systems.
3. Develop the discrete Fourier transform (DFT) over time domain signals, its applications, and its implementation by FFT techniques.
4. Apply the design techniques for FIR type digital filters known as the ―windowing method.
5. Design IIR type digital filters over the given specifications

CO - PO MAPPING:

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

(A402601) RENEWABLE ENERGY SOURCES
(Open Elective – I) (Offered by EEE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT I

GLOBAL AND NATIONAL ENERGY SCENARIO: Overview of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO_2 reduction potential of renewable energy- concept of Hybrid systems.

UNIT II

SOLAR ENERGY" Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

UNIT III

WIND ENERGY: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Windmill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

UNIT IV

BIOGAS: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermochemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.

UNIT V

OCEAN ENERGY: Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.
Small hydro Power Plant: Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.
Geothermal Energy: Geothermal power plants, various types, hot springs and steam ejection.

TEXT BOOKS

1. Renewable Energy Sources / Twidell, J.W. and Weir, A./ EFN Spon Ltd., 1986.
2. Non-Conventional Energy Sources / G.D Rai/ Khanna Publishers

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

1. Understand the importance of renewable energy sources
2. Explain the operation of solar energy system
3. Illustrate various wind energy conversion systems
4. Explain the operation Bio gas conversion
5. Explain the principle and operation of Ocean wave energy conversion.

CO- PO MAPPING :

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

(A402602) BASICS OF POWER ELECTRONICS & DRIVES
(Open Elective – I) (Offered by EEE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT I

POWER SEMICONDUCTOR DEVICES: Power Semiconductor Devices Construction and Characteristics of Power diodes, Power Transistors, Power MOSFET, Insulated Gate Bipolar transistors (IGBTs) Introduction to Thyristor family: SCR, DIACs, TRIACs.

UNIT II

PHASE CONTROLLED (AC TO DC) CONVERTERS: Principle of phase-controlled converter operation; Operation of 1-phase half wave converter with R, RL and RLE load; 1-phase full wave converter, Bridge Configuration; Operation with R, RL, RLE load; Operation of 1-phase Semi-converter/ Half controlled converter:

UNIT III

THREE -PHASE CONVERTERS: Operation of half wave converter: Full wave fully controlled converters: Semi-controlled converter; Dual Converter: Principle and operation; Applications of AC-DC converters

UNIT IV

DC TO DC CONVERTERS : The chopper, Basic principle of DC chopper, Classification of DC choppers, Control strategies Basic DC-DC converter (switch regulator) topologies: Principle, operation Step-down (Buck), Step-up (Boost), Step up/down (Buck-Boost), Continuous conduction and Discontinuous conduction operation, Two zone operation, Four quadrant operation (Operating modes),

UNIT V

POWER CONVERTERS FED DRIVES: Single phase separately excited drives: Half Wave converter, Semi converter and Fully Controlled converter based drives; Braking operation of separately excited drive Semi-converter and Fully Controlled converter based drives 3-phase separately excited drives: Half Wave converter, Semi-converter and Fully Controlled converter based drives; Principle of power control (motoring control) of separately excited and series motor with DC-DC Converter;

Text books:

1. M D Singh and K B Khanchandani, “Power electronics”, TMH, New Delhi, 2nd ed., 2007.
2. P.S. Bimbhra, “Power Electronics”, Khanna Publishers, New Delhi, 2012..
3. Muhammad H. Rashid, “Power Electronics - Circuits, Devices and Applications”, Prentice Hall of India, 3rd ed., 2003.

Reference Books:

1. VedamSubramanyam, “Power Electronics – Devices, Converters and Applications”, New Age International Publishers Pvt. Ltd., Bangalore, 2nd ed. 2006.

2. Ned Mohan, Undeland and Robbins, "Power Electronics – Converters, Applications and Design", John Willey & sons, Inc., 3rd ed., 2003.
3. V.R.Moorthi, "Power Electronics", Oxford University press, 2005.
4. G..K. Dubey, S.R. Doradla, A. Joshi, and R.M.K. Sinha, "Thyristorised Power Controllers", New Age International Ltd. Publishers, 1986 (Reprint 2008).
5. P.T. Krein, "Elements of Power Electronics", Oxford University Press, 1998.
6. G..K. Dubey, " Fundamentals of Electrical Drives", Narosa Publishing House, New Delhi, 2nd ed. 2001

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

1. Explain the construction and characteristics of Power semiconductor devices
2. Analyze the operation of single phase and three phase ac-to-dc converters.
3. Analyze various three phase converters
4. Compare the various types of dc-to-dc converters.
5. Apply the knowledge of power electronic converter for various applications.

CO- PO MAPPING :

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

(A405604) JAVA PROGRAMMING
(Open Elective – I) (Offered by CSE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT I

Introduction: Java Essentials, JVM, Java Features, Creation and Execution of Programs, Data Types, Type Conversion, Casting, Conditional Statements, Loops, Branching Mechanism, Classes, Objects, Class Declaration, Creating Objects, Method Declaration and Invocation, Method Overloading, Constructors– Parameterized Constructors, Constructor Overloading, Cleaning-up unused Objects, Class Variables & Methods-static Keyword, this Keyword.

UNIT–II

Arrays: One-Dimensional Arrays, Two-Dimensional Arrays, Command-Line Arguments, Inner Class. **Inheritance**: Introduction, Types of Inheritance, extends Keyword, Examples, Method Overriding, super, final Keywords, Abstract classes, Interfaces, Abstract Classes Verses Interfaces.

UNIT–III

Packages–Creating and Using Packages, Access Protection, Wrapper Classes, String Class, String Buffer Class. **Exception**: Introduction, Types, Exception Handling Techniques, User-Defined Exception.

UNIT-IV

Multithreading: Introduction, Main Thread, Creation of New Threads – By Inheriting the Thread Class or Implementing the Runnable Interface, Thread Lifecycle, Thread Priority, Synchronization.

UNIT–V

java.io Package, File Class, File Input Stream Class, File Output Stream Class, Scanner Class, Buffered Input Stream Class, Buffered Output Stream Class, Random Access File Class.

Text Books:

1. Sachin Malhotra, Saurabh Choudhary, Programming in Java (2e), Oxford publications.

Reference Books:

1. Herbert Schildt, Java: The Complete Reference (9e), McGraw Hill Education;
2. C. Thomas Wu, An introduction to object-oriented programming with Java (5e), McGraw-Hill Education;

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

1. Explain the OOPs concepts.
2. Describe various types of Inheritance in Java.
3. Develop robust Java applications using Packages, Exceptions.
4. Implement Java applications using Java Threads.
5. Design Java applications with various modes of Input and output

CO- PO Mapping:

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

(A405602) FUNDAMENTALS OF OPERATING SYSTEMS
(Open Elective – I) (Offered by CSE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT - I

Operating System - Introduction, Structures - Simple Batch, Multi programmed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT - II

CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT - III

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

UNIT – IV

Inter process Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT – V

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms

TEXTBOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCE BOOKS:

1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

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

1 Control access to a computer and the files that may be shared
2 Demonstrate the knowledge of the components of computers and their respective roles in computing.
3 Ability to recognize and resolve user problems with standard operating environments.
4 Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.
5 Understanding various page replacement algorithms and their trade-offs for efficient memory management

CO- PO MAPPING

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

(A403601) FUNDAMENTALS OF ENGINEERING MATERIALS
(Open Elective – I) (Offered by ME)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT – I

Structure of Metals: Crystallography, Miller's indices, Packing Efficiency, Density calculations. Grains and Grain Boundaries. Effect of grain size on the properties. Determination of grain size by different methods. Constitution of Alloys: Necessity of alloying, Types of solid solutions, Hume - Rothery rules, Intermediate alloy phases.

UNIT –II

Phase Diagrams: Construction and interpretation of phase diagrams, Phase rule. Lever rule. Binary phase Diagrams, Isomorphous, Eutectic and Eutectoid transformations with examples.

UNIT – III

Steels: Iron-Carbon Phase Diagram and Heat Treatment: Study of Fe-Fe3C phase diagram. Construction of TTT diagrams. Annealing, Normalizing, Hardening and Tempering of steels, Hardenability. Alloy steels.

UNIT – IV

Cast Irons: Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron. Engineering Materials-III: Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Al-Cu phase diagram, Titanium and its alloys.

UNIT – V

Ceramics, Polymers and Composites: Crystalline ceramics, glasses, cermets: structure, properties and applications. Classification, properties and applications of composites. Classification, Properties and applications of Polymers.

TEXT BOOKS:

1. Material Science and Metallurgy/ Kodgire
2. Essentials of Materials Science and engineering / Donald R. Askeland / Thomson.

REFERENCE BOOKS:

1 Introduction to Physical Metallurgy / Sidney H. Avner.
2 Materials Science and engineering / William and callister.
3 Elements of Material science / V. Rahghavan

Course Outcomes: At the end of the course the students are able to:

1 Identify the crystalline structure of steel.
2 Understand the theory of time temperature and transformation
3 Determine of different uses of heat treatment in steel.
4 Distinguish between the various forms of steel.
5 Understand the properties of non-ferrous alloys and uses of composite materials.

CO- PO MAPPING :

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

(A403602) BASICS OF THERMODYNAMICS
(Open Elective – I) (Offered by ME)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle, Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility.

UNIT-II

Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale.

UNIT-III

First and Second Laws of Thermodynamics: First Law: Cycle and Process, Specific Heats (cpand cv), Heat interactions in a Closed System for various processes, Limitations of First Law,Concept of Heat Engine (H.E.) and Reversed H.E. (Heat Pump and Refrigerator), Efficiency/COP, Second Law: Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, Statement of Clausius Inequality, Property of Entropy, T-S and P-V Diagrams

UNIT-IV

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const.

Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Psychrometric chart

UNIT-V

Power Cycles: Otto, Diesel cycles - Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis

Refrigeration Cycles: Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS:

1 Basic Engineering Thermodynamics / PK Nag / Mc Graw Hill
2 Engineering Thermodynamics / chattopadhyay/ Oxford

REFERENCE BOOKS:

1 Thermodynamics for Engineers / Kenneth A. Kroos, Merle C. Potter/ Cengage
2 Thermodynamics /G.C. Gupta /Pearson

Course Outcomes: At the end of the course the students are able to:

1 Apply energy balance to systems and control volumes, in situations involving heat and work interactions.
2 Evaluate changes in thermometric properties of substances.
3 Apply the laws of thermodynamics to different systems.
4 Understand the psychrometric properties of air
5 Compare differ**e**nt air standard cycles.

CO-PO Mapping:

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

(A400601) BASICS OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT
(Open Elective – I) (Offered by MBA)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Understanding Supply Chain: Objectives of a Supply Chain, Importance, Stages of Supply Chain, Value Chain Process, CycleView of Supply Chain Process, KeyIssuesin SCM, Logistics & SCM, Supply Chain Drivers and Obstacles, Supply Chain Strategies, Strategic Fit, Best Practices in SCM, Obstacles of Streamlined SCM, Green Supply Chain Management, Supply Chain Sustainability.

UNIT-II

Logistics: Evolution, Objectives, Components and Functions of Logistics Management, Difference between Logistics and Supply Chain, Distribution related Issues and Challenges. GainingCompetitive Advantage through Logistics Management, Transportation: Functions, Costs, and Mode of Transportation Network and Decision, Models, Containerization, Cross Docking, Reverse Logistics. Outsourcing: Natureand Concept, Strategic Decision to Outsourcing, Third-party Logistics (3PL), Fourth-party Logistics (4PL).

UNIT-III

Designing the Supply Chain Network: Designing the Distribution Network, Role of Distribution, Factors Influencing Distribution, Design Options, e-Business and its Impact, DistributionNetworks in Practice, Network Design in the Supply Chain, Role of Network, Factors Affecting the Network Design Decisions, Modeling for Supply Chain.

UNIT-IV

Supply Chain Performance: Bull whip Effect and Reduction, Performance Measurement: Dimension, Tools of Performance Measurement, SCOR Model. Demand Chain Management, Global Supply Chain, Challenges in Establishing GlobalSupplyChain, Factors thatinfluence Designing GlobalSupplyChainNetwork.

UNIT-V

Coordination in a Supply Chain: Importance of Coordination, Lack of Supply Chain Coordination and the Bull whip Effect, Obstacles to Coordination, Managerial Levels, Building Partnerships and Trust, Continuous Replenishment and Vendor Managed Inventories, Collaborative Planning, Forecasting and Replenishment. Role of Information Technology in Supply Chain, SupplyChain 4.0.

Text Books / ReferenceBooks

1. IMT Ghaziabad, Advanced Supply Chain Management, Sage Publications, 2021.
2. Rajat K. Basiya, Integrated Supply Chain Management, Sage Publications, 2020.
3. K Sridhara Bhat, Logistics & Supply ChainManagement, HPH,1e,2017.
4. Chopra, Sunil, Meindl, Peter and Kalra, D. V., Supply Chain Management: Strategy, PlanningandOperation; Pearson Education, 6e, 2016.
5. Altekar,Rahul V,SupplyChainManagement: ConceptsandCases;PHILearning,1e,2005.
6. Donald J. Bowersox and David J. Closs, Logistical Management" The Integrated Supply ChainProcess, TMH, 2017

7. Edward J Bradi, John J Coyle, A Logistics Approach to Supply Chain Management, Cengage Learning, New Delhi, 2012
8. Sunil Chopra and Peter Meindl, Supply chain Management: Strategy, Planning and Operation, Pearson Education, New Delhi2013

Course Outcomes: At the end of the course the students are able to:

1. Understand the cyclical perspective of logistics and supply chain process.
2. Learn about the distribution, transportation, warehousing related issues and challenges in supply chain.
3. Appreciate the significance of network design in the supply chain.
4. Gain knowledge of various models/ tools of measuring the Supply Chain Performance.
5. Appreciate the role of coordination and technology in supply chain management.

CO- PO MAPPING :

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

(A400602) INDUSTRIAL RELATIONS
(Open Elective – I) (Offered by MBA)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Overview of Industrial Relations: Meaning & Objectives, Scope, Importance, Approaches toIndustrialRelations–RoleofThreeActorstoIndustrialRelations– State,Employer&Employees,CausesforpoorIR,DevelopingsoundIR.EthicalapproachtoIR:Ideaoftrusteeship – Principles& features, Code of conduct. The industrial policy resolution 1991.ILOin IR. Collective Bargaining (Perspective, Bargaining Structure, Procedure and Machinery forCollectiveBargaining)–TheBargainingProcess– Strengths andSkills

UNIT-II

Laws on Industrial Relations: The Trade Union Act 1926: Role & function of Trade union,Registration,Rights andprivileges, Duties, DissolutionofTradeUnions.

Industrial Disputes Act 1947: Strike, Lockout, Layoff, Retrenchment, Grievance and disciplinaryprocedures,Penalties, Causes,Tripartite &Bipartite Bodies,GrievanceProcedure. IndustrialEmploymentAct,1946:Informationinstandingorders,Procedureforsubmission

UNIT-III

Laws on Wages, Welfare and Social Security: Minimum Wages Act, 1948, Payment of WagesAct,1936,PaymentofBonusAct,1965LawsonLabourWelfare:TheWorkmen'sCompensation Act, 1923, The Employees' State Insurance Act,1948, The Maternity Benefit Act,1961.Laws on Social Security: The Employee's Provident Fund Act, 1952, The Payment ofGratuityAct, 1972.

UNIT-IV

Laws on Working Conditions: Factories Act, 1948: Health, Welfare, Safety, Working Hours,Annual Leave with wages, Registers and Records. Contract Labour (Regulation and Abolition)Act,1986 – Child Labour(Prohibition and Regulation Act, 1986)

UNIT-V

Quality of Work Life and Quality Circles: Meaning of quality of work life – Quality Circles-Objectives- Process, Structure and problems- workers participation in management and qualitycircles– Concept of empowerment.

` Text Books / ReferenceBooks

1. Arun Monappa (2020). Industrial Relations. New Delhi: Tata Mc Graw-Hill Publishing company Ltd.
2. Mamoria C.B, Mamoria,G. (2021). Dynamics of Industrial Relations. New Delhi: Himalayan Publications,
3. Padhi, P.K.(2012). Labour& Industrial Laws. New Delhi: PHI Learning P.Ltd.
4. Kapoor, N.D. (2014). Elements of Mercantile Law. New Delhi: S.Chand & Co.
5. Subramani, PN. & Rajendran,G. (2001). Human Resources Management and Industrial Relations. New Delhi: Himalaya Publishing House.
6. Pylee, PV.& A Simon George. (2007). Industrialrelations and personnel Management. NewDelhi: Vikas Publishing House Pvt. Ltd., NewDelhi.
7. Verma,P.(1991).Management of Industrial Relations Reading and cases. Oxford and IBH publications.

Course Outcomes: At the end of the course the students are able to:

1. Access the concept and Scope of Industrial Relations and its resolution.
2. Outline the knowledge towards Trade unions, Industrial disputes and Grievance Procedure.
3. Identify various Laws on Wages, Welfare and Social Security.
4. Illustrate rules and regulations of working conditions.
5. Enlighten on quality standards in industry.

CO- PO MAPPING

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

(A401601) DISASTER PREPAREDNESS & PLANNING MANAGEMENT
(Open Elective – I) (Offered by CE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction: Concepts and definitions: disaster, hazard, vulnerability, resilience, risksseverity, frequencyand details, capacity, impact, prevention, mitigation.

UNIT-II

Disasters: Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastalerosion, soilerosion, forestfiresetc.); man made disasters (industrialpollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecologicalfragility.

UNIT-III

Disaster Impacts: Disaster impacts (environmental, physical, social, ecological, economic, political, etc.);health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; globalandnationaldisaster trends; climatechange and urbandisasters.

UNIT-IV

Disaster Risk Reduction (DRR): Disaster management cycle–itsphases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability andcapacity assessment; early warning systems, Post disaster environmental response (water, sanitation, foodsafety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation fordisaster risk reduction, DRR programmes in India and the activities of National Disaster ManagementAuthority.

UNIT-V

Disasters, Environmentand Development- Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization, etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

TEXT BOOKS:

1. PradeepSahni,2004, Disaster Risk Reductionin SouthAsia, PrenticeHall.
2. SinghB.K.,2008, Handbook of Disaster Management: Techniques Guidelines, Rajat Publication.
3. GhoshG.K.,2006, Disaster Management, APH PublishingCorporation

REFERENCE BOOKS:

1. http://ndma.gov.in/(HomepageofNationalDisasterManagementAuthority)
2. http://www.ndmindia.nic.in/(National Disaster management in India, Ministry of Home Affairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
4. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Course Outcomes: At the end of the course the students are able to:

1. Analyze impact of disasters
2. Identify the natural and manmade disasters and its vulnerability
3. Relate the disaster impacts at national and global context
4. Develop strategies to cope up with disasters
5. Build disaster management plan

CO- PO MAPPING :

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

(A401602) ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective – I) (Offered By CE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT - I:

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT- II

EIA Methodologies: Environmental attributes -Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT- III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre-Appraisal and Appraisal.

UNIT- IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules. Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria case studies.

UNIT- V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996

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

1. Explain the roles in the EIA Process
2. Identify the attributes to be considered for EIA
3. Identify the methodology to prepare rapid EIA
4. Assessment of EIA life cycle
5. Prepare EIA reports and environmental management plans

CO- PO MAPPING :

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

(A401803) PROJECT STAGE - I

B. Tech (CE) VII Semester

L	T	P	C
0	0	6	3

(A401416) PAVEMENT ASSET MANAGEMENT
(Professional Elective – VI)

B. Tech (CE) VIII Semester

L	T	P	C
3	0	0	3

Pre-requisites: Transportation Engineering

UNIT I

Introduction to Pavement Asset Management: Introduction to road assets: Pavement structure, shoulders, road side tree plantations, street lighting, traffic signs, traffic signals, intersection elements, interchange elements; Pavement Management as a part of Road Asset Management: Evolution and Development of Pavement Management Systems (PMS), Components of PMS and their inter linkages, Project and Network level PMS.

UNIT II

Flexible Pavement Failures and Maintenance: Flexible Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of surface defects, deformation and disintegration of flexible pavements.

Maintenance of Flexible Pavements: Periodic maintenance: periodic renewals, need and importance of periodic renewals, planning and programming of renewals, identification of stretches to be renewed, types of renewal treatments, periodicity of renewal, rectification of profile at the time of renewal; pothole filling / patching, tools and equipment for pothole / patch repairs, modern mobile mechanized pothole filling/road patching technologies, arrangements for traffic and safety measures during road maintenance, preventive maintenance: introduction, selection of preventive maintenance treatment, warrants for preventive maintenance, flexible pavement preservation tools.

Importance of maintenance: Homogeneous sections by AASHTO's cumulative difference approach, types of maintenance – Preventive maintenance, minor rehabilitation, major rehabilitation, reconstruction; planning of maintenance activities.

UNIT III

Rigid Pavement Failures and Maintenance Rigid Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of joint spalling, faulting, polished aggregate, shrinkage cracking, pumping, linear cracking, durability cracking;

Maintenance of Rigid Pavements: Assessing maintenance needs, methods for repairing concrete pavements, crack sealing and joint resealing, crack stitching (cross stitching), partial-depth repair, full depth repair, slab stabilization, special techniques for rehabilitation of rigid pavements, repair materials, tools and plant, planning the maintenance operations, arrangement for traffic and safety, rigid pavement preservation tools.

UNIT IV

Pavement Evaluation: Pavement Structural Condition Evaluation: Importance of structural condition evaluation of pavements, benkelman beam technique for flexible pavement evaluation, falling weight deflectometer technique for both flexible and rigid pavements

Pavement Functional Condition Evaluation: Importance of functional condition evaluation of pavements, pavement roughness concepts; instrumentation used to assess pavement roughness, international roughness index and its importance, measurement of surface defects in both flexible and rigid pavements

Pavement Safety Condition Evaluation: Pavement texture, importance of surface friction characteristics on pavement safety, discussion on the methods of evaluation of pavement safety

UNIT V

Pavement Performance and Deterioration Modelling: Structural condition (Distress) models, functional condition models, initiation models and progression models; Combined measures of pavement quality, discussions on condition indices and serviceability indices, pavement condition rating, introduction to pavement rating manuals by different agencies.

TEXT BOOKS

1. Kadiyali, LR (1987), Traffic Engineering and Transportation Planning, Khanna Publishers, New Delhi.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. McGraw Hill Book Company, New York.

REFERENCE BOOKS:

1. Papacostas, C. S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning.3rd Edition, Prentice - Hall of India Pvt Ltd.
2. NPTEL videos on Urban Transportation Planning, Dr. V. Tamizh Arasan, IIT Madras
3. Paul.H. Wright (1995), Transportation Engineering – Planning & Design, John Wiley & Sons,New york.
4. John W Dickey (1995), Metropolitan Transportation Planning, Tata McGraw-Hill publishing company Ltd, New Delhi.

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

1. Find the role of Pavement Asset Management.
2. Understand the Flexible and Rigid pavement failures and importance of maintenance.
3. Identify the importance of pavement evaluation.
4. Analyse the methods of evaluation of pavement safety
5. Analyse the pavement performance and deterioration modeling.

CO- PO MAPPING :

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

(A401417) PROJECT MANAGEMENT
(Professional Elective – VI)

B. Tech (CE) VIII Semester

L	T	P	C
3	0	0	3

UNIT I

Introduction: Introduction to Project management – Project Characteristics-Project Life cycle-ProjectIdentification. Formulation and implementation. Project management in different sectors: Construction, Services Sector, Public sector and Government Projects. Systems approach to project management.

UNIT- II

Project Planning and Appraisal: Project Planning – Project Appraisal-Feasibility Study-Technical, Commercial, Economic, Financial, Management, Social Cost Benefit Analysis-Project Risk Analysis.

UNIT- III

Project Finance: Project Cost Estimation, Project Financing-Investment Criteria. Project EvaluationTechniques - Pay Back Period, Accounting rate of return. Net present value, Internal Rate of return, Profitability Index, Cash Flows Estimation for new and replacement projects-Cost of Capital, RiskAnalysis.

UNIT- IV

Project Planning and Control: Planning Steps-Scheduling- Network Diagrams. Network Analysis, Critical Path, Quality Management, Project Execution, Monitoring and control, Agile project Management, Scrum, Lean Production and project management.

UNIT- V

Organizational Behavior and Project Management: Organizational Structure and Integration, Role of Project manager, Roles in the project team, Project stakeholder engagement. Leadership in project management, participative management, team building approach. Conflict Management in Projects, Stress Management.

REFERENCE BOOKS

1. Join M. Nicholas and Herman Steyn, Project Management for Engineering. Business andTechnology, 5e, Routledge, 2017
2. Prasanna Chandra, Projects. Planning, Analysis. Selection. Financing Implementation and review, 6e, TATA Mc Gaw Hill 2008.
3. K. Nagarajan, Project Management, New Age International publishers, 7e 2015.
4. Jack Gido, Jim Clements Rose Baker. Successful Project Management. Cengage Learning, 2015.
5. R Panneerselvam. P. Senthil Kumar, Project Management. PHI, 2009

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

1. Explain the Importance of Project Management.
2. Apply research methods applicable to social science problems
3. Illustrate the Project evaluation techniques.
4. Dicuss the Project Plan, Execution, and implementation.
5. Identify the Implication of teams in projects

CO- PO MAPPING :

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

(A401418) REHABILITATION AND RETROFITTING OF STRUCTURES
(Professional Elective – VI)

B. Tech (CE) VIII Semester

L	T	P	C
3	0	0	3

UNIT – I

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage

UNIT – II

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation.

UNIT – III

Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment – NDT.

UNIT – IV

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting – Shot Create – Underpinning. Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing.

UNIT – V

Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

TEXT BOOKS:

1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
2. Concrete Technology by A.R. Santa kumar, Oxford University press

REFERENCES:

1. Defects and Deterioration in Buildings, EF & N Spon, London
2. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press
3. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H. Ranso, (1981)
4. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B.A. Richardson, (1991).

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

1. identify the preventive measures against damages of structures
2. Assess steel-reinforcement behaviour subject to corrosion & fire
3. Predict damages and distress using NDT techniques
4. Make use of repairing and strengthening techniques for structures
5. Adapt health monitoring techniques for various structures

CO- PO MAPPING :

	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

(A404603) SENSORS AND TRANSDUCERS
(Open Elective – II) (Offered by ECE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT - I

Introduction: Definition, principle of sensing & transduction, classification.

Mechanical and Electromechanical sensor: Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes. Inductive sensor: common types- Reluctance change type, Mutual inductance change type, Magnetostrictive type, material, construction and input output variable, Ferromagnetic plunger type, short analysis.

UNIT-II

Capacitive sensors: variable distance-parallel plate type, variable area- parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type, calculation of sensitivity, Proximity sensor. Stretched diaphragm type: microphone, response characteristics. Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors.

UNIT-III

Thermal sensors: Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermistor material, shape, ranges and accuracy specification. Thermoemf sensor: types, thermoelectric power, general consideration, Junction semiconductor type IC and PTAT type. Radiation sensors: types, characteristics and comparison, Pyro electric type.

UNIT-IV

Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics. Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive celltypes, materials, construction, response. Geiger counters, Scintillation detectors.

UNIT-V

Film Sensors: Thick film and thin film types, Electroanalytic sensors – Electrochemical cell, Polarization types, and membrane electrode types. Biosensors, Smart/Intelligent sensors, Nano-sensors, Nano-tube sensors, molecular and quantum sensors.

TEXT BOOKS:

1. Sensor & transducers, D. Patranabis, 2nd edition, PHI
2. Instrument transducers, H.K.P. Neubert, Oxford University press.
3. Measurement systems: application & design, E.A.Doebelin, McGraw Hill.

REFERENCE BOOKS:

1. Sensor and Transducers, Third Edition, Ian Sinclair, Newnes.
2. Sensor Technology, Hand Book, JON S. Wilson, Newnes.ELSEVIER.
3. Sensor and Transducers, Characteristics, Applications, Instrumentation, Interfacing, Second edition, M.J.Usher and D.A.Keating, MACMILLAN Press Ltd.

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

1. Explain the basic concepts of mechanical and electromechanical sensors, their electrical characteristics.
2. Analyze various capacitor sensors, ultrasonic sensors their electrical characteristics.
3. Compare and elaborate various thermal sensors, principle of operation.
4. Distinguish various magnetic sensors based on their operations, radiation sensors and their operation.
5. Analyze various film sensors and operation of different nano sensors and their applications.

CO_PO Mapping:

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

(A404604) IMAGE PROCESSING
(Open Elective – II) (Offered by ECE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Digital Image Fundamentals: Digital Image fundamentals, Components of Digital Image Processing, Sampling and Quantization, Relationship between pixels.

Image Transforms: 2-D FFT, Properties, Walsh transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform.

UNIT-II

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial domain, Enhancement through point operation,Types of point operation, Histogram manipulation, Linear and nonlinear gray level Transformation, Local or neighborhood operation,Median filter, image Smoothing & Sharpening

Image Enhancement (Frequency Domain): Filtering in Frequency domain, obtaining frequency domain filters from spatial filters, generating filters directly in the frequency domain, image Smoothing&Sharpening.

UNIT-III

Image Restoration: Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least Squares Restoration.

UNIT-IV

Image Segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.

Morphological Image Processing: Dilation and Erosion, Structuring Element Decomposition, Opening and Closing, the Hit or Miss Transformation.

UNIT-V

Image Compression: Redundancies and their removal methods, Fidelity criteria, Image compression models, Huffman and Arithmetic Coding, Error free compression, Lossy compression, Lossy and Lossless Predictive Coding, Transform based Compression, JPEG 2000 Standards.

Text Books:

1. Digital Image Processing – Rafael C. Gonzalez, Rechard E. Woods, 3rd edition. Pearson, 2008
2. Digital Image Processing – S. Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010

Reference Books:

1. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
2. Fundamentals of Digital Image Processing – A. K. Jain, PHI, 1989.
3. Digital Image processing and Computer vision – Somka, Hlavac, Boyle Cengage learning (Indian edition) 2008.
4. Introductory Computer vision Imaging Techniques and Solutions – Adrian low, 2008, 2nd Edition.

5. Introduction to Image Processing & Analysis – John C. Russ, J. Christian Russ, CRC press, 2010.

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

1. Describe the fundamentals of digital image processing.
2. Distinguish between spatial domain enhancement and frequency domain enhancement.
3. Explain various image degradation models for image restoration.
4. Analyze the image restoration and segmentation methods.
5. Discriminate between lossless and lossy compression techniques.

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

(A402603) ELECTRIC VEHICLE TECHNOLOGY
(Open Elective –II) (Offered by EEE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Hybrid Electric Vehicle: Review of Conventional Vehicle: Introduction to Hybrid Electric Vehicles: Types of EVs, Hybrid Electric Drive-train, Tractive effort in normal driving

UNIT-II

Electric Drives: Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains, Electric Propulsion unit, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, switched reluctance motor

UNIT-III

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system, Design of Hybrid Electric Vehicle and Plug-in Electric Vehicle.

UNIT-IV

Energy Management System: Energy Management Strategies, Automotive networking and communication, EV charging standards, V2G, G2V, V2B, V2H. Business: E-mobility business, electrification challenges, Business- E-mobility business, electrification challenges.

UNIT-V

Mobility and Connectors: Connected Mobility and Autonomous Mobility- case study Emobility Indian Roadmap Perspective. Policy: EVs in infrastructure system, integration of Evs in smart grid, social dimensions of Evs. Connectors- Types of EV charging connector, North American EV Plug Standards, DC Fast Charge EV Plug Standards in North America, CCS (Combined Charging System), CHAdeMO, Tesla, European EV Plug Standards.

Text books

1. Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003
2. Husain, I. "Electric and Hybrid Vehicles" Boca Raton, CRC Press, 2010.

Reference Books

1. Larminie, James, and John Lowry, "Electric Vehicle Technology Explained" John Wiley and Sons, 2012
2. Tariq Muneer and Irene IllescasGarcía, "The automobile, In Electric Vehicles: Prospects and Challenges", Elsevier, 2017
3. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer, 2013

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

1. Explain Hybrid Electric Vehicle technology
2. Understand the operation of various Electric Drives used in Hybrid Electric Vehicle
3. Illustrate various energy storage techniques in Hybrid Electric Vehicle
4. Gain Knowledge on Energy Management Strategies in Hybrid Electric Vehicle
5. Understand the different types of Mobility and Connectors in Hybrid Electric Vehicle

	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		

(A402604) BASICS OF POWER PLANT ENGINEERING
(Open Elective – II) (Offered by EEE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Coal Based Thermal Power Plants: Basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems.

UNIT-II

Gas Turbine and Combined Cycle Power Plants: Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

UNIT-III

Basics of Nuclear Energy Conversion: Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

UNIT-IV

Hydroelectric Power Plants: Classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems

UNIT-V

Energy, Economic and Environmental Issues: Power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

TEXT BOOKS:

1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

REFERENCE BOOK:

1. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

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

1. Understand the layout of and various components of Coal Based Thermal Power Plants
2. Understand the operation of Gas Turbine and Combined Cycle Power Plants
3. Illustrate the Nuclear Energy Conversion system
4. Explain the operation and Classification, typical layout and components of Hydroelectric Power Plants
5. Understand the different parameters associated with Energy, Economic and Environmental Issues

CO- PO MAPPING :

	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		

(A405601) FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS
(Open Elective – II) (Offered by CSE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Databases: Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment, Advantages and Disadvantages of DBMS, The Three-Level ANSI-SPARC Architecture, Database Languages, Data Models, Functions of a DBMS, Components of DBMS. Relational Model: Introduction, Terminology, Integrity Constraints, Views. The Relational Algebra: Unary Operations, Set Operations, Join Operations, Division Operation, Aggregation and Grouping Operations.

UNIT-II

SQL: The ISO SQL Data Types, Integrity Enhancement Feature–Domain Constraints, Entity Integrity, Referential Integrity, General Constraints, Data Definition–Creating a Database, creating a Table, changing a Table Definition, removing a Table, Creating an Index, Removing an Index, Views–Creating a View, Removing a View, View Resolution, Restrictions on Views, View Updatability 'WITH CHECK OPTION', Advantages and Disadvantages of Views, View Materialization.

UNIT-III

SQL: Introduction, Data Manipulation–Simple Queries, Sorting Results, Using the SQL Aggregate Functions, Grouping Results, Sub-queries, ANY and ALL, Multi-table Queries, EXISTS and NOT EXIST, Combining Result Tables, Database Updates.

UNIT-IV

Advanced SQL: The SQL Programming Language–Declarations, Assignments, Control Statements, Exceptions, Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers, Recursion.

UNIT-V

Normalization: The Purpose of Normalization, How Normalization Supports Database Design, Data Redundancy and Update Anomalies, Functional Dependencies in brief, The Process of Normalization,1NF, 2NF, 3NF, BCNF.

Textbooks:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill Education, 2003
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw-Hill Education

Reference Books:

1. Thomas M. Connolly, Carolyn E. Begg, Database Systems–A Practical Approach to Design, Implementation, and Management (6e), Pearson publisher
2. RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson publisher

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

1. Describe Database Management System Architecture.
2. Create, update, modify Relational Database Objects.
3. Manipulate data in Relational Database
4. Develop PL/SQL programs using Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers.
5. Explain the purpose of normalization and types Normal forms.

CO- PO MAPPING:

	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		

(A405605) WEB PROGRAMMING
(Open Elective – II) (Offered by CSE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Structuring Documents for the Web: Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups Links and Navigation: Basic Links, Creating Links with the **< a>** Element, Advanced E- mail Links. Images, Audio, and Video: Adding Images Using the **<img>** Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages. Tables: Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables Forms: Introducing Forms, Form Controls, Sending Form Data to the Server Frames: Introducing Frameset, <frame>Element, Creating Links Between Frames, Setting a Default Target Frame Using **<base>**Element, Nested Framesets, Inline or Floating Frames with **<iframe>**. Changing font size, color of text using <font> Element, scrolling text/image using <marquee> Element

UNIT-II

Cascading Style Sheets: Introducing CSS, where you can Add CSS Rules. **CSS Properties**: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model. **More Cascading Style Sheets:** Links, Lists, Tables, Outlines, the: focus and: activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout with CSS, **Page Layout**: Understating the Site's Audience, Page Size, Designing Pages, Coding your Design, Developing for Mobile Devices. **Design Issues:** Typography, Navigation, Tables, Forms.

UNIT-III

Learning JavaScript: How to Add Script to Your Pages, the Document Object Model, Variables, Operators, Functions, Control Statements, Looping, Events, Built- In Objects, Working with JavaScript: Practical Tips for Writing Scripts, Form Validation, Form Enhancements, JavaScript Libraries. Putting Your site on the web: Meta tags, testing your site, Taking the Leap to Live, Telling the World about your site, Understanding your visitors.

UNIT-IV

XML - Introduction, XML Basics, Structuring Data, XML Namespaces, Document Type Definitions (DTDs), W3C XML Schema Documents, XML Vocabularies, Extensible Style sheet Language and XSL Transformations, Document Object Model (DOM).

UNIT-V

Ajax-Enabled Rich Internet Applications: introduction, history of Ajax, traditional web applications Vs Ajax Applications, RIAs with Ajax, Ajax example using XML Http Request object, XML and DOM, creating full scale Ajax-enabled application, Dojo Toolkit.

TEXTBOOK:

1. Jon Duckett, Beginning HTML, XTML, CSS and JavaScript
2. Dietel and Dietel : "Internet and World Wide Web - How to Program", 5th Edition, PHI/Pearson Education, 2011.

REFERENCE BOOKS:

1. Chris Bates, Web Programming
2. M. Srinivasan, Web Technology: Theory and Practice
3. Achyut S. Godbole, AtulKahate, Web Technologies
4. Kogent Learning Solutions Inc, Web Technologies Black Book
5. Ralph Moseley and M. T. Savaliya, Developing Web Applications

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

1. write well-structured, easily maintained, standards-compliant, accessible HTML code.
2. write well-structured, easily maintained, standards-compliant CSS code to present HTML pages in different way
3. use JavaScript to add dynamic content to pages.
4. effectively debug JavaScript code, making use of good practice and debugging tools.
5. use JavaScript to access and use web services for dynamic content (AJAX, JSON, etc.)

CO- PO MAPPING :

	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		

(A403603) FUNDAMENTALS OF MANUFACTURING PROCESSES
(Open Elective – II) (Offered by ME)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

UNIT-II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding. Inert Gas Welding - TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT-III

Hot working, cold working, strain hardening, recovery, recrystallisation, and grain growth. Stamping, forming, and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT-IV

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

UNIT-V

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects –cold forging, swaging, Forces in forging operations.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao / Mc Graw Hill
2. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson.

REFERENCE BOOKS:

1. Metal Casting / T.V Ramana Rao / New Age
2. Métal Fabrication Technology/ Mukherjee/PHI

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

1. Understand the idea for selecting materials for patterns.
2. Learn different types and allowances of patterns used in casting and analyze the components of moulds.
3. Design core, core print and gating system in metal casting processes Understand arc, gas, solid state and resistance welding processes.
4. Develop process-maps for metal forming processes using plasticity principles.
5. Identify the effect of process variables to manufacture defect free products.

CO- PO MAPPING :

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

(A403604) FUNDAMENTALS OF AUTOMOBILE ENGINEERING
(Open Elective – II) (Offered by ME)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction: Components of four-wheeler automobile – chassis and body – power unit – power transmission rear wheel drive, front wheel drive, 4-wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, re boring, decarburization

UNIT-II

Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pumps – Carburetor – types – air filters – petrol injection.
C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection, Classification, Properties, Hybrid vehicles injection timing, testing of fuel, pumps.
Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.

UNIT-III

Electrical System: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.
Ignition System: Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

UNIT-IV

Transmission System: Clutches, principle, types- cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – Gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter.
Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.
Steering System: Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism

UNIT-V

Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.
Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

TEXT BOOKS

1 Automobile Engineering, Vol. 1 & Vol. 2/ Kripal Singh
2 Automobile Engineering, Vol. 1 & Vol. 2 ,by K.M Gupta,Umesh publication

REFERENCE BOOKS

1. A System approach to Automotive Technology by Jack Erjavec YesDee publishing Pvt Ltd.
2. Automobile Engineering / William Crouse
3. Automotive Mechanics / Heitner
4. Alternative fuels of Automobiles by P. Rami Reddy, Frontline publications.

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

1. Identify power generation, transmission and control mechanisms in an automobile
2. Manipulate the chemical, thermal, mechanical and electrical energies in an automobile
3. Infer the interaction between subsystems
4. Analyze how transmission system works
5. Learn different components of suspension systems.

CO- PO MAPPING :

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

(A400603) ENTREPRENEURSHIP
(Open Elective – II) (Offered by MBA)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

UnderstandingEntrepreneurialMindset: The revolution impact of entrepreneurship-The evolution of entrepreneurship- Approaches to entrepreneurship- Process approach- Twenty first centaury trends in entrepreneurship.

UNIT-II

The individual entrepreneurial mind-set and Personality: The entrepreneurial journey-Stress and the entrepreneur-the entrepreneurialego-Entrepreneurialmotivations. Corporate Entrepreneurial Mindset- the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

UNIT-III

LaunchingEntrepreneurialVentures: Opportunities identification-entrepreneurial Imagination and Creativity- the nature of the creativity process-Innovation and entrepreneurship. Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising-hybrid-disadvantage of Franchising.

UNIT-IV

LegalchallengesofEntrepreneurship: Intellectual property protection- Patents, Copyrights-Trade marks and Trade secrets-Avoiding trademark pitfalls. Formulation of the entrepreneurial Plan- The challenges of new venture start-ups, Poor financial Understanding-Critical factors fornewventuredevelopment-TheEvaluationprocess-Feasibility criteriaapproach.

UNIT-V

Strategicperspectivesinentrepreneurship: Strategic planning- Strategicactions-strategic positioning- Business stabilization- Building the adaptive firms-Understanding the growth stage- Unique managerial concern of growing ventures.

Text Books:

1. D F Kuratko and T V Rao "Entrepreneurship- A South-Asian Perspective "Cengage Learning, 1st edition, 2012. (For PPT, Case Solutions Faculty may visit: login.cengage.com)
2. Vasant Desai "Small Scale industries and entrepreneurship" Himalaya publishing, 9th Edition, 2017.
3. Rajeev Roy "Entrepreneurship" 3e, Oxford,2020.
4. B.Janakiramand and M.Rizwana "Entrepreneurship Development: Text & Cases, Excel Books, 1st Edition, 2011.
5. Stuart Read, Effectual Entrepreneur ship, Routledge, 2nd Edition,2016.

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

1. Identify the evolution and approaches of Entrepreneurship.
2. Analyze and develop the conceptualization of corporate Entrepreneurship Personality.
3. Explore different possibilities to start an Enterprise for young Entrepreneurs.
4. Outline challenging benchmarks for formulation of Entrepreneurship.
5. Evaluate the application of Strategic action for growing ventures

CO- PO MAPPING :

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

(A400604) ETHICS IN BUSINESS & CORPORATE GOVERNANCE
(Open Elective – II) (Offered by MBA)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Business Ethics in the Changing Environment: Business Ethics, Levels of BusinessEthics, Myths about Business Ethics, Stages of Moral Development Kohlberg's Study, CarolGilligan'sTheory, Principles ofEthics.

UNIT-II

Professional Ethics: Introduction to Professional Ethics, Ethics in Production andProduct Management, Ethics of Marketing Professionals, Ethics in HRM, Ethics of Finance and Accounting Professionals, Ethics of Advertisement, Ethics of Media Reporting, Ethics of Healthcare Services. Ethical Dilemma, Mounting Scandals, Ethical Issues, Preparatory Ethics: ProactiveSteps, CyberEthics.

UNIT-III

Corporate Governance: Introduction to Corporate Governance, Major CorporateGovernance Failures, Need for Corporate Governance, Corporate Governance in India, Theories of Corporate Governance: Agency Theory, Stewardship Theory and Stakeholder Theory, Problems of Governance in Companies, Role of Capital Markets, Regulator, Government inCorporateGovernance.

Corporate Governance Codesand Committees: Global Reporting Initiative, OECD Principles, Cadbury Committee Report, Kumara Mangalam Birla Committee Report, NareshChandra Committee Report, Narayana Murthy Committee Report, SEBI Clause 49 Guidelines, Corporate Governance Committees.

UNIT-IV

Role of Board: Types of Directors Functions of the Board, Structure of the Board, Role of the Board in Subcommittees, Audit, Compensation Committee, Role, Duties and Responsibilities of Directors, Conflicts of Interest, Remedial Actions. Governance Ratings, Merits and Demerits of Governance Ratings.

UNIT-V

Corporate Social Responsibility (CSR): Models for Implementation of CSR, Scopeof CSR, Steps to attain CSR, Business Council for Sustainable Development (BCSD) India, Ethics and Social Responsibility of Business, Social Responsibility and Indian Corporations, CSR as a Business Strategy for Sustainable Development, CSR Committee, Recent Amendments in Companies Act (Sec:135).

Reference Books

1. JyotsnaGB, RC Joshi, Business Ethicsand CorporateGovernance, TMH,1e, 2019.
2. Martin J. Ossewaarde, Introduction to Sustainable Development, sage,1e,2018.
3. T.N. Sateesh Kumar, Corporate Governance, Oxford University Press,2015.
4. S K Mandal, Ethicsin Businessand Corporate Governance, TMH,2/e,2017.
5. Archie.B Carroll, Business Ethics-Brief Readings on Vital Topics, Routledge,2013.
6. A.C. Fernando, Corporate Governance: Principles, Policies and Practices, 2nd Edition, Pearson,2018.
7. C.S.V. Murthy, Business Ethics, 1st Edition, Himalaya PublishingHouse,2019.

8. N. Balasubramanian, Corporate Governance and Stewardship, TMH,2012.
9. Nina Godbole & Sunit Belapure, Cyber Security, wileyindia, 2012.
10. Joseph W. Weiss,Business Ethics,Thomson,2006.
11. Geethika, R K Mishra, Corporate Governance Theory and Practice, Excel,2013.
12. Dr.S.S.Khanka,BusinessEthicsandCorporateGovernance,S.Chand,2013.
13. Praveen Parboteeach, Business Ethics, Routledge,2019.
14. Praveen B Malla, Corporate Governance, Routledge 2016.

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

1. Understand the Need for Business Ethics and Corporate Governance in India.
2. Apply Knowledge of Established Methodologies of Solving Professional Ethical Issues.
3. Learn Codes and Committees in Corporate Governance.
4. Understand the Role of Board in Corporate Governance.
5. Assess the Stakeholder perspective of Corporate Governance.

CO- PO MAPPING :

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

(A401603) REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEMS
(Open Elective-II) (Offered by CE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT - I:

Introduction to Photogrammetry: Principles and types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement to single vertical aerial photograph, height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT- II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT- III

Geographic Information System: Introduction to GIS; components of a GIS; Geo spatial Data: Spatial Data- Attribute data-Joining Spatial and attribute data; GIS Operations: Spatial Data Input, Attribute data Management, Data display Data Exploration, Data Analysis.

Coordinate Systems: Geographic coordinate System: approximation of the Earth, Datum; Map Projections: Types of Map Projections – Map projection parameters – Commonly used Map Projections- Projected Coordinate Systems.

UNIT- IV

Vector Data Model: Representation of simple features, Topology and its importance; coverage and its data structure, Shape fire; Data models for compost feature Object Based Vector Data Model; Classes and their Relationship; The geo-base data model; Geometric representation of Spatial Feature and data structure, Tomography rules

UNIT- V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion, Integration of Raster and Vector data.

Data Input: Metadata, on version of Existing data, creating new data; remote sensing data, filed data.

TEXT BOOKS:

1. Remote Sensing and GIS, M. Anji Reddy JNTU Hyderabad, B.S. Publications.
2. Basics of remote sensing & GIS by A. Kumar, Laxmi publications.

REFERENCE BOOKS:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W Young, PHI.
2. Introduction to GIS, Kang, Tsurg Charg.Tata McGraw Hill Education Private Ltd.

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

1. Illustrate the principles of photogrammetry
2. Make use of remote sensing process
3. Utilize GIS principles in real life
4. Explain the concepts of topology, OBVDM and tomography
5. Develop the geospatial data model with various file formats

CO-PO Mapping:

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

(A401604) SOLID WASTE MANAGEMENT
(Open Elective – II) (Offered by CE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

SolidWaste: Definitions, Types of solid wastes, sources of solidwastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solidwastes, Elements of solid waste management -Integrated solid waste management, Solid Waste Management Rules 2016.

UNIT-II

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage andprocessing; collection of solid wastes; Stationary container system and Hauled container systems – Routeplanning-transferand transport; processingtechniques.

UNIT-III

Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recoverysystems; recovery of biological conversion products – Composting, pre and post processing, types ofcomposting, Critical parameters, Problems with composing - recovery of thermal conversion products; Pyrolisis, Gasification, RDF-recovery of energy from conversion products; materials and energy recovery systems.

UNIT-IV

Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life oflandfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control –Monitoringlandfills– Landfillsreclamation.

UNIT-V

Hazardous waste Management: Sources and characteristics, Effects on environment, Risk assessment –Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal,E-waste management, NuclearWastes,IndustrialwasteManagement

TEXTBOOKS:

1. Tchobanoglous G, Theisen H and Vigil S A ‘Integrated Solid WasteManagement, Engineering Principles and Management Issues’ McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, ‘Solid Waste Engineering’ Brooks/Cole ThomsonLearning Inc., 2002.

REFERENCE BOOKS:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, ‘Environmental Engineering’, Mc Graw Hill Inc., NewYork, 1985.
2. QianX, Koerner R M and Gray D H, ‘Geotechnical Aspects of Land fill Design and Construction’ Prentice Hall, 2002.

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

1. Explain the sources of solid waste and its impact.
2. Describe the process of solid waste and its management
3. Identify engineering systems for resource and energy recovery.
4. Classify the types and Construction of landfills.
5. Identify and design various waste disposal systems

6. Illustrate the process of handling hazardous wastes
7. Classify various biomedical waste management systems
8. Apply e-waste management techniques

CO- PO MAPPING ;

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

(A404605) FUNDAMENTALS OF EMBEDDED SYSTEMS
(Open Elective – III) (Offered by ECE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems

UNIT-II

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, Memory, ROM, RAM, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: On-board and External Communication Interfaces.

UNIT-III

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT-IV

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT-V

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization issues, Task Synchronization Techniques, Device Drivers

Textbook:

1. Introduction to Embedded Systems – Shibu K.V. McGraw Hill
2. Embedded Systems – Raj Kamal, TMH

Reference Books:

1. Embedded System Design – Frank Vahid, Tony Givargis, John Wiley.
2. Embedded Systems – Lyla, Pearson, 2013
3. An Embedded Software Primer- David E Simon, Pearson Education

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

1. Explain the basics of embedded systems and classify its applications
2. Compare various types of memories, sensors and Input / Output devices.
3. Summerize the embedded firmware for various applications.
4. Interpret the characteristics of Real time operating Systems
5. Illustrate the concepts of shared memory and task communications

CO-PO MAPPING:

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

(A404606) DATA COMMUNICATIONS
(Open Elective – III) (Offered by ECE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction to data communications, networking, signals, noise, modulation and demodulation. Data communication network architecture, layered network architecture, open systems interconnection, data communications circuits, serial and parallel data transmission, data communications circuit arrangements, data communication networks, alternate protocol suites. Information capacity, bits, bit rate, baud, and M-ARY encoding.

UNIT-II

Metallic cable transmission media & optical fiber transmission media: metallic transmission lines, transverse electromagnetic waves, characteristics of electromagnetic waves, transmission line classifications, metallic transmission line types, metallic transmission line equivalent circuit, wave propagation on metallic transmission lines, metallic transmission line losses, block diagram of an optical fiber communications system, optical fiber versus metallic cable facilities.

UNIT-III

Digital transmission & multiplexing and t-carriers digital transmission: pulse modulation, pulse code modulation, dynamic range, signal–to-quantization noise voltage Ratio, linear versus nonlinear PCM codes

Multiplexing: Time- division multiplexing, t1 digital carrier system, north American digital multiplexing hierarchy, digital line encoding, t carrier systems, European digital carrier system, statistical time – division multiplexing, frame synchronization, frequency- division multiplexing, wavelength- division multiplexing, synchronous optical network

UNIT-IV

Telephone instruments and signals: The subscriber loop, standard telephone set, basic telephone call procedures, call progress tones and signals, cordless telephones, caller id, electronic telephones, paging systems.

The telephone circuit: The local subscriber loop, telephone message- channel noise and noise weighting, units of powers measurement, transmission parameters and private-line circuits, voice-frequency circuit arrangements, crosstalk.

UNIT-V

Data communication codes, bar codes, error control, error detection, error correction, data formats, data communications hardware, character synchronization.

Text Books:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.

Reference Books:

1. Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.Tmh.
2. Computer Communications and Networking Technologies, Gallow, Secondedition Thomson
3. Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education

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

1. Explain the basic concepts of data communication systems.
2. Distinguish various types of transmission medias for data communications.
3. Compare different multiplexing techniques for digital transmission
4. Analyze different telephone instruments, signal and circuits
5. Identify different error detecting and correcting codes.

CO-PO MAPPING:

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

(A402605) NANO TECHNOLOGY
(Open Elective – III) (Offered by EEE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

INTRODUCTION: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

UNIT-II

UNIQUE PROPERTIES OF NANOMATERIALS: Microstructure and Defects in Nano crystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and declinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. Magnetic Properties: Soft magnetic nano crystalline alloy, Permanent magnetic nano-crystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT-III

SYNTHESIS ROUTES: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method, Self-assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing, Spark plasma sintering.

UNIT-IV

TOOLS TO CHARACTERIZE NANO MATERIALS: X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNIT-V

APPLICATIONS OF NANOMATERIALS: Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, WaterTreatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Défense and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T. Pradeep, McGraw- Hill Education.

2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press 2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press

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

1. Classify nanostructured materials
2. Illustrate the characteristics and properties of nano-materials.
3. Identify the synthesis routes of nano-materials
4. Make use of the tools to characterize the nano-materials.
5. Utilize the nano-materials for various applications

CO-PO MAPPING:

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

(A402606) EV BATTERIES & CHARGING SYSTEM
(Open Elective – III) (Offered by EEE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Battery parameters: Cell and battery voltages, Charge (or Amphour) capacity, Energy stored, Energy density, Specific power, Amphour (or charge) efficiency, Energy efficiency, Self-discharge rates, Battery geometry, Battery temperature, heating and cooling needs, Battery life and number of deep cycles

UNIT-II

EV Batteries: Lead Acid Batteries Lead acid battery basics, Special characteristics of lead acid batteries, Battery life and maintenance, Battery charging, Summary Nickel-based Batteries Introduction, Nickel cadmium, Nickel metal hydride batteries

UNIT-III

Sodium, Lithium and Metal air batteries: Sodium-based Batteries Introduction, Sodium sulphur batteries, Sodium metal chloride (Zebra) batteries Lithium Batteries Introduction, The lithium polymer battery, The lithium ion battery Metal Air Batteries Introduction, The aluminium air battery, The zinc air battery

UNIT-IV

Charging Infrastructure: Domestic Charging Infrastructure, Public Charging Infrastructure, Normal Charging Station, Occasional Charging Station, Fast Charging Station, Battery Swapping Station, Move-and-charge zone.

UNIT-V

EV Charging Battery Chargers: Charge equalisation, Conductive (Basic charger circuits, Microprocessor based charger circuit. Arrangement of an off-board conductive charger, Standard power levels of conductive chargers, Inductive (Principle of inductive charging, Soft-switching power converter for inductive charging), Battery indication methods

Text books

1. James Larminie Oxford Brookes University, Oxford, UK John Lowry Acenti Designs Ltd., UK, Electric Vehicle Technology Explained
2. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.

Reference Books:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
2. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

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

1. Gain knowledge on various battery parameters
2. Classify different types of EV batteries
3. Illustrate Sodium, Lithium and Metal air batteries
4. Understand the different types of Charging Infrastructure.
5. Understand the operation of EV Charging Battery Chargers

CO-PO MAPPING:

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

(A405603) FUNDAMENTALS OF COMPUTER NETWORKS
(Open Elective – III) (Offered by CSE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Fundamental of Data Communication and Computer Network: Components, Data Representation, Data Flow, Data and Signal, Classification Network: LAN, WAN, MAN,
Network Architecture: Peer to Peer, Client Server Network, History of Internet.

UNIT-II

Network Model: OSI Reference Model and TCP/IP Protocol Suit
Network Connecting Devices: Hub, Switch, Router, Repeater, Bridge, Gateway, Modem
Network Topologies: Types of Topology-Bus, Ring, Star, Mesh, Tree, Hybrid, and IEEE Standards.

UNIT-III

Physical Layer: Guided Transmission Media and Unguided Transmission Media
Data Link Layer: Design Issues, Error Detection and Correction, Simplex Stop and wait protocol.

UNIT-IV

Network Layer: Design Issues, Routing Algorithm: Shortest Path Routing algorithm, Congestion Control, IPv4, IPv6, DHCP
Transport Layer: Process to process Delivery, Addressing, UDP and TCP, Error control and flow control.

UNIT-V

Application Layer: Domain Name System, E-Mail, FTP, WWW and Http.
Network Security: Cryptography, Symmetric Key and Public Key, Firewall, VPN, Web Security

Textbooks:

1 Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition.Pearson Education/PHI
2 Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.

Reference Books:

1. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.
2. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson
3. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016.

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

1 Explain the Data in communication and two types of networks architecture.
2 Compare OSI Reference model and TCP/IP Protocol Suit and able to Sketch the different topologies and network connecting devices.
3 Describe about Transmission media in Physical layer and Analyze the Error detection and correction methods in Data link layer.
4 Apply knowledge in developing routing algorithm and Explain transport layer protocols.
5 Examine the Application layer Protocols and Analyze various network security approaches.

CO-PO MAPPING:

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

(A405606) Fundamental of DEVOPS
(Open Elective – III) (Offered by CSE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT-II

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.
DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT-III

Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT-IV

Integrating the system: Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT-V

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven developmentDeployment of the system: Deployment systems, Virtualization stacks, code execution at the client,
Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXTBOOKS:

1 Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2 Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOK:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10

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

1. Identify components of Devops environment
2. Describe Software development models and architectures of DevOps
3. Apply different project management, integration, testing and code deployment tool
4. Investigate different DevOps Software development models
5. Assess various Devops practices and collaborate and adopt Devops in real-time projects

CO-PO MAPPING:

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

(A403605) INDUSTRIAL SAFETY ENGINEERING
(Open Elective – III) (Offered by ME)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT-II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TEXT BOOKS

1 Mobley, R. Keith, Lindley R. Higgins, and Darrin J. Wikoff. *Maintenance Engineering Handbook*. New York, NY: Mcgraw-Hill, 2008.
2 Garg, H. P. *Industrial Maintenance*. S Chand, 1976.

REFERENCE BOOKS:

1 Graham, F. D. "Audels Pumps, Hydraulics and Air Compressors. Theo." (1998).
2 Winterkorn, Hans F., and Hsai-Yang Fang. *Foundation engineering handbook*. Springer, Boston, MA, 1991.

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

1. Understand various hazards and their prevention.
2. Apply maintenance techniques to various equipment's.
3. Understand types of wear and corrosions and their prevention.
4. Explain fault tracing and its applications.
5. Apply periodic and preventive maintenance techniques to various equipment's.

CO-PO MAPPING:

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

(A403606) WASTE TO ENERGY
(Open Elective – III) (Offered by ME)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT-II

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-IV

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V

Biogas: Properties of biogas (Calorific value and composition), Biogas plant technology and status, Bio energy system, Design and constructional features, Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion, Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

TEXT BOOKS:

1 Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2 Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

REFERENCE BOOKS:

1 Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2 Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons,1996.

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

1. Understand different Conversion Devices.
2. Explain Biomass Pyrolysis.
3. Understand the working Principle of biomass gasification
4. Explain Biomass Combustion.
5. Know the application of Bio Gas.

CO-PO MAPPING:

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

(A400605) BASICS OF MARKETING
(Open Elective – III) (Offered by MBA)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Understanding Marketing Management: Concepts of Marketing, Marketing Strategies & Plans, Creatinglong term Loyalty relationships, Marketingmix, Product Life Cycle.

UNIT-II

Connecting with Customers & Building Strong Brands: Analyzing Competitors, Conducting Marketing Research, Consumer Behaviour, Identifying market segments and targets, crafting Brand Positioning.

UNIT-III

New Product and Promotions: Introducing New Market Offering, Developing Pricing Strategies & Programmes, Designing & Managing Integrated Marketing Communications, Advertising & Sales Promotions, Managing Digital Communication – Online, Social Media & Mobile, Personal Selling.

UNIT-IV

Delivering Value: Managing Retailing, Wholesaling and logistics, Designing and ManagingIntegratedMarketing Channels.

UNIT-V

Sales Management: Nature and Importance of Sales Management, Skills of Sales Manager, Sales objectives, Concepts of Sales organization, Type of Sales organization.

Textbooks:

1. Marketing Management, Philip Kotler, Kevin Lane Keller, Pearson

References:

1 Rosalind Masterson, Nichola Philips, David Pickton, Marketing: An Introduction, 5e, Sage Publications, 2021.
2 G. Shainesh Philip Kotler, Kevin Lane Keller, Alexander Cherneb, Jagdish N Sheth, Marketing Management, 16e, Pearson, 2022.
3 Lamb, Hair, Sharma, Mc Daniel: MKTG, A South Asian Perspective, Cengage Learning, 2016. (For PPT, Case Solutions, video cases, Faculty may visit: login.cengage.com)
4 Philip Kotler, GrayArmstrong, Principles of Marketing, Pearson Education, 18e,2020.
5 Ramaswamy, Namakumari, Marketing Management, Sage Publications,6e,2018.
6 Lamb, Hair, Sharma, Mc Daniel, Principles of Marketing: A South Asian Perspective, Cengage Learning, 2016.
7 Paul Baines, Chris Fill, Kelly Page, Piyush Sinha, Marketing, Asian Edition, Oxford University Press, 2015.
8 ArunKumar & N. Meenakshi, Marketing Management, Vikas,3e,2016
9 Rajan Saxena, Marketing Management, Tata Mc Graw Hill, 3e, 2012.

COURSEOUTCOMES: On completion of the course students will be able to

1. Analyze the scope, concepts of Marketing and forecasting techniques in present Global Market Environment.
2. Outline marketing research, consumer behaviour, segmentation and targeting.
3. Develop conceptual knowledge on new product development, marketing mix andpromotional mix
4. Illustrate marketing channels of distribution and logistics
5. Identify the skillsand importanceof salesmanagement.

CO-PO MAPPING:

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

(A405607) CLOUD COMPUTING
(Open Elective – III) (Offered by CSE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing,Nano computing.

UNIT-II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Needfor Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, CloudComputing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four CloudDeploymentModels.

UNIT-III

Cloud Computing Architecture and Management: Cloudarchitecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases ofCloudMigrationApproaches forCloudMigration.

UNIT-IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Prosand Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other CloudServiceModels.

UNIT-V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, CloudStorage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue, service, Microsoft, Windows Azure

TEXTBOOKS:

1. Essentials of cloud Computing: K. Chandrasekhran, C R C press,2014

REFERENCE BOOKS:

1 Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej
2 M. Goscinski, Wiley, 2011.
3 Distributed and Cloud Computing, KaiHwang, Geoffery C. Fox, JackJ. Dongarra, Elsevier,2012.
4 Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

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

1. ExplainDistributedSystem Modeling, Clustering and Virtualization
2. Discussbasicconceptsofcloud computing.
3. Distinguish Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS/SAAS).
4. Design & implement cloud computing applications.
5. Explore some important cloud computing driven commercial systems.

CO- PO MAPPING:

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

(A401605) ENERGY EFFICIENT BUILDINGS
(Open Elective – III) (Offered by CE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

Climates and buildings, Thermal properties and energy content of building materials, Psychrometry, thermalcomfort: Criteria and various parameters, Airconditioning systems, Energy conservation techniques in Air conditioning systems. Climate and comfort zones, Introduction to the design of shading devices, Overhangs. Factors that effects energy use in buildings: ventilation and its significance.

UNIT-II

Passive and active methods of heating and cooling, Passive heating concepts: direct heat gain, indirect heat gain, isolated gain and sunspaces. Passive cooling concepts: evaporative cooling, radiative cooling; application of wind, water and earth for cooling; shading, paints and cavity walls for cooling; roofradiationtraps; earth air-tunnel.

UNIT-III

Heat transmission in buildings: surface co-efficient: air cavity, Internal and external surfaces Overall thermal transmittance, Wall and windows; Heat transfer due to ventilation / infiltration, Internal heattransfer; Decrementfactor; Phase lag; Lighting (Day lighting and Electric lighting), Design of daylighting, Concept of solar temperature and its significance.

UNIT-IV

Estimation of building loads, Steady state method, Network method, Numerical method, Correlations. Energy conservation through site selection, Planning and design; Siting and orientation Green buildings, Zero emission buildings. Energy Efficient Landscape Design: Modification of micro climatic through landscape element for energy conservation.

UNIT-V

Bioclimatic classification of India; Passive concepts appropriate for the various climatic zones in India; Typical design of selected buildings in various climatic zones; Thumb rules for design of buildings andbuilding codes Energy Efficient Landscape Design: Modification of microclimatic through landscapeelementfor energyconservation

TEXT BOOKS:

1 Tiwari GN, Goyal RK,Green houseTechnology: Fundamentals, Design Modeling and Application, Narosa Publishing House.
2 KriederJ, Rabi A, Heating and Cooling of Buildings: Design for Efficiency, Mc GrawHill.

REFERENCE BOOKS:

1. Archie, CulpW, Principles of Energy Conservation, Mc GrawHill.
2. Callaghan PO, Energy Management, McGraw-HillBookCompany.
3. Williams JR, Passive Solar Heating, Ann Arbar Science.
4. Majumder Milli, Energy Efficient Buildings, TERI, New Delhi.

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

1. Identify different energy conservation techniques in air conditioning systems
2. demonstrate a good ability to calculate the energy balance of buildings
3. assess potential conflict between energy conservation and indoor climate for different energy saving measures
4. evaluate save energy for building technology and building services engineering
5. design different buildings in various climatic zones

CO-PO MAPPING:

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

(A401606) ENVIRONMENTAL POLLUTION
(Open Elective – III) (Offered by CE)

B. Tech (CE)

L	T	P	C
3	0	0	3

UNIT-I

AirPollution: Airpollution Control Methods– Particulate control devices–Methods of Controlling Gaseous Emissions–Air quality standards. Noise Pollution: Noise standards, Measurement and control methods –Reducing residential and industrial noise–ISO: 14000.

UNIT-II

Industrial waste water Management: Strategies for pollution control Volume, and Strength reduction–Neutralization–Equalization–Proportioning–Common Effluent Treatment Plants– Recirculation of industrial wastes– Effluent standards.

UNIT-III

Solid Waste Management: Solid Wast eManagement: solidwaste characteristics–basics of on-site handling and collection– separation and processing– Incineration-Composting-Solidwastedisposalmethods–fundamentals of Land filling. Hazardous Waste: Characterization– Nuclearwaste– Biomedical wastes– Electronic wastes– Chemical wastes–Treatment and management of hazardouswaste- Disposal and Control methods.

UNIT-IV

EnvironmentalSanitation: Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, RuralSanitation-low costwastedisposalmethods.

UNIT-V

SustainableDevelopment: Sustainable Development: Definition-elements of sustainable developments- Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability– Industrialization and sustainable development– Cleaner production in achieving sustainability- sustainable development.

Text Books

1. Peavy, H.S., Rowe, D.R, Tchobanoglous, "Environmental Engineering", G. Mc-Graw Hill International Editions, NewYork 1985..
2. G. Henry and G.W. Heinke, "Environmental Science and Engineering", Pearson Education.

Reference Books

1 G. L. Karia and R.A. Christian, "Waste water treatment-concepts and design approach", Prentice Hall of India

2 M.N. Rao and H.V.N. Rao, "Airpollution", Tata Mc.GrawHill Company.

3 Ruth F. "Weiner and Robin Matthews Environmental Engineering", 4th Edition Elesevier, 2003.

4 K. V. S. G. Murali Krishna, "Air Pollution and Control" by, Kousal & Co. Publications, New Delhi.

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

1. define the air pollution control methods
2. able to evaluate Volume and Strength reduction
3. identify the different ways to dispose Solid waste
4. Identify the sanitation methods.
5. Products that accelerate more sustainable lifestyles

CO-PO MAPPING:

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

(A401804) PROJECT STAGE –II

B. Tech (CE) VIII-Semester

L	T	P	C
0	0	18	9

(A401805) TECHNICAL SEMINAR

B. Tech (CE) VIII-Semester

L	T	P	C
0	0	4	2