

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 <u>Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)</u>

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		BSC – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2	Foundation Courses	ESC - Engineering Sciences	Includes Fundamental Engineering Subjects
3	(FnC)	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	Flective	PEC – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6	Courses (E&C)	OEC – Open Electives	Elective subjects which include inter- disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.

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

4.0 Course Registration

- **4.1** A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.
- 4.2 The academic section of the college invites 'registration forms' from students before the beginning of the semester through 'on-line registration', ensuring 'date and time stamping'. The online registration requests for any 'current semester' shall be completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'.
- **4.3** A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor/counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor/ Counselor and the student.
- **4.4** A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA/ CGPA, and completion of the '**pre-requisites**' as indicated for various subjects/ courses, in the department course structure and syllabus contents.
- **4.5** Choice for 'additional subjects/courses', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Mentor/HOD.
- **4.6** If the student submits ambiguous choices or multiple options or erroneous entries during **online** registration for the subject(s) / course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.
- **4.7** Subject/ course options exercised through **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered.

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

- **4.8** Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.
- **4.9 Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.
- **4.10 Professional Electives**: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

5.0 Subjects/ courses to be offered

- **5.1** A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.
- 5.2 More than **one faculty member** may offer the **same subject** (lab/ practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice for students will be based on 'first come first serve basis and CGPA criterion' (i.e. the first focus shall be on early **on-line entry** from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).
- **5.3** If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject/ course for **two (or multiple) sections**.
- 5.4 In case of options coming from students of other departments/ branches/ disciplines (not considering open electives), first priority shall be given to the student of the 'parent department'.

6.0 Attendance requirements:

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

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

- **6.2** Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.
- 6.3 A stipulated fee shall be payable for condoning of shortage of attendance.
- 6.4 Shortage of attendance below 65% in aggregate shall in NO case be condoned.
- 6.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled, including all academic credentials (internal marks etc.) of that semester. They will not be promoted to the next semester. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the same set of elective subjects offered under that category.
- 6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0 Academic Requirements

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

- 7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that subject/ course.
- 7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Mini Project (or) Internship (or) Technical Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time ResearchProject (or) Field Based Research Project (or) Mini Project (or) Internship (or) Technical Seminar evaluations.

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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.

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to	Regular course of study of first year first
	first year second semester	semester.
2	First year second semester to	(i) Regular course of study of first year
	Second year first semester	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	Regular course of study of fourth year first
	Fourth year second semester	semester.

7.3 **Promotion Rules**

- 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 \geq 5.0 (in each semester), and CGPA \geq 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 $\geq 35\%$ (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 $\geq 35\%$ (14 marks) of 40 Continuous Internal Examination (CIE) marks.

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

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

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

- 2. II Year II Semester *Real-Time (or) Field-based Research Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.
- 8.5 There shall be Industry training (or) Internship (or) Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal in collaboration with an industry of their specialization. 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 of approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his project work.
- 8.8 UG project work shall be carried out in two stages: Project Stage I for approval of

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

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

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

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

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

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

- **8.11** A student shall be given only one time chance to re-register for a maximum of two subjects in a semester:
 - If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Vivavoce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.

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

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

9.0 Grading Procedure

- **9.1** Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/Practicals/ Mini Project/Internship/SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.
- **9.2** As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

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

- **9.3** A student who has obtained an '**F**' grade in any subject shall be deemed to have '**failed**' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.
- **9.4** To a student who has not appeared for an examination in any subject, '**Ab**' grade will be allocated in that subject, and he is deemed to have '**Failed**'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.
- **9.5** A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.
- **9.6** A student earns Grade Point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'Credit Points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

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

- 9.7 A student passes the subject/ course only when $GP \ge 5$ ('C' grade or above)
- 9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects/ courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

SGPA = {
$$\sum_{i=1}^{N} C_i G_i$$
 } / { $\sum_{i=1}^{N} C_i$ } For each semester,

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

9.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses (of 160) in **all** semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

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

(i.e., up to and inclusive of S semesters, $S \ge 2$),

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 1st semester onwards up to and inclusive of the 8th 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 jth subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that jth 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.

Course/Subject	Credits	Letter	Grade	Credit
Course/Subject	Creates	Grade	Points	Points
Course 1	4	А	8	$4 \times 8 = 32$
Course 2	4	0	10	$4 \ge 10 = 40$
Course 3	2	С	5	$2 \ge 5 = 10$
Course 4	3	В	6	$3 \times 6 = 18$
Course 5	1	A+	9	$1 \times 9 = 9$
Course 6	1	С	5	$1 \ge 5 = 5$
Course 7	1	0	10	$1 \ge 10 = 10$
Course 8	2	А	8	$2 \times 8 = 16$
Course 9	1	$\overline{\mathrm{B}}^+$	7	$1 \times 7 = 7$

Illustration of calculation of SGPA:

B.Tech- R22 Academic Regulations

Course 10	1	B^+	7	$1 \ge 7 = 7$
	20			154

SGPA = 154/20 = 7.7

-			Letter	Corresponding	Credit
Semester	Course/	Credits	Grade	Grade Point	Points
	Subject Title	Allotted	Secured	(GP)	(CP)
Ι	Course 1	4	А	8	32
Ι	Course 2	4	0	10	40
Ι	Course 3	2	В	6	12
Ι	Course 4	3	А	8	24
Ι	Course 5	1	A+	9	9
Ι	Course 6	1	С	5	5
Ι	Course 7	1	В	6	6
Ι	Course 8	2	А	8	16
Ι	Course 9	1	С	5	5
Ι	Course 10	1	0	10	10
II	Course 11	2	B+	7	14
II	Course 12	4	В	6	24
II	Course 13	4	А	8	32
II	Course 14	3	0	10	30
II	Course 15	1	А	8	8
II	Course 16	1.5	С	5	7.5
II	Course 17	1.5	0	10	15
II	Course 18	1.5	B+	7	10.5
II	Course 19	1.5	В	6	9
III	Course 20	4	А	8	32
III	Course 21	3	B+	7	21
III	Course 22	3	А	8	24
III	Course 23	3	0	10	30
III	Course 24	3	А	8	24
III	Course 25	2	С	5	10
III	Course 26	1	0	10	10
III	Course 27	1	B+	7	7
	Total Credits	60		Total Credit Points	467

Illustration of Calculation of CGPA up to 3rd Semester:

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 $GP \ge 5$ ('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
 - 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

- A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B.Tech. II Year II Semester, if the student want to exit the 4-Year B.Tech. program and *requests for the 2 -Year* B. Tech. (UG) Diploma Certificate.
- 2. The student once opted and awarded 2-Year UG Diploma Certificate, the student will be permitted to join in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. *However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.*
- 3. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech. program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.
- 4. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0 Withholding of results

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

student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0 Transitory Regulations

- A. For students detained due to shortage of attendance:
 - 1. A Student who has been detained in I year of R18 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.
 - 2. A student who has been detained in any semester of II to VIII semesters of R18 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.
- B. For students detained due to shortage of credits:
 - 3. A student of R18 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of R22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.
- C. For readmitted students in R22 Regulations:
 - 4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
 - 5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. There is NO exemption of credits in any case.
 - 6. If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the Board of Studies.
 - 7. The total credits required are 160 including both R18 & R22 regulations, and if the total credits are less than 160 including both R18 & R22 Regulations then an additional course(s) suggested by the Board of Studies may be given to fulfill the minimum requirements of 160 credits.

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

subjects/topics for the benefit of the students.

15.0 Student Transfers

- **15.1** There shall be no Branch transfers after the completion of Admission Process.
- **15.2** Transfer of candidates from other Institutions will be governed by the regulations of Telangana State Government issued from time to time.
- **15.3** The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the students have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.
- **15.4** The transferred students from other Universities/Institutions to JNTUH affiliated colleges who are on rolls are to be provided one chance to write the CBT (for internal marks) in the equivalent subject(s) as per the clearance letter issued by the University.
- **15.5** The autonomous affiliated colleges have to provide one chance to write the internal examinations in the equivalent subject(s) to the students transferred from other universities/institutions to JNTUH autonomous affiliated colleges who are on rolls, as per the clearance (equivalence) letter issued by the University.

16.0 Scope

- i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".
- ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".
- iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.
- iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal/College Academic Council/Honourable Vice-Chancellor of JNTUH is final.
- v) The College may change or amend the Academic Regulations, Course Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all Students with effect from the dates notified by the College Authorities.

ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME)

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

1. <u>Eligibility for the award of B.Tech Degree (LES)</u>

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 \geq 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).

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to	Regular course of study of second year
	second year second semester	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.

5. <u>Promotion rule</u>

- 6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).
- 7. LES students are not eligible for 2-Year B. Tech. Diploma Certificate.

MALPRACTICE RULES

Disciplinary Action for Malpractices/Improper Conduct in Examinations

	Nature of Malpractices/ Improper	Punishment	
	conduct	1 นการกากเราน	
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	Cancellation of the performance in that subject
6.	requesting him to award pass marks 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

- 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

Program Educational Objectives (PEOs):

- 1. Excel in their professional career and higher education in their related fields.
- 2. Exhibit professionalism through leadership, communication skills and team work.

3. Adapt to emerging trends for sustained growth and exhibit social responsibility and professional ethics.

Program Outcomes (POs):

- 1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

- 1. Graduates will have an ability to apply knowledge in identification, formulation and understanding the problem related to Civil Engineering.
- 2. Execution at optimum cost, with quality using appropriate tools adopting safety norms with an inclination towards social issues and research.

CMR COLLEGE OF ENGINEERING & TECHNOLOGY (UGC AUTONOMOUS) B. Tech- Civil Engineering CBCS & OUTCOME BASEDI-YEAR COURSE STRUCTURE & SYLLABUS (Effective for the students admitted into I year from the Academic Year 2022-23)

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

	SEMESTER - III													
S.	Course	C TH		Η	ours p Week	er	dits	Maxi Ma	mum rks					
No	Code	Course Title	Category	L	T	Р	Cree	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													
		SENIES I					1							
s.	Course	Course Title	Category	Н	ours p Week	er	dits	Maxi Ma	mum rks					
S. No	Course Code	Course Title	Category	H L	ours p Week T	er P	Credits	Maxi Ma CIE	mum rks SEE					
S. No	Course Code A400005	Course Title Probability & Statistics	Category BSC	H L 3	ours p Week T	er P 0	4	Maxi Ma CIE 40	mum rks SEE 60					
S. No 1 2	Course Code A400005 A401306	Course Title Probability & Statistics Concrete Technology	Category BSC PCC	H L 3 3	ours p Week T 1	er P 0 0	Credits 3	Maximum Ma CIE 40 40	mum rks SEE 60 60					
S. No 1 2 3	Course Code A400005 A401306 A401307	Course Title Probability & Statistics Concrete Technology Strength of Materials - II	Category BSC PCC PCC	H L 3 3 2	ours p Week T 1 0 0	er P 0 0 0	Credits 2	Maximum Maximum CIE 40 40 40	mum rks SEE 60 60 60					
S. No 1 2 3 4	Course Code A400005 A401306 A401307 A401308	Course Title Probability & Statistics Concrete Technology Strength of Materials - II Hydraulics and Hydraulics Machinery	Category BSC PCC PCC PCC	H 2 3 3	ours p Week T 1 0 0 0	er P 0 0 0 0 0	Credits 3 3	Maximum Maximum CIE 40 40 40 40 40	SEE 60 60 60 60					
S. No 1 2 3 4 5	Course Code A400005 A401306 A401307 A401308 A401309	Course Title Probability & Statistics Concrete Technology Strength of Materials - II Hydraulics and Hydraulics Machinery Structural Analysis - I	Category BSC PCC PCC PCC PCC	H 2 3 3 3 3 3	ours p Week T 1 0 0 0 0	er P 0 0 0 0 0 0 0	Credits 2 3 3 3	Maximum Maximum CIE 40 40 40 40 40 40 40	SEE 60 60 60 60 60 60					
S. No 1 2 3 4 5 6	Course Code A400005 A401306 A401307 A401308 A401309 A401505	Course Title Probability & Statistics Concrete Technology Strength of Materials - II Hydraulics and Hydraulics Machinery Structural Analysis - I Concrete Technology Lab	Category BSC PCC PCC PCC PCC PCC	H L 3 3 2 3 3 3 0	ours p Week T 1 0 0 0 0 0	er P 0 0 0 0 0 0 2	Credits 3 3 1	Maximum Maximum CIE 40 40 40 40 40 40 40 40 40 40 40	num see 60 60 60 60 60 60 60 60 60 60 60 60 60 60					
S. No 1 2 3 4 5 6 7	Course Code A400005 A401306 A401307 A401308 A401309 A401505 A401506	Course Title Probability & Statistics Concrete Technology Strength of Materials - II Hydraulics and Hydraulics Machinery Structural Analysis - I Concrete Technology Lab Fluid Mechanics and Hydraulics Machinery Laboratory	Category BSC PCC PCC PCC PCC PCC PCC PCC	H 2 3 3 3 0 0	ours p Week T 1 0 0 0 0 0 0 0 0 0 0	er P 0 0 0 0 0 0 2 2	4 3 2 3 3 1 1	Maximum Maximum CIE 40 40 40 40 40 40 40 40 40 40 40 40 40 40	num see 60 60 60 60 60 60 60 60 60 60 60					
S. No 1 2 3 4 5 6 7 8	Course Code A400005 A401306 A401307 A401308 A401309 A401505 A401506	Course Title Probability & Statistics Concrete Technology Strength of Materials - II Hydraulics and Hydraulics Machinery Structural Analysis - I Concrete Technology Lab Fluid Mechanics and Hydraulics Machinery Laboratory Social Innovation in Practice	Category BSC PCC PCC PCC PCC PCC PCC PCC HSMC	H 2 3 3 3 0 0 0 0	ours p Week T 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	er P 0 0 0 0 0 0 2 2 2 2	4 3 2 3 3 1 1 1	Maximum Maximum CIE 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40	wum see 60					
S. No 1 2 3 4 5 6 7 8 9	Course Code A400005 A401306 A401307 A401308 A401309 A401505 A401506 A400505 A401801	Course Title Probability & Statistics Concrete Technology Strength of Materials - II Hydraulics and Hydraulics Machinery Structural Analysis - I Concrete Technology Lab Fluid Mechanics and Hydraulics Machinery Laboratory Social Innovation in Practice Real-time Research Project/ Field- Based Project	Category BSC PCC PCC PCC PCC PCC PCC PCC HSMC PROJ	H 2 3 3 3 0 0 0 0 0 0	ours p Week T 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	er P 0 0 0 0 0 2 2 2 4	4 3 2 3 3 1 1 1 2	Maximum Maximum CIE 40 40 40 40 40 40 40 40 40 40 50	num see 60 60 60 60 60 60 60 60 60 60 60 60 60 60 60 60 60 60 60					
S. No 1 2 3 4 5 6 7 8 9 10	Course Code A400005 A401306 A401307 A401308 A401309 A401505 A401506 A400505 A401801	Course Title Probability & Statistics Concrete Technology Strength of Materials - II Hydraulics and Hydraulics Machinery Structural Analysis - I Concrete Technology Lab Fluid Mechanics and Hydraulics Machinery Laboratory Social Innovation in Practice Real-time Research Project/ Field- Based Project Environmental Science	Category BSC PCC PCC PCC PCC PCC PCC PCC HSMC PROJ MC	H 2 3 3 3 0 0 0 0 2	Ours p Week T 1 0	er P 0 0 0 0 0 2 2 2 2 4 0	4 3 2 3 3 1 1 1 2 0	Maximum Maximum CIE 40 40 40 40 40 40 40 40 50	wum see 60					
S. No 1 2 3 4 5 6 7 8 9 10	Course Code A400005 A401306 A401307 A401308 A401309 A401505 A401506 A400505 A401801 A400701	Course Title Probability & Statistics Concrete Technology Strength of Materials - II Hydraulics and Hydraulics Machinery Structural Analysis - I Concrete Technology Lab Fluid Mechanics and Hydraulics Machinery Laboratory Social Innovation in Practice Real-time Research Project/ Field- Based Project Environmental Science Total:	Category BSC PCC PCC PCC PCC PCC PCC PCC HSMC PROJ MC	H L 3 3 2 3 3 0 0 0 0 0 2 16	ours p Week T 1 0 1	er P 0 0 0 0 0 2 2 2 2 4 0 10	4 3 2 3 3 1 1 1 2 0 20	Maximum Maximum CIE 40 40 40 40 40 40 40 40 50	num see 60					
S. No 1 2 3 4 5 6 7 8 9 10	Course Code A400005 A401306 A401307 A401308 A401309 A401505 A401506 A400505 A401801 A400701	Course Title Probability & Statistics Concrete Technology Strength of Materials - II Hydraulics and Hydraulics Machinery Structural Analysis - I Concrete Technology Lab Fluid Mechanics and Hydraulics Machinery Laboratory Social Innovation in Practice Real-time Research Project/ Field- Based Project Environmental Science Total:	Category BSC PCC PCC PCC PCC PCC PCC HSMC PROJ MC	H 2 3 3 2 3 3 0 0 0 0 0 2 16	ours p Week T 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 28	er P 0 0 0 0 0 2 2 2 4 0 10	4 3 2 3 3 1 1 1 2 0 20 20	Maximum CIE 40 40 40 40 40 40 40 40 50	num see 60					

	SEMES	STER - V						
Course	Course Title	Cetaer	Hou	rs per	Week	dits	Maxi Ma	imum arks
Code	Course little	Category	L	Т	Р	Cre	CIE	SEE
A401310	Structural Analysis - II	PCC	3	0	0	3	40	60
A401311	Geotechnical Engineering	PCC	3	0	0	3	40	60
A401312	Structural Engineering -I (RCC)	PCC	3	0	0	3	40	60
A4014XX	Professional Elective - I	PEC	3	0	0	3	40	60
A401313	Professional Course Core	PCC	3	0	0	3	40	60
A401314	Project Management	PCC	2	0	0	2	40	60
A401507	Professional Core Laboratory	PCC	0	0	2	1	40	60
A401508	Professional Core Laboratory	PCC	0	0	2	1	40	60
A400504	Advanced English Communication Skills Laboratory	HSMC	0	0	2	1	40	60
	Total:		17	0	6	20		
	Total hours per Week:			23				
	SEMES	TER - VI				•		
Course	Course Title	Category	Hou	rs per	Week	dits	Maximum Marks	
Code	course rate	Category	L	Т	Р	Cre	CIE	SEE
A401315	Environmental Engineering	PCC	3	0	0	3	40	60
A401316	Foundation Engineering	PCC	3	0	0	3	40	60
A401317	Professional Course Core	PCC	3	0	0	3	40	60
A401318	Professional Course Core	PCC	3	0	0	3	40	60
A401XXX	Professional Elective - II	PEC	3	0	0	3	40	60
A401509	Professional Core Laboratory	PCC	0	0	2	1	40	60
A401510	Professional Core Laboratory	PCC	0	0	2	1	40	60
A401511	Professional Core Laboratory	PCC	0	0	2	1	40	60
A401802	Industrial Oriented Mini Project / Internship	PROJ	0	0	4	2	-	100
	Intellectual property rights	MC	2	0	0	0	-	-
	Interfectual property rights							
	Total:		17	0	10	20		
	Total hour Total Credits	s per Week in III Year:	17 40	0 27	10	20		

	SEMEST	FER - VII						
Course			Hou	rs per	Week	lits	Maxi Ma	mum rks
Code	Course Title	Category	L	Т	Р	Cree	CIE	SEE
A401319	Professional Course Core	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
A4XX601	Open Elective - I	OEC	3	0	0	3	40	60
A4XX604	Open Elective - II	OEC	3	0	0	3	40	60
A401803	Project Stage -I	PROJ	0	0	6	3	40	60
	Total:		17	0	6	20		
	Total hours per Week:			23				
	SEMEST	TER - VIII				-		
Course	Course Title	Category	Hours per Week			edits	Maximum Marks	
Code			L	Т	Р	Cr	CIE	SEE
A401XXX	Professional Elective - VI	PEC	3	0	0	3	40	60
A4XX607	Open Elective - III	OEC	3	0	0	3	40	60
	Business Management & Financial Analysis	HSMC	3	0	0	3	40	60
A401804	Project Stage –II	PROJ	0	0	20	9	40	60
A401805	Technical Seminar	PROJ	0	0	4	2	-	100
	Total:		9	0	24	20		
	Total hours	per Week		33				
	Total Credits	in IV Year	: 40					

List of Open Electives

	Open Elective-I									
Sr.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	A462601	Fundamentals of Cyber security								
8	A467801	Data science using R								
9	A466601	Robotics								
10	A403601	Fundamentals of Engineering Materials								
11	A403602	Basics of Thermodynamics								
12	A400601	Basics of Logistics and Supply Chain Management								
13	A400602	Industrial Relations								
14	A401601	Disaster Preparedness & Planning Management								
15	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	A462602	Cloud Computing								
8	A467802	Linux Programming								
9	A466602	Foundations of Machine Learning								
10	A403603	Fundamentals of Manufacturing Processes								
11	A403604	Fundamentals of Automobile Engineering								
12	A400603	Entrepreneurship								
13	A400604	Ethics in Business & Corporate Governance								
14	A401603	Remote Sensing & Geographical Information Systems								
15	A401604	Solid Waste Management								
		Open Elective-III								
1	A404605	Fundamentals of Embedded Systems								
2	A404606	Data Communications								
3	A402605	Nano Technology								
4	A402606	EV Batteries & Charging System								
5	A405603	Fundamentals of Computer networks								
6	A405606	Devops								
7	A462603	Cyber Laws & Ethics								
8	A467803	Business Intelligence								
9	A466603	Artificial Neural Networks								
10	A403605	Industrial safety Engineering								
11	A403606	Waste to Energy								
12	A400605	Basics of Marketing								
13	A400606	Intellectual property rights								
14	A401605	Energy Efficient Buildings								
15	A401606	Environmental Pollution								

ENGLISH FOR SKILL ENHANCEMENT (Common to all branches)

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

UNIT - I

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

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

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

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

UNIT – II

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

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

Reading: Sub-Skills of Reading – Skimming and Scanning

UNIT – III

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

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

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

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

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

UNIT - IV

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

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

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

Essay Writing-Writing Introduction and Conclusion - Précis Writing

UNIT - V

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

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

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

- NOTE 1: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is Open-ended, besides following the prescribed textbook, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.
- NOTE 2: Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40percent of each topic from the syllabus in blended mode.

TEXT BOOK:

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

REFERENCE BOOKS:

- 1. Effective Academic Writing, (2nd edition) by Liss and Davis (OUP)2014.
- 2. Richards, Jack C. Interchange Series. Introduction, ,(4th edition), Cambridge University Press 2022
- 3. Remedial English Grammar by Wood F.T, Macmillan.2007
- 4. Learn English: A Fun Book of Functional Language ,Grammar and Vocabulary, (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: On completion of the course students will be able to

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	-	-	-	-	-	-	-	-	2	3	-	-
CO2	-	-	-	-	-	-	-	-	-	2	2	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	2
CO5	-	-	-	-	-	-	-	-	-	2	-	3

MATRICES AND CALCULUS (Common to All branches)

Course: B.Tech (CE): I-Sem. Subject Code: A400001 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 (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

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

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

APPLIED PHYSICS (Common to all branches)

Course: B.Tech (CE): I-Sem. Subject Code: A400007 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 electronorigin 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 relationslasing action - pumping methods- ruby laser, He-Ne laser , CO₂ laser - semiconductor laser-applications of laser.

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

UNIT - IV

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

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

UNIT - V

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

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

TEXT BOOKS:

1. Engineering Physics(3rd edition), PK Palanisamy, SciTech Publications, 2015.

2. Essentials of Nan science & Nano-technology(1st Edition), Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 2021.

REFERENCES:

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

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

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

CO-PO MAPPING:

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

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

Pre-requisites: Nil

List of Experiments:

- 1. **Identification of Minerals :** Silica Group, Feldspar Group, Crystalline Group, Carbonate Group, Pyroxene Group, Mica Group, Amphibole Group.
- 2. Identification of Rocks: Igneous Petrology, Sedimentary Petrology, Metamorphic Petrology.
 - a. Study of topographical features from Geological maps. Identification of symbols in maps.
 - b. Simple structural Geology Problems (Folds, Faults & Unconformities)

3. Tests on Cement:

- a. Fineness test & Norma Consistency test.
- b. Specific gravity test, Initial and Final setting time of cement.

4. Tests on Fine Aggregates

- a. Specific Gravity test.
- b. Bulking of sand & Fineness modulus of Fine aggregate.

5. Tests on Coarse Aggregate

- a. Specific Gravity test.
- b. Fineness modulus of Coarse aggregate

TEXT BOOKS:

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

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

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

ENGINEERING MECHANICS (Common to Mechanical & Civil)

Course: B.Tech (CE): I-Sem. Subject Code: A403201 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 of gravity of simple bodies, Composite bodies - Theorem of Pappus

UNIT - IV:

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

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

UNIT - V:

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

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

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

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

Course: B.Tech (CE): I-Sem. Subject Code: A400503

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 Communication Presentation Skills. Practice: Making a Short Speech – Extempore- Making a Presentation.

EXERCISE – V:

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

ICS Lab: Understand: Group Discussion Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

- 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
- 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:

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

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

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

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

APPLIED PHYSICS LABORATORY

(Common to all branches)

Course: B.Tech (CE): I-Sem. Subject Code: A400501

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.

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

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

ENGINEERING WORKSHOP

(Common to Mechanical & Civil)

Course: B.Tech (CE): I-Sem. Subject Code: A403503

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.

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

INTRODUCTION TO SOCIAL INNOVATION (Common to all branches)

Course: B.Tech (CE): I-Sem. Subject Code: A400505

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

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

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

UNIVERSAL HUMAN VALUES

(Mandatory Course-Common to all branches)

Course: B.Tech (CE): I-Sem. Subject Code: A400704

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:
- a. Ability to utilize the professional competence for augmenting universal human order
- b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,
- c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- > Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

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

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

ENGINEERING CHEMISTRY

(Common to all branches)

Course: B.Tech (CE): II-Sem. Subject Code: A400009

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 (H₂-O₂ 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. Classificationsolid 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:

- 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.
- Chemistry of Engineering Materials (5th edition), C. V. Agarwal, C. P. Murthy, A. Naidu, Wiley India, 2013.
- 8. Chemistry of Engineering Materials (3rd edition), R. P. Mani, K. N. Mishra, Cengage Learning, 2015

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

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

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

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to all branches)

Course: B.Tech (CE): II-Sem. Subject Code: A400002

L	Т	Р	С
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.
- AdvancedEngineeringMathematics, (5thEdition),R.K.JainandS.R.K.Iyengar,NarosaPublications,2016.

REFERENCE BOOKS:

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

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

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

										B	. Tech (CE) R22
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	2
CO4	3	3	-	-	-	-	-	-	-	-	-	2
CO5	3	3	-	-	-	-	-	-	-	-	-	2

BUILDING MATERIALS, CONSTRUCTION AND PLANNING

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

Pre-requisites: Nil

UNIT–I: Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing.

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

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

Admixtures: Mineral & chemical admixtures – uses.

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

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

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

- 1. Understand the different construction material.
- 2. Understand the different component parts of building and their construction practices and techniques
- 3. Understand the functional requirements to be considered for design and construction of building
- 4. Identify the factors to be considered in planning and construction of buildings
- 5. Plan a building based on the factors and principles of planning.

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

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

Course: B. Tech (CE): II-Sem. Subject Code: A405202 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, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment & Decrement Operators, Conditional Operators, Bitwise Operator, Special Operators. Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators.

UNIT-II

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

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

UNIT-III

Character Arrays and Strings: Introduction, declaring and initializing string variables, reading strings from terminal, writing strings to screen, string-handling functions. **Functions:** Introduction, definition of functions, return values, function calls, function declaration, scope, visibility and lifetime of variables. **Pointers:** Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures 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
- 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.

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

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

ENGINEERING GRAPHICS (Common to Mechanical and Civil)

Course: B. Tech (CE): II-Sem. Subject Code: A403202 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

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

ENGINEERING CHEMISTRY LABORATORY

(Common to all Branches)

Course: B. Tech (CE): II-Sem. Subject Code: A400502 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

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

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

Course: B. Tech (CE): II-Sem. Subject Code: A405503

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/sec² (= 9.8 m/s²)).
- 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				
2					2	2			
2	3				3	3	3		
2	3	4			4	4	4	4	
2	3	4	5		5	5	5	5	5
	2 2 2 2	2 2 3 2 3 2 3	2 2 3 2 3 4 2 3 4 2 3 4	2 2 3 2 3 4 2 3 4 5	2 2 3 2 3 4 2 3 4 5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

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) usingi) Arrays, ii) Pointers
- 3. Write a program that implement Queue (its operations) using i) Arrays, ii) Pointers

Experiment

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

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

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

ENGINEERING EXPLORATION & PRACTICE (Common to all branches)

Course: B. Tech (CE): II Semester Subject Code: A400506

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

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

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

CONSTITUTION OF INDIA (Common to all branches)

Course: B. Tech (CE): II Semester Subject Code: A400703

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
- \blacktriangleright Right to Freedom
- ▶ Right against Exploitation
- Right to Freedom of Religion
- > Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- ➢ Fundamental Duties.

UNIT - 4

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

UNIT - 5

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

REFERENCE BOOKS:

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

- 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.

	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

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STRENGTH OF MATERIALS - I

Course: B. Tech (CE): III Semester Subject Code: A401302

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

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	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

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ENGINEERING GEOLOGY

Course: B. Tech (CE): III Semester Subject Code: A401303 UNIT - I

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

Weathering of Rocks: Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like "Granite".

UNIT - II

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

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

UNIT - III

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

UNIT - IV

Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence. Importance of Geophysical Studies: Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc. Fundamental aspects of Rock mechanics and Environmental Geology.

UNIT - V

Geology of Dams, Reservoirs, and Tunnels: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e., Tithological, structural and ground water) in tunneling over break and lining in tunnels.

TEXT BOOKS:

- 1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005.
- 2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
- 3. Engineering Geology by S K Duggal, H K Pandey McGraw Hill Education Pvt Ltd 2014.
- 4. Principles of Engineering Geology by K.V.G.K. Gokhale B.S Publications.

REFERENCE BOOKS:

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

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

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

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SURVEYING

Course: B. Tech (CE): III Semester Subject Code: A401304

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions: Linear distances- Approximate methods, Direct Methods, Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass: Bearings, included angles, Local Attraction, Magnetic Declination and dip.

UNIT - II

Levelling: Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring: Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

UNIT - III

Areas: Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes: Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

UNIT - IV

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry. **Curves:** Types of curves and their necessity, elements of simple curve, setting out of simple Curves,

UNIT - V

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

Textbooks:

1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi.

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

References:

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

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

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

FLUID MECHANICS

Course: B. Tech (CE): III Semester Subject Code: A401305

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UNIT – I

Properties of Fluid: Distinction between a fluid and a solid; Properties of fluids – Viscosity, Newton lawof viscosity; vapourpressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of lasticity, compressibility.

Fluid Statics: Fluid Pressure: Pressure at a point, Pascals law, Hydrostatic law, Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro-manometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

UNIT - II

Fluid Kinematics:

Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar andturbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and realfluid flow; One, two- and three-dimensional flows; Streamline, path line, streak line and streamtube; stream function, velocity potential function, flow net, One, two- and three-dimensionalcontinuity equations in Cartesian coordinates applications.

Fluid Dynamics:

Surface and Body forces -Euler's and Bernoulli's equation; Momentum equation. Correction factors.Bernoulli's equation to real fluid flows.

UNIT - III

Flow Measurement in Pipes:

Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube, 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 of approach. Broad crested weir.

$\mathbf{UNIT} - \mathbf{IV}$

Flow through Pipes:

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

UNIT - V

Laminar & Turbulent Flow: Laminar flow through circular pipes, and fixed parallel plates.

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

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.

2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015.

3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.

REFERENCE BOOKS:

- 1. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, McGraw Hill Education (India) Private Limited
- 2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.

3. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar DhanpatRai & Co

4. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publication Pvt Ltd.

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

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

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course: B. Tech (CE): III Semester Subject Code: A402204 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.

	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

PYTHON PROGRAMMING LABORATORY

Course: B. Tech (CE): III Semester Subject Code: A405506

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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. Experimet-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
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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: ______. Morking 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. <u>https://www.includehelp.com/python/programs.aspx</u>.
- 3. https://www.anaconda.com/products/individual
- 4. <u>https://www.jetbrains.com/pycharm/</u>

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.

	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

SURVEYING LABORATORY

Course: B. Tech (CE): III Semester Subject Code: A401502

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

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

STRENGTH OF MATERIALS LABORATORY

Course: B. Tech (CE): III Semester Subject Code: A401503 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

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

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

Course: B. Tech (CE): III Semester Subject Code: A402504 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.

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COMPUTER AIDED DRAFTING LABORATORY

Course: B. Tech (CE): III Semester Subject Code: A401504

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.
- 3. Civil Engineering Drawing-I by N. Sreenivasulu, S. Rama Rao Radiant Publishing House.
- 4. Civil Engineering Drawing-II by N. Sreenivasulu Radiant Publishing House.

REFERENCE BOOKS:

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

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

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GENDER SENSITIZATION

Course: B. Tech (CE): III Semester Subject Code: A400702

UNIT-I:

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

UNIT – II:

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

UNIT – III:

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

UNIT – IV:

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

UNIT – V:

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

REFERENCE BOOKS:

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

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

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

	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

PROBABILITYANDSTATISTICS

Course: B. Tech (CE): IV Semester Subject Code: A400005

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

	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

CONCRETE TECHNOLOGY

Course: B. Tech (CE): IV Semester Subject Code: A401306

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 and coarse Aggregates – Gap graded aggregate – Maximum aggregate size, Properties Recycled aggregate.

UNIT - II

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

UNIT – III

Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength, Relation between compression and tensile strength - Curing.

Testing of Hardened Concrete: Compression tests– Tension tests– Factors affecting strength, Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.

UNIT - IV

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

$\mathbf{UNIT} - \mathbf{V}$

Admixtures: Types of admixtures - mineral and chemical admixtures.

Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

Special Concretes: Introduction to Light weight concrete – Cellular concrete – No-fines concrete, High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete, Self compacting concrete, Nano silica and Nano Alumina concrete.

TEXT BOOKS:

- 1. Concrete Technology by M.S. Shetty. S. Chand & Co.; 2004
- 2. Concrete Technology by A.R. Santhakumar, 2 nd Edition, Oxford university Press, New Delhi
- 3. Concrete Technology by M. L. Gambhir. Tata Mc. Graw Hill Publishers, 5THEdition, New Delhi **REFERENCE BOOKS:**
- 1. Properties of Concrete by A. M. Neville Low priced Edition 4th edition
- 2. Concrete: Micro structure, Properties and Materials P.K. Mehta and J.M. Monteiro, McGraw Hill Publishers

IS Codes:

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

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

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

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

STRENGTH OF MATERIALS - II

Course: B. Tech (CE): IV Semester Subject Code: A401307

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.

$\mathbf{UNIT} - \mathbf{IV}$

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.

$\mathbf{UNIT} - \mathbf{V}$

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

Textbooks:

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

References:

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

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

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

HYDRAULICS AND HYDRAULIC MACHINERY

Course: B. Tech (CE): IV Semester Subject Code: A401308

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

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	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

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STRUCTURAL ANALYSIS – I

Course: B. Tech (CE): IV Semester Subject Code: A401309

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 arches having 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.

$\mathbf{UNIT} - \mathbf{IV}$

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.

$\mathbf{UNIT} - \mathbf{V}$

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 force and 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

B. Tech (CE) R22

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

CONCRETE TECHNOLOGY LABORATORY

Course: B. Tech (CE): IV Semester Subject Code: A401505

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

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

	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

LTPC

0 0 2 1

FLUID MECHANICS AND HYDRAULICS MACHINERY LABORATORY

Course: B. Tech (CE): IV Semester Subject Code: A401506

List of Experiments

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

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

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

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

B. Tech (CE) R22

SOCIAL INNOVATION IN PRACTICE

Course: B. Tech (CE): IV Semester Subject Code: A400505

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 idea in 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 risks and Marketing strategies

Week-10: Verification of Business Model and Validation

Week-11: Business Model Development

Week-12: Documentation and Panel presentation

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.

REFERENCE BOOKS:

- 1. Requirements Analysis: From Business Views to Architecture; David C. Hay; Prentice Hall Professional
- 2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, Yeheskel Hasenfeld; Palgrave Macmillan
- 3. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean
- 4. Introduction to Sustainability by Robert Brinkmann, Wiley-Blackwell

	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

ENVIRONMENTAL SCIENCES

Course: B. Tech (CE): IV Semester Subject Code: A400701

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

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

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

B.Tech VII-Semester Subject Code: A404601 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.

$\mathbf{UNIT} - \mathbf{II}$

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.

$\mathbf{UNIT} - \mathbf{V}$

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, 1stEdition, 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.

	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

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

B.Tech VII-Semester Subject Code: A404602 UNIT-I L T P C 3 0 0 3

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, Digital Signal Processing, TMH/McGrawHillIntern ational, 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

	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

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

B.Tech VII-Semester Subject Code: A402601

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, CO₂ 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 scope and development, Scheme of development of tidal its 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.

	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		

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

B.Tech VII-Semester Subject Code: A402602

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.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	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		

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

B.Tech VII-Semester Subject Code: A405604

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	-	-

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

B.Tech VII-Semester Subject Code: A405602

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

$\mathbf{UNIT} - \mathbf{IV}$

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:

- 1 Will be able to 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.

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- 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.

CO- PO MAPPING

	P01	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	-	-

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FUNDAMENTALS OF CYBER SECURITY (Open Elective – I) (Offered by CSC)

B.Tech VII-Semester Subject Code: A462601

UNIT-I

Introduction to Cyber Crime and Security: Introduction Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, CIA Triad, Who are Cybercriminals, Classifications of Cybercrimes, E-mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/ Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/ Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Credit Card Frauds.

UNIT-II

Cyber Offenses: How Criminals Plan Them: Introduction, Categories of Cybercrime, How Criminals Plan the Attacks, Reconnaissance, Passive Attacks, Active Attacks, Scamming and Scrutinizing Gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, Classification of Social Engineering,

UNIT-III

Tools and Methods Used in Cyber Crime and Security Measures – I: Introduction, Proxy Servers and Anonymizers, Phishing, How Phishing Works, Password Cracking, Online Attacks, Offline Attacks, Strong, Weak and Random Passwords, Random Passwords, Keyloggers and Spywares, Software Keyloggers, Hardware Keyloggers, Antikeylogger.

UNIT-IV

Tools and Methods Used In Cyber Crime and Security Measures – II: DoS and DDoS Attacks, DoS Attacks, Classification of DoS Attacks, Types of Levels of DoS Attack, Tools Used to Launch DoS Attacks, DDoS Attacks, How to protect from DoS/DDoS Attacks, SQL Injection, Steps for SQL Injection Attack, How to Prevent SQL Injection Attacks.

UNIT-V

Cybercrime and Cyberterrorism: Social, Political, Ethical and Psychological Dimensions: Introduction, Intellectual Property in the Cyberspace, Copyright, Patent, Trademarks, Trade Secret, Trade Name, Domain Name, The Ethical Dimension of Cybercrimes, Ethical Hackers: Good Guys in Bad Land, The Psychology, Mindset and Skills of Hackers and Other Cybercriminals.

TEXTBOOKS:

- 1 Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley
- 2 Cyber Law & Cyber Crimes by Advocate Prashant Mali; Snow White publications, Mumbai

REFERENCES:

- 1 Management of Information Security, M. E. Whitman, H. J. Mattord, Nelson Education, CENGAGE Learning, 3rd Edition, 2011
- Guide to Computer Forensics and Investigations, B. Nelson, A. Phillips, F. Enfinger,
 C. Steuart, Nelson Education / CENGAGE Learning, 4th Edition, 2010

3 Information Technology Law and Practice by Vakul Sharma; Universal Law Publishing Co. Pvt. Ltd

COURSE OUTCOMES: After completion of the course, the student should be able to

- 1. Categorize cyber-crimes and an understanding of social, political, ethical and psychological dimensions of cyber security
- 2. Demonstrate cyber offenses tools, methods used in cyber crime
- 3. Document an appropriate procedure of Risk Management and Security Standards
- 4. Understand cyber laws and Indian Information Technology Act

	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		2	2	1							
CO5	3		3	2	1							

LTPC

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DATA SCIENCE USING R (Open Elective – I) (Offered by CSM)

B.Tech VII-Semester Subject Code: A467801

UNIT-I

Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. **Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II

Data Types & Statistical Description- Types of Data: Attributes and Measurement, what is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, and Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, andMode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter- quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting,

Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

Factors and Data Frames: Introduction to Factors:Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating ListElements, Merging Lists, Converting Lists to Vectors

UNIT - IV

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, writing a Functionin R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functionsin R.

UNIT - V

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation.

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXTBOOKS:

- 1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly,2014
- 2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed.

The Morgan Kaufmann Series in Data Management Systems.

3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

- 1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
- 2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
- 3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
- 4. Paul Teetor, "R Cookbook", O'Reilly, 2011.

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

- 1. Understand basic terms what Statistical Inference means.
- 2. Identify probability distributions commonly used as foundations for statistical modelling. Fit amodel to data
- 3. describe the data using various statistical measures
- 4. utilize R elements for data handling.
- 5. Perform data reduction and apply visualization techniques.

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

ROBOTICS

(Open Elective – I) (Offered by CSM)

B.Tech VII-Semester Subject Code: A466601

L T P C 3 0 0 3

Unit I

Introduction: Introduction to Robotics Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Robot Programming languages & systems: Introduction, the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.

Unit II

Need of AI in Robotics: History, state of the art, Need for AI in Robotics. Thinking and acting humanly, intelligent agents, structure of agents.

Unit III

Game Playing: AI and game playing, plausible move generator, static evaluation move generator, game playing strategies, problems in game playing.

Unit IV

Robotics fundamentals: Robot Classification, Robot Specification, notation, kinematic representations and transformations, dynamics techniques; trajectory planning and control.

Unit V

Robotics and Its applications: DDD concept, Intelligent robots, Robot Anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple Problems-Specifications of Robot-Speed of Robot, Robot joints and links-Robot classifications Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system.

Textbooks/ References:

- 1 Robotics, Vision and Control: Fundamental Algorithms in MATLAB, Peter Corke, Springer, 2011.
- 2 Robotics: Everything You Need to Know About Robotics from Beginner to Expert, Peter McKinnon, Createspace Independent Publishing Platform, 2016.
- 3 Introduction to AI Robotics, Second Edition, By Robin R. Murphy, MIT press, 2001.
- 4 Artificial Intelligence for Robotics: Build intelligent robots that perform human tasks using AI techniques, Francis X. Govers, Packt Publishers, 2018.

	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3									
CO2	2	2	3		3							2
CO3	2	2	3		3			2				2
CO4	2	2	3					2				2
CO5	2	2	3					2				2

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

B.Tech VII-Semester Subject Code: A403601

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.

$\mathbf{UNIT} - \mathbf{IV}$

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.

$\mathbf{UNIT} - \mathbf{V}$

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.

	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

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

B.Tech VII-Semester Subject Code: A403602

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 different 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

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

B.Tech-VII-Semester Subject Code: A400601

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, Cycle View of Supply Chain Process, Key Issues in 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. Gaining Competitive Advantage through Logistics Management, Transportation: Functions, Costs, and Mode of Transportation Network and Decision, Models, Containerization, Cross Docking, Reverse Logistics. Outsourcing: Nature and 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, Distribution Networks 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: Bullwhip Effect and Reduction, Performance Measurement: Dimension, Tools of Performance Measurement, SCOR Model. Demand Chain Management, Global Supply Chain, Challenges in Establishing Global Supply Chain, Factors that influence Designing Global Supply Chain Network.

UNIT-V

Coordination in a Supply Chain: Importance of Coordination, Lack of Supply Chain Coordination and the Bullwhip 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, Supply Chain 4.0.

Reference Books

- 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 Chain Management, 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, Supply Chain Management: Concepts and Cases; PHI Learning ,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, CengageLearning, New Delhi, 2012
- 8. Sunil Chopra and Peter Meindl, Supply chain Management: Strategy, Planning and Operation, Pearson Education, New Delhi 2013

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 supplychain.
- 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

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

B.Tech- VII-Semester Subject Code: A400602

UNIT-I

Overview of Industrial Relations: Meaning & Objectives, Scope, Importance, Approaches to Industrial Relations – Role of Three Actors to Industrial Relations – State, Employer & Employees, Causes for poor IR, Developing sound IR. Ethical approach to IR: Idea of trusteeship - Principles & features, Code of conduct. The industrial policy resolution 1991.ILO in IR. Collective Bargaining (Perspective, Bargaining Structure, Procedure and Machinery for Collective Bargaining) - The Bargaining Process - Strengths and Skills

UNIT-II

Laws on Industrial Relations: The Trade Union Act 1926: Role & function of Trade union. Registration, Rights and privileges, Duties, Dissolution of Trade Unions.

Industrial Disputes Act 1947: Strike, Lockout, Layoff, Retrenchment, Grievance and disciplinary procedures, Penalties, Causes, Tripartite & Bipartite Bodies, Grievance Procedure. Industrial Employment Act, 1946: Information in standing orders, Procedure for submission

UNIT-III

Laws on Wages, Welfare and Social Security: Minimum Wages Act, 1948, Payment of Wages Act, 1936, Payment of Bonus Act, 1965 Laws on Labour Welfare: The Workmen's Compensation 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 of Gratuity Act, 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 quality circles - Concept of empowerment.

Suggested Reading:

- 1. ArunMonappa (2020). Industrial Relations. New Delhi: Tata McGraw- Hill Publishing companyLtd.
- 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: PHILearning P.Ltd.
- 4. Kapoor, N.D. (2014). Elements of Mercantile Law. New Delhi: S.Chand & Co.
- 5. Subramani, P N. & Rajendran, G. (2001). Human Resources Management and Industrial Relations. New Delhi: Himalaya Publishing House.
- 6. Pylee, P V. & A Simon George. (2007). Industrial relations and personnel Management. New Delhi: 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	-	-	-

DISASTER PREPAREDNESS & PLANNINGMANAGEMENT (Open Elective – I) (Offered by CE)

B.Tech VII-Semester Subject Code: A401601

L T P C 3 0 0 3

UNIT - I

Introduction - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT - II

Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

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; global and national disaster trends; climate change and urban disasters.

UNIT - IV

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

UNIT - V

Disasters, Environment and 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 developmentmethods.

TEXT BOOKS:

- 1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
- 2. Singh B.K., 2008, Handbook of Disaster Management: Techniques Guidelines, Rajat Publication.
- 3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

REFERENCE BOOKS:

- 1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
- 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	3	2	2	1	2	2	-	3	2	1	3
CO2	3	3	2	2	1	2	2	-	3	2	1	3
CO3	3	3	2	2	1	2	2	-	3	2	1	3
CO4	3	3	2	2	1	2	2	-	3	2	1	3
CO5	3	3	2	2	1	2	2	-	3	2	1	3

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

B.Tech VII -Semester Subject Code: A401602

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

CMR College of Engineering & Technology (UGC Autonomous)

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

- 1. identify the attributes to be considered for EIA
- 2. assess impact of deforestation
- 3. interpret impact prediction, significance of soil quality and mitigation
- 4. conduct environmental audit and prepare reports
- 5. illustrate environmental policies and provisions

	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

SENSORS & TRANSDUCERS (Open Elective – II) (Offered by ECE)

B.Tech VII-Semester Subject Code: A404603

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

IMAGE PROCESSING

(Open Elective – II) (Offered by ECE)

B.Tech VII-Semester Subject Code: A404604 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.
- 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.

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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

ELECTRIC VEHICLE TECHNOLOGY (Open Elective – I) (Offered by EEE)

B.Tech VII-Semester Subject Code: A402603 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
C01	3	3								2		
CO2	3	3								2		
CO3	3	3								2		
CO4	3	3								2		
CO5	3	3								2		

LTPC

3 0 0 3

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

B.Tech VII-Semester Subject Code: A402604

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		

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

B.Tech VII-Semester Subject Code: A405601

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		

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3 0 0 3

WEB PROGRAMMING

(Open Elective – II) (Offered by CSE)

B.Tech VII-Semester Subject Code: A405605

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 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		

CLOUD COMPUTING (Open Elective – II) (Offered by CSC)

B.Tech VII-Semester Subject Code: A462602

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 Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT-III

Cloud Computing Architecture and Management: Cloud architecture, 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 of Cloud Migration Approaches for Cloud Migration.

UNIT-IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and 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 Cloud Service Models.

UNIT-V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, 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, CRC press, 2014

REFERENCE BOOKS:

 Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej

M. Goscinski, Wiley, 2011.

- 2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
- 3. 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. Explain Distributed System Modeling, Clustering and Virtualization
- 2. Discuss basic concepts of cloud computing.
- 3. Distinguish Infrastructure as a Service(IAAS) & Platform and Softwareas 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										

LINUX PROGRAMMING (Open Elective – II) (Offered by CSE)

B.Tech VII-Semester Subject Code: A467802

L T P C 3 0 0 3

UNIT-I

Introduction to Linux Utilities: Linux utilities: A brief history of UNIX, architecture and features of UNIX, introduction to vi editor. General purpose utilities, handling utilities, security by file permissions, process utilities, disk utilities, Networking commands; Text processing and backup utilities: Text processing utilities and backup utilities;

SED: Scripts, operation, addresses, commands;

AWK: Execution, fields and records, scripts, operation, patterns, actions, associative arrays, string and mathematical functions, system commands in awk, applications.

UNIT-II

Working with The Bourn Again Shell (Bash): Shell: Shell responsibilities, types of shell, pipes and i/o redirection, shell as a programming language, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, quoting, test command, control structures, arithmetic inshell, interrupt processing, functions, and debugging scripts;

UNIT-III

Handle Files and Directories: File structure and directories: Introduction to filesystem, file descriptors, file types, file system structure; File metadata: I nodes; System calls for file I/O operations: open, create, read, write, close, lseek, dup2, file status information-stat family; File and record locking: fcntl function, file permissions, files ownership, links; Directories: Creating, removing and changing directories, obtaining current working directory, directory contents, scanning directories.

UNIT-IV

Process and Signals: Process: Process identifiers, process structure: process table, viewing processes, system processes, process scheduling; Starting new processes: Waiting for a process, process termination, zombie processes, orphan process, system call interface for process management, fork, vfork, exit,wait,waitpid, exec.

Signals: Signal functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets.

UNIT-V

Inter Process Communication: Inter process communication: Pipes, Semaphores, Shared Memory, and Message Queues.

Textbooks

- 1. W. Richard, Stevens, Advanced Programming in the UNIX Environment, Pearson Education,1 Edition,2005
- 2. Sumitabha Das, Unix Concepts and Applications, Tata McGraw-Hill, 4th Edition, 2006.
- 3. Neil Mathew, Richard Stones, Beginning Linux Programming, Wrox, Wiley India, 4th Edition, 2011.

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Reference Textbooks

- 1. Sumitabha Das, Your Unix the Ultimate Guide, Tata Mc Graw-Hill, 4th Edition,2007.
- W. R. Stevens, S. A. Rago, Advanced Programming in the Unix Environment Pearson Education, 2ndEdition,2009
- 3. B. A. Forouzan, R. F. Gilberg, Unix and Shell Programming, Cengage Learning, 3rd Edition, 2005.

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

- 1. Understand the basic commands of linux operating system and can write shell scripts.
- 2. Create file systems and directories and operate those using programs.
- 3. Understand the processes background and fore ground by process and signals system calls.
- 4. Create shared memory segments, pipes, message queues and can exercise inter process communication.
- 5. Create semaphores to interact between processes of different system

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

FOUNDATIONS OF MACHINE LEARNING (Open Elective – II) (Offered by CSE)

B.Tech VII-Semester Subject Code: A466602

L T P C 3 0 0 3

UNIT-I

Introduction: What Is Machine Learning? How Do We Define Learning?, How Do We Evaluate Our Networks?, How Do We Learn Our Network?, What are datasets and how to handle them?, Feature sets, Dataset division: test, train and validation sets, cross validation.

UNIT-II

Basics of machine learning: Applications of Machine Learning, processes involved in Machine Learning, Introduction to Machine Learning Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Real life examples of Machine Learning.

UNIT-III

Supervised learning: Classification and Regression: K-Nearest Neighbor, Linear Regression, Logistic Regression, Support Vector Machine (SVM), Evaluation Measures: SSE, MME, R2, confusion matrix, precision, recall, F-Score, ROC-Curve.

UNIT-IV

Unsupervised learning: Introduction to clustering, Types of Clustering: Hierarchical, Agglomerative Clustering and Divisive clustering; Partitional Clustering - K-means clustering.

UNIT-V

Miscellaneous: Dimensionality reduction techniques: PCA, LDA, ICA. Introduction to Deep Learning, Gaussian Mixture Models, Natural Language Processing, Computer Vision.

Textbooks:

- 1. Introduction to Machine Learning, By Jeeva Jose, Khanna Book Publishing Co., 2020.
- 2. Machine Learning for Dummies, By John Paul Mueller and Luca Massaron, For Dummies, 2016.
- 3. Machine Learning, By Rajeev Chopra, Khanna Book Publishing Co., 2021.
- 4. Machine Learning: The New AI, By EthemAlpaydin, The MIT Press, 2016.

Reference Books

- 1. Machine Learning, Tom M. Mitchell, McGraw Hill Education, 2017.
- 2. https://www.udacity.com/course/intro-to-machine-learning--ud120
- 3. https://www.coursera.org/learn/machine-learning-duke

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

- 1. Understand basic applications and issues of Machine Learning
- 2. Understand the different types of datasets
- 3. Analyze and work with different datasets
- 4. Analyze various Machine Learning techniques and algorithms
- 5. Apply various algorithms to different datasets.

CO-PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	2	3	2									2
CO2	3	2	3	3	3							2
CO3	3	3	3		3			2				2
CO4	3	3	3		3			2				2
CO5	3	3	3		3			2				2

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3 0 0 3

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

B.Tech VII-Semester Subject Code: A403603

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

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

B.Tech VII-Semester Subject Code: A403604

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
C01	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

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

B.Tech VII-Semester Subject Code: A4000603

L T P C 3 0 0 3

UNIT-I

Understanding Entrepreneurial Mindset- 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-Stressand the entrepreneur- the entrepreneurial ego- Entrepreneurial motivations. Corporate Entrepreneurial Mindset- the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

UNIT-III

Launching Entrepreneurial Ventures- 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

Legal challenges of Entrepreneurship-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 for new venture development-The Evaluation process-Feasibility criteria approach.

UNIT-V

Strategic perspectives in entrepreneurship- Strategic planning-Strategic actions- strategic positioning-Business stabilization- Building the 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)
- Vasant Desai "Small Scale industries and entrepreneurship" Himalaya publishing, 9th Edition, 2017.
- 3. Rajeev Roy "Entrepreneurship" 3e, Oxford, 2020.
- 4. B.Janakiram and M.Rizwana" Entrepreneurship Development :Text & Cases, ExcelBooks, 1st Edition, 2011.
- 5. Stuart Read, Effectual Entrepreneurship, 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

B.Tech (CE) R22

CO-PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	-	-	-	-	-	-	-	-	-	-	2
CO2	-	-	-	-	-	-	-	-	3	3	-	2
CO3	3	2	3	-	-	2	2	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	2	3
CO5	-	-	3	-	3	-	-	-	-	3	2	-

CMR College of Engineering & Technology (UGC Autonomous)

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

B.Tech VII-Semester Subject Code: A4000604

L T P C 3 0 0 3

UNIT-I

Business Ethics in the Changing Environment: Business Ethics, Levels of Business Ethics, Myths about Business Ethics, Stages of Moral Development Kohlberg's Study, Carol Gilligan's Theory, Principles of Ethics.

UNIT-IV

Professional Ethics: Introduction to Professional Ethics, Ethics in Production and Product 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: Proactive Steps, Cyber Ethics.

UNIT-IV

Corporate Governance: Introduction to Corporate Governance, Major Corporate Governance 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 in Corporate Governance.

Corporate Governance Codes and Committees: Global Reporting Initiative, OECD Principles, Cadbury Committee Report, Kumara Mangalam Birla Committee Report, Naresh Chandra 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-IV

Corporate Social Responsibility (CSR): Models for Implementation of CSR, Scope of 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. Jyotsna G B, R C Joshi, Business Ethics and Corporate Governance, 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. SK Mandal, Ethics in Business and 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 Publishing House, 2019.
- 8. N. Balasubramanian, Corporate Governance and Stewardship, TMH, 2012.
- 9. Nina Godbole & SunitBelapure, Cyber Security, wileyindia, 2012.
- 10. Joseph W. Weiss, Business Ethics, Thomson, 2006.
- 11. Geethika, RK Mishra, Corporate Governance Theory and Practice, Excel, 2013.
- 12. Dr.S.S. Khanka, Business Ethics and Corporate Governance, S.Chand, 2013.
- 13. Praveen Parboteeach, Business Ethics, Routledge, 2019.
- 14. Praveen B Malla, Corporate Governance, Routledge2016.

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	MAPPI	NG:										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	-	-	-	-	-	-	3	3	2	3	-	3
CO2	I	-	-	-	-	-	3	3	2	2	-	3
CO3	3	-	-	-	3	-	-	-	-	-	3	-
CO4	-	-	-	-	-	3	3	3	-	-	-	-
CO5	-	-	-	-	3	2	3	-	-	-	2	3

CO-PO MAPPING :

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

B.Tech VII -Semester Subject Code: A401603

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. 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

	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

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3 0 0 3

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

B.Tech VII-Semester Subject Code: A401604

UNIT-I

Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, 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 and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning - transfer and transport; processing techniques.

UNIT-III

Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with 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 of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.

UNIT-V

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

TEXT BOOKS:

- 1. 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 Thomson LearningInc., 2002.

REFERENCE BOOKS:

- 1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985.
- 2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill 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. illustrate the process of handling hazardous wastes
- 4. classify various biomedical waste management systems
- 5. apply e-waste management techniques

B.Tech (CE) R22

CO-PO MAPPING :

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

CMR College of Engineering & Technology (UGC Autonomous)

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

B.Tech VII-Semester Subject Code: A404605

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

Text Book:

- 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

	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							

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

B.Tech VII-Semester Subject Code: A404606 UNIT-I

L T P C 3 0 0 3

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

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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.

	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

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

B.Tech VII-Semester Subject Code: A402605

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 Nanoelectromechanical 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:

- 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.

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- 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	3	2	2						2		
CO2	3	3	3							2		
CO3	3	3								2		
CO4	3	3			2					2		
CO5	3	3								2		

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

B.Tech VII-Semester Subject Code: A402606

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

	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

LTPC

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FUNDAMENTALS OFCOMPUTER NETWORKS (Open Elective – III) (Offered by CSE)

B.Tech VII-Semester Subject Code: A405603

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-I

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-I

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

UNIT-I

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-I

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.

	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

DEVOPS

(Open Elective – III) (Offered by CSE)

B.Tech VII-Semester Subject Code: A405606

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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:

 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
- 6. Collaborate and adopt Devops in real-time projects

	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

CYBER LAWS AND ETHICS (**Open Elective – III**) (**Offered by CSC**)

B.Tech VII-Semester Subject Code: A462602

L T P C 3 0 0 3

UNIT-I

Evolution of the IT Act: Genesis and Necessity Salient features of the IT Act, 2000,2008 various authorities under IT Act and their powers. ; Penalties &Offences, amendments.

UNIT-I

Impact on other related Acts (Amendments): (a) Amendments to Indian Penal Code.(b) Amendments to Indian Evidence Act.(c) Amendments to Bankers Book Evidence Act.(d) Amendments to Reserve Bank of India Act.

Cyber Space Jurisdiction: (a) Jurisdiction issues under IT Act, 2000, 2008, (b) Traditional principals of Jurisdiction, (c) Extra-terrestrial Jurisdiction, (d) Case Laws on Cyber Space Jurisdiction

UNIT-III

E – **commerce and Laws in India:**(a) Digital / Electronic Signature in Indian Laws, (b) E – Commerce; Issues and provisions in Indian Law, (c) E – Governance; concept and practicality in India ,(d) E – Taxation issues in Cyberspace ,(e) E – Contracts and its validity in India ,(f) Cyber Tribunal & AppellateTribunal, (g) Cyber Regulations

UNIT-IV

Sensitive Personal Data or Information (SPDI) in Cyber Law: (a) SPDI Definition and Reasonable Security Practices in India, (b) Reasonable Security Practices – International perspective

UNIT-V

Cloud Computing & Law : International Perspective, (a) EDI: Concept and legal Issues. (b) UNCITRAL Model Law. (c) Electronic Signature Law's of Major Countries, (d) Cryptography Laws, (e)Cyber Law's of Major Countries ,(f) EU Convention on Cyber Crime

TEXTBOOKS:

- 1 Cyber Law & Cyber Crimes By Advocat Prashant Mali; Snow White publications, Mumbai
- 2 Cyber Law in India by Farooq Ahmad; Pioneer Books

REFERENCE BOOKS:

- 1 Information Technology Law and Practice by Vakul Sharma; Universal Law Publishing Co. Pvt. Ltd.
- 2 The Indian Cyber Law by Suresh T. Vishwanathan; Bharat Law House New Delhi.

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

- 1 To understand about IT Act.
- 2 To know about cyber space Jurisdiction
- 3 To know about E- Commerce and laws
- 4 To Understand Intellectual property rights.
- 5 To know about cyber laws.

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CO-PO MAPPING:

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

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BUSINESS INTELLIGENCE (Open Elective – III) (Offered by CSM)

B.Tech VII-Semester Subject Code: A467803

UNIT-I

Business Intelligence: Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT-II

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-event-Driven alerts - A cyclic process of Intelligence Creation. The value of Business Intelligence-Value driven & Information use.

UNIT-III

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of differentBI-Tools (Pentaho, KNIME)

UNIT-IV

Business Intelligence Implementation-Business Intelligence and integration implementation-connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

UNIT-V

Building the BI Project- Planning the BI Project, Project Resources, Project Tasks, Risk Management and Mitigation, Cost justifying BI solutions and measuring success. Creating User Requirements, Requirements-Gathering Techniques; Prioritizing & Validating BI Requirements, Changing Requirements; BI Design and Development; Best practices for BI Design; Post Implementation- Evaluation; Maintaining your BI Environment.

TEXTBOOKS:

- 1 Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012.
- 2 Business Intelligence (IBM ICE Publication)

REFERENCE BOOKS:

- 1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
- 2. David Loshin, Business Intelligence The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
- 3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence Solutions with SQLServer, 2008 R2 & Office 2010, TMH, 2011.
- 4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis][Publication: (Wiley)].

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

- 1. Understand Fundamental concepts of BI and Analytics
- 2. Application of BI Key Performance indicators
- 3. Design of Dashboards, Implementation of WebAnalytics
- 4. Understand Utilization of Advanced BI Tools and their Implementation.
- 5. Implementation of BI Techniques and BI Ethics.

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

ARTIFICIAL NEURAL NETWORKS (Open Elective – III) (Offered by CSM)

B.Tech VII-Semester Subject Code: A466603

UNIT-I

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT-II

Single Layer Perceptron: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT-III

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT-IV

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT-V

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm Hopfield Models – Hopfield Models, Computer Experiment

TEXTBOOKS:

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

REFERENCE BOOKS:

- 1. Artificial Neural Networks B. Vegnanarayana Prentice Hall of India P Ltd 2005
- 2. Neural Networks in Computer Inteligance, Li Min Fu MC GRAW HILL EDUCATION 2003
- 3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
- 4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

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L T P C 3 0 0 3 **Course Outcomes:** By completing this course the student will be able to:

- 1 Create different neural networks of various architectures both feeds forward and feed backward.
- 2 Perform the training of neural networks using various learning rules.
- ³ Perform the testing of neural networks and do the perform analysis of these networks.for various pattern recognition applications.

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

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

B.Tech VII-Semester Subject Code: A403605

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.

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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.

	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

WASTE TO ENERGY (Open Elective – III) (Offered by ME)

B.Tech VII-Semester Subject Code: A403606

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.

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B.Tech (CE) R22

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

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BASICS OF MARKETING (Open Elective – III) (Offered by MBA)

B.Tech VII-Semester Subject Code: A400605

L T P C 3 0 0 3

UNIT-I

Understanding Marketing Management: Concepts of Marketing, Marketing Strategies & Plans, Creating long term Loyalty relationships, Marketing mix, 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 Managing Integrated Marketing 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.

Text books:

• 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, Gray Armstrong, 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. Arun Kumar & N. Meenakshi, Marketing Management, Vikas, 3e, 2016
- 9. RajanSaxena, Marketing Management, Tata Mc Graw Hill, 3e, 2012.

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

- 1. Analyze the scope, concepts of Marketing and forecasting techniques in presentGlobal Market Environment.
- 2. Outline marketing research, consumer behaviour, segmentation and targeting.
- 3. Develop conceptual knowledge on new product development, marketing mix and promotional mix
- 4. Illustrate marketing channels of distribution and logistics
- 5. Identify the skills and importance of sales management.

	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	-	-

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INTELLECTUAL PROPERTY RIGHTS (Open Elective – III) (Offered by MBA)

B.Tech VII-Semester Subject Code: A400606 UNIT-I

INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international Organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II

TRADE MARKS: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, Selecting and evaluating trade mark, trade mark registration processes.

UNIT-III

LAW OF COPY RIGHTS: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right owner ship issues, copy right registration, notice of copy right, international copy right law.

Law of Patents: Foundation of patent law, patent searching process, owner rights and transfer. UNIT-IV

TRADE SECRETS: Trade secret law, determination of trade secrete status' liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

UNFAIR COMPETITION: Misappropriation right of publicity, false advertising

UNIT-V

NEW DEVELOPMENT OF INTELLECTUAL PROPERTY: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international-trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES

- 1 Intellectual property right, Deborah, E. Bouchoux, cengage learning, 5E, 2017.
- 2 Intellectual property right Unleashing the knowledge economy, Prabuddha Ganguli, TataMc Graw Hill Publishing Company Ltd, 1E, 2017.

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

- 1. Skill to understand the concept of intellectual property rights.
- 2. Gain knowledge on development and owning of Trade Marks, Copy Rights, and Patents.
- 3. Develops procedural knowledge to Legal System and solving the problem relatingPatents.
- 4. Develops conceptual exposure on trade secrets.
- 5. Knowledge on new development of intellectual property.

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

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ENERGY EFFICIENT BUILDINGS (**Open Elective – III**) (**Offered by CE**)

B.Tech VII-Semester Subject Code: A401605

UNIT-I

Climates and buildings, Thermal properties and energy content of building materials, Psychrometry, thermal comfort: Criteria and various parameters, Air conditioning 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; roof radiation traps; 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; Decrement factor; Phase lag; Lighting (Daylighting and Electric lighting), Design of day-lighting, Concept of sol-air 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 microclimatic throughlandscape 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 and building codes Energy Efficient Landscape Design: Modification of microclimatic through landscape element for energy conservation

TEXT BOOKS:

- 1 Tiwari G N, Goyal R K, Greenhouse Technology: Fundamentals, Design Modelingand Application, Narosa Publishing House.
- 2 Krieder J, Rabi A, Heating and Cooling of Buildings: Design for Efficiency, McGrawHill.

REFERENCE BOOKS:

- 1. Archie, Culp W, Principles of Energy Conservation, McGraw Hill.
- 2. Callaghan P O, Energy Management, McGraw Hill Book Company.
- 3. Williams J R, 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

	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

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ENVIRONMENTAL POLLUTION (Open Elective – III) (Offered by CE)

B.Tech VII-Semester Subject Code: A401606

UNIT-I

Air Pollution: Air pollution 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 Waste Management: solid waste characteristics –basics of onsite handling and collection – separation and processing –Incineration-Composting-Solid waste disposal methods –fundamentals of Land filling. Hazardous Waste: Characterization –Nuclear waste –Biomedical wastes –Electronic wastes –Chemical wastes –Treatment and management of hazardous waste-Disposal and Control methods.

UNIT-IV

Environmental Sanitation: Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT-V

Sustainable Development: 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, New York 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 Hallof India
- 2 M.N.Rao and H.V. N. Rao, "Airpollution", Tata Mc.GrawHill Company.
- 3 Ruth F. "Weiner and Robin Matthews Environmental Engineering", 4thEdition 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
C01	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