ACADEMIC REGULATIONS (R20)

COURSE STRUCTURE AND DETAILED SYLLABUS

(CHOICE BASED CREDIT SYSTEM (CBCS))

B.Tech.

Civil Engineering

(B.Tech. Regular: Applicable for the batches admitted from 2020 - 2021)

&

(B.Tech. LES: Applicable for the batches admitted from 2021 - 2022)

Department of Civil Engineering

CMR INSTITUTE OF TECHNOLOGY

(UGC - Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NBA and NAAC with A Grade

Kandlakoya(V), Medchal District, Hyderabad-501 401, Telangana State

Mobile No.: 8008557612 **E-mail:** principal@cmritonline.ac.in **Web:** www.cmritonline.ac.in

FOREWORD

CMR Institute of Technology, established in the year 2005, Approved by AICTE, New Delhi, Permanently Affiliated to JNTUH, thrice Accredited by NBA, Achieved UGC Autonomous Status and has been bestowed with NAAC 'A' Grade in July 2018 for its remarkable academic accomplishments accompanied by its unflinching spirit and dedication to impart quality technical education to the deserving aspirants. The institution has commenced functioning independently within the set norms prescribed by UGC and AICTE. The performance of the institution manifests the confidence that the prestigious monitoring body, the UGC has on it, in terms of upholding its spirit and sustenance of the expected standards of functioning on its own consequently facilitating the award of degrees for its students. Thus, an autonomous institution is provided with the necessary freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

CMR Institute of Technology takes pride for having won the confidence of such distinguished academic bodies meant for monitoring the quality in technology education. Besides, the institution is delighted to sustain the same spirit of discharging the responsibilities that it has been conveying since a decade to attain the current academic excellence, if not improving upon the standards and ethics. Consequently, statutory bodies such as the Academic Council and the Boards of Studies have been constituted under the supervision of the Governing Body of the College and with the recommendations of the JNTU Hyderabad, to frame the regulations, course structure and syllabi for autonomous status.

The autonomous regulations, course structure and syllabi have been framed in accordance with the vision and mission of the institution along with certain valuable suggestions from professionals of various ancillary fields such as the academics, the industry and the research, all with a noble vision to impart quality technical education and contribute in catering full-fledged engineering and management graduates to the society.

All the faculty members, the parents and the students are requested to study all the rules and regulations carefully and approach the Principal to seek any clarifications, if needed, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the institution and for brightening the career prospects of engineering and management graduates.

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CMR INSTITUTE OF TECHNOLOGY

Vision: To create world class technocrats for societal needs.

Mission: Impart global quality technical education for a better future by providing appropriate learning environment through continuous improvement and customization.

Quality Policy: Strive for global excellence in academics & research to the satisfaction of students and stakeholders.

DEPARTMENT OF CIVIL ENGINEERING (CE)

Vision: To be a centre of excellence that nurtures technically competent civil engineers and promotes high-end research to meet the global challenges.

Mission: Provide fundamentals and emerging technical skills to design, build, operate and manage the infrastructure requirements of the society through education, training, research and consultancy.

I. PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

PEO1: Graduate will build successful career in the diversified sectors of the engineering industry and/or higher studies by acquiring knowledge in mathematical, scientific and engineering fundamentals.

PEO2: Graduate will plan, analyze and design civil engineering systems with societal responsibility.

PEO3: Graduate exhibits professional ethics, communication skills, teamwork and adapts to changing environments of engineering and technology by engaging in lifelong learning.

II. PROGRAMME OUTCOMES (PO's)

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.

13. **PSO1:** Identify, understand, formulate and analyze civil engineering problems related to structural, geo-technical, hydraulic, water resources, transportation and environmental engineering towards R&D, professional, career and societal needs.

14. **PSO2:** Apply modern techniques, software's and multi-disciplinary knowledge for the design and execution of civil engineering projects within stipulated time and cost.

Academic Regulations (R20)
B.Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2020 - 21)
&
B.Tech. - Lateral Entry Scheme
(For batches admitted from the academic year 2021 - 22)

PREAMBLE

For pursuing four year under graduate Bachelor Degree Programme in Engineering (B.Tech.) offered by **CMR Institute of Technology** under Autonomous status will herein be referred to as CMRIT (Autonomous).

All the specified rules are herein approved by the Academic Council. These rules will be in force and are applicable to students admitted from the Academic Year 2020-21 onwards. Any reference to "Institute" or "College" in these rules and regulations stand for CMRIT (Autonomous).

Choice Based Credit System (CBCS) has been adopted since 2017-18 under Autonomous status.

All the rules and regulations specified shall hereafter be read as a whole for the purpose of interpretation, as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, CMRIT (Autonomous) shall be The Chairman, Academic Council.

1. UNDER GRADUATE PROGRAMS OFFERED (E&T)

CMRIT (Autonomous), affiliated to JNTUH, offers 4 Year (8 Semesters) **B.Tech.** Degree Programme in the following Branches of Engineering:

S. No.	Branch
1	Civil Engineering (CE)
2	Mechanical Engineering (ME)
3	Electronics and Communication Engineering (ECE)
4	Computer Science and Engineering (CSE)
5	Computer Science and Engineering (AI & ML)
6	Computer Science and Engineering (Data Science)

2. ADMISSION CRITERIA AND MEDIUM OF INSTRUCTION

2.1. Admission into first year of four year B.Tech. (Regular) Degree Programme:

2.1.1. Eligibility: A candidate seeking admission into the first year of four year B. Tech. Degree Programme should have:

(i) Passed either Intermediate Public Examination (IPE) conducted by the Board of Intermediate Education, Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana or a Diploma in Engineering conducted by the Board of Technical Education, Telangana or equivalent Diploma recognized by Board of Technical Education for admission as per guidelines defined by the Regulatory bodies of Telangana State Council for Higher Education (TSCHE) and AICTE.

(ii) Secured a rank in the TSEAMCET examination conducted by TSCHE for allotment of a seat by the Convenor, TSEAMCET.

2.1.2. Admission Procedure: Admissions are made into the first year of four year B.Tech. Degree Programme as per the stipulations of the TSCHE.

(a) Category A: 70% of the seats are filled through TSEAMCET counseling.
(b) Category B: 30% of the seats are filled by the Management.

2.2. Admission into the second year of four year B. Tech. (Regular) Degree Programme Under Lateral Entry Scheme.

2.2.1 Eligibility: A candidate seeking admission into the II year I Semester B. Tech. Regular Degree Programme under Lateral Entry Scheme (LES) should have passed the qualifying examination (B.Sc. Mathematics or Diploma in concerned course) and have secured a rank at Engineering Common Entrance Test TSECET (FDH). Admissions are made in accordance with the instructions received from the Convenor, TSECET and Government of Telangana State.

2.2.2 Admission Procedure: Admissions are made into the II year of four year B.Tech. (Regular) Degree Programme through Convenor, TSECET (FDH) against the sanctioned intake in each Programme of study as lateral entry student.

2.3. Branch Transfers: There shall be no Branch transfers after the completion of Admission Process.

2.4. Medium of Instruction: The Medium of Instruction and Examinations for the entire B.Tech. programme will be in **English** only.

3. B.Tech. PROGRAMME STRUCTURE

3.1 Admitted under Four year B. Tech. (Regular) degree Programme:

3.1.1 A student after securing admission shall pursue the under graduate programme in B.Tech. for 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, students shall forfeit their seat in B.Tech course.

3.1.2 As per AICTE guidelines, a 3-week 'Mandatory **Induction Programme'** shall be offered to I-B.Tech. students to acquaint the newly admitted students with the professional environment and prepare them for the academic schedules ahead.

3.1.3 The entire B.Tech. programme is structured for a total of 160 credits. Distribution of credits Semester-wise is available in the respective course structure.

3.1.4 Each student shall register and secure 160 credits (with CGPA $\geq$ 5) for the completion of the under graduate programme and award of the B.Tech. degree.

3.2 Admitted under Lateral Entry Scheme (LES) into B. Tech. degree Programme:

3.2.1 After securing admission into II year B.Tech. I Semester, the LES students shall pursue a course of study for not less than three academic years (6 Semesters) and not more than six academic years (12 Semesters), failing which students shall forfeit their seat in B.Tech. programme.

3.2.2 The student shall register and secure 122 credits (with CGPA $\geq$ 5) from II year to IV year B.Tech. programme (LES) for the award of B.Tech. degree.

3.3 The Course Structure is designed based on the AICTE Model Curriculum (Jan-2018) for Under-Graduate Degree Courses in Engineering & Technology. **UGC / AICTE** specified definitions / descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations / Norms, which are listed below:

3.3.1 **Semester Scheme:** Each B.Tech. (Regular) Programme is of 4 Academic Years (8 Semesters) and B.Tech. (LES) Programme is of 3 Academic Years (6 Semesters)), with the academic year being divided into two semesters of 22 weeks (≥ 90 Instructional days per semester) each, each Semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)', Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and Curriculum / Course Structure as suggested by AICTE are followed.

3.3.2 **Credit Courses:**

a) All Subjects / Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject / Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods : Credits) Structure based on the following pattern:

Theory		Practical	
1 Hr. Lecture (L) per week	1 credit	1 Hr. Practical (P) per week	0.5 credit
1 Hr. Tutorial (T) per week	1 credit	2 Hrs Practical (Lab) per week	1.0 credit

All Mandatory Courses, Study Tour, Guest Lecture, etc., will not carry any Credits.

b) **Contact Hours:** Weekly contact hours – maximum of 30 hours per week (i.e. 1 hour = 60 Minutes) including credit and non-credit courses.

3.3.3 **Subject / Course Classification and Nomenclature:**

CMRIT has followed the guidelines specified by AICTE / UGC / JNTUH. The subjects / courses offered in B.Tech. programme are broadly classified as mentioned below.

S. No.	Category	Breakup of Credits	
		(AICTE)	(CMRIT)
1	Humanities and Social Sciences including Management courses (HSMC)	12*	10
2	Basic Science Courses (BSC)	25*	25
3	Engineering Science courses including workshop, drawing, basics of Electrical / Mechanical / Computer etc. (ESC)	24*	24
4	Professional core courses (PCC)	48*	60
5	Professional Elective courses relevant to chosen specialization / branch (PEC)	18*	18
6	Open subjects – Electives from other technical and /or emerging subjects (OEC)	18*	09
7	Project work, seminar and internship in industry or appropriate work place / academic and research institutions in India / abroad (PRJ)	15*	14
8	Mandatory Courses: (Environmental Sciences, Induction program, Indian Constitution, Essence of Indian Traditional Knowledge, etc) (MC)	(non-credit)	(non-credit)
Total Credits		**160***	**160**

**Minor variation is allowed as per need of the respective disciplines.*

4. COURSE REGISTRATION

4.1 A '**faculty advisor or counselor**' shall be assigned to each student to advise the student about the B.Tech. programme, course structure and curriculum, choice / option for subjects / courses, based on his/her 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 online submission, 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 **online** registration, **only after** obtaining the '**written approval**' from his faculty advisor or counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with Head of the Department, faculty advisor and the student.

4.4 A student has to register for all subjects/courses in a semester as specified in the course structure and may be permitted to register one additional theory subject / course limited to 3 credits, based on the student's **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 If the student submits ambiguous choices or multiple options or erroneous (incorrect) 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.

4.6 Subject / course options exercised through **online** registration are final and **cannot** be changed or inter- changed; further, alternate choices will not be considered. However, if the subject / course that has already been listed for registration by Head of the Department in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice - either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by Head of the Department, with due notification and time-framed schedule, within the **first week** from the commencement of class-work for that semester.

4.7 Dropping of additional registered subject / course (refer 4.4) may be permitted only after obtaining prior approval from the faculty advisor / counselor, '**within a period of 15 days**' from the commencement of that semester.

4.8 **Open electives**: Students have to choose one open elective wherever offered from the list of open electives given for their stream. Students should opt for open electives offered by other departments / branches only.

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

4.10 **Mandatory Courses (Non-Credit):** All mandatory courses wherever offered require prior registration.

5. SUBJECTS / COURSES TO BE OFFERED

5.1 A typical Section (or Class) Strength for each Semester shall be 60. A subject / course may be offered to the students, **if only** a minimum 1/3 of students register to the course. The Maximum Strength of a Section is limited to 80 (60 + 1/3 of the Section Strength).

i) More than **one faculty member** may offer the **same subject** (lab / practical's may be included with the corresponding theory subject in the same semester) in any semester. However, selection 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).

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

6. ATTENDANCE REQUIREMENTS

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

6.2 Condoning of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be granted 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 towards 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. They will not be promoted to the next semester.** They may seek re-registration for all those subjects registered in that semester in which student was detained, by seeking re-admission into that semester as and when offered; in case 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. 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% marks (25 out of 70 marks) in the semester end examination (SEE), and a minimum of 40% of marks in the sum total of the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) 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 summer internship and project courses, if student secures not less than 40% of the total marks in each of them. The student would be treated as failed, if student does not submit a report on his project(s), or does not make a presentation of the same before the evaluation committee as per the schedule. Student may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one re-appearance' evaluation also, student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	I Semester to II Semester	Regular course of study of I semester.
2	II Semester to III Semester	**(i)** Regular course of study of II semester. **(ii)** Must have secured at least 19 credits out of 38 credits i.e., 50% credits up to second semester from all the relevant regular and supplementary examinations whether the student takes those examinations or not.
3	III Semester to IV Semester	Regular course of study of III semester.

4	IV Semester to V Semester	**(i)** Regular course of study of IV semester. **(ii)** Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to fourth semester (21 credits out of 42 credits in case of LES) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	V Semester to VI Semester	Regular course of study of V semester.
6	VI Semester to VII Semester	**(i)** Regular course of study of sixth semester. **(ii)** Must have secured at least 72 credits out of 120 credits (49 credits out of 82 credits in case of LES) i.e., 60% credits up to sixth semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	VII Semester to VIII semester	Regular course of study of VII semester.

7.4 A student has to register for all subjects covering 160 credits (122 credits in case of LES) as specified and listed (with the relevant course / subject classifications as mentioned) in the course structure, fulfill all the attendance and academic requirements for 160 credits (122 credits in case of LES) securing a minimum of **'C'** grade or above in each subject, and 'earn all 160 credits (122 credits in case of LES) securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, to successfully complete the under graduate programme.

7.5 If a student registers for '**additional subjects'** (in the parent department or other departments / branches of engineering) other than those listed subjects totaling to 160 credits (122 credits in case of LES) as specified in the course structure of parent department, the performances in those '**additional subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits (122 credits in case of LES)) will not be taken into account while calculating the SGPA and CGPA. For such '**additional subjects'** registered, % of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations 6 and 7.1 to 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 when the same semester is offered in the next academic year for fulfillment of academic requirements**. The academic regulations under which student has been readmitted shall be applicable. However, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which 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 academic credits.** The academic regulations under which student has been readmitted shall be applicable.

8. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

8.1 The performance of a student in each semester shall be evaluated subject-wise / course-wise (irrespective of credits assigned) with a maximum of 100 marks. These evaluations shall be based on 30 marks allotted for CIE (Continuous Internal Evaluation) and 70 marks for SEE (Semester End Examination), and a letter grade corresponding to the percentage of marks obtained shall be given.

8.2 Evaluation of Theory Subjects / Courses

A) Continuous Internal Evaluation: For each theory subject, during the semester, there shall be 2 mid-term examinations of 30 marks each. Each mid-term examination consists of subjective paper for 25 marks & assignment for 5 marks and the final CIE marks (for total of 30) are calculated by taking 80% weightage from best of the two mid examinations and 20% weightage from the least scored mid examination marks in each subject.

- The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.
- The subjective paper shall be conducted for duration of 90 minutes. Each subjective paper shall contain 2 parts (Part-A and Part-B). Part-A consists of one compulsory question with five sub questions carrying two marks each. Part-B consists of 3 essay questions carrying five marks each with internal choice; the student has to answer all 3 questions.
- First assignment should be submitted before the commencement of the first mid-term examinations, and the second assignment should be submitted before the commencement of the second mid-term examinations. The assignments shall be specified / given by the concerned subject teacher.

B) Semester End Examinations: The duration of SEE is 3 hours. The details of the question paper pattern are as follows:

- The end semester examinations will be conducted for 70 marks consisting of two parts viz. i) **Part- A** for 20 marks, ii) **Part - B** for 50 marks.
- Part-A is compulsory, which consists of ten questions (two from each unit) carrying 2 marks each.
- Part-B consists of five questions (numbered from 11 to 15) carrying 10 marks each. One question from each unit (may contain sub-questions) with internal choice.

8.3 Evaluation of Practical / Design / Drawing Subjects /Courses:

In any semester, a student has to complete a minimum of 10 experiments / exercises in each laboratory course and get the record certified by the concerned Head of the Department to be eligible for Semester End Examination. For practical subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 internal marks and 70 marks for Semester End Examination (SEE).

A) Continuous Internal Evaluation (CIE): For each practical subject, during the semester, there shall be 2 mid-term examinations of 30 marks each. Each mid-term examination consists of day-to-day work evaluation for 20 marks and internal test for 10 marks conducted by the concerned laboratory teacher for duration of 90 minutes. The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus. The final CIE marks (for total of 30) are calculated by taking 80% weightage from best of the two mid examinations and 20% weightage from the least scored mid examination marks in each practical subject.

B) Semester End Examination (SEE): The SEE for practical subject / course shall be conducted at the end of the semester with duration of 3 hours by one internal and one external examiner appointed by the Head of the Institution as per the recommendation of the concerned Head of the Department.

8.4 Evaluation of Summer Internship:

The summer internship shall be registered by the students immediately after their IV semester course work in consultation with course coordinator and carried out in Industry/R&D organizations with a minimum duration of 4

weeks. The completed internship report will be assessed as SEE for 100 marks in V semester by a committee consisting of an external examiner; Head of the Department, supervisor of the Summer Internship and a senior faculty member of the department. There shall be no internal marks for Summer Internship.

8.5 **Evaluation of Industry Oriented Mini-Project:** The industry-oriented mini-project shall be registered by the students immediately after their VI semester course work in consultation with course coordinator and carried out in any Industry or R&D organization during the summer vacation for four weeks duration. The industry oriented mini-project shall be submitted in a report form and presented before the committee in VII semester. It shall be evaluated as SEE for 100 marks by the committee consisting of Head of the Department, concerned supervisor and two senior faculty members of the department. There shall be no internal marks for industry-oriented mini- project.

8.6 **Evaluation of Major Project:** The student shall enroll for the main project 15 days before commencement of VIII semester and should submit before II mid-test as per the guidelines issued by the respective Head of the Department. The main project will be evaluated for a total of 100 marks, of which 30 marks shall be for continuous internal evaluation and 70 marks for the end semester viva-voce examination. Out of 30 marks allocated for CIE, 15 marks shall be awarded by the project supervisor (based on the continuous evaluation of student's performance throughout the project work period), and the other 15 marks shall be awarded by a Departmental Committee consisting of Head of the Department and Project Supervisor, and two senior faculty members, based on the work carried out and the presentation made by the student during internal reviews (at least two internal reviews shall be conducted). The project viva-voce shall be conducted by a committee comprising an external examiner, Head of the Department and Project Supervisor.

8.7 **Evaluation of Mandatory Non-Credit Courses:** A student has to fulfill minimum attendance requirement for successful completion of all mandatory (non-credit) courses. Instead of letter grades, **'Satisfactory'** or "**Unsatisfactory'** shall be indicated and will not be counted for SGPA / CGPA computations for the award of the degree. Any student who fails to obtain the required attendance has to reregister and repeat the course as and when offered for award of the degree as per guidelines.

9. GRADING PROCEDURE

9.1 Marks will be awarded to indicate the performance of the student in each theory subject, lab /practical's/design/drawing practice, Summer Internship, Industry oriented Mini-Project and Major Project based on the percentage of marks obtained in 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 student's performance, a 10-point Absolute Grading System using the following letter grades (UGC Guidelines) and corresponding percentage of marks shall be followed...

% of Marks Secured (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
90% and above (≥ 90% , ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥ 80% , < 90%)	A^+ (Excellent)	9
Below 80% but not less than 70% (≥ 70% , < 80%)	A (Very Good)	8
Below 70% but not less than 60% (≥ 60% , < 70%)	B^+ (Good)	7
Below 60% but not less than 50% (≥ 50% , < 60%)	B (Average)	6
Below 50% but not less than 40% (≥ 40% , < 50%)	C (Pass)	5
Below 40% (< 40%)	F (Fail)	0
Absent	Ab	0

9.3 A student obtaining '**F**' grade in any subject shall be considered **'failed**' and will be required to reappear as '**Supplementary Student**' in the Semester End Examination (SEE),

as and when offered. In such cases, Continuous Internal Examination (CIE) in those subject(s) will remain same as those obtained earlier.

9.4 A letter grade does not imply any specific % of marks.

9.5 In general, a student shall not be permitted to repeat any subject/course (s) only for the sake of '**grade improvement**' or 'SGPA / CGPA improvement'. However, student has to repeat all the subjects / courses pertaining to that semester, if detained.

9.6 A student earns grade point (GP) in each subject / course, on the basis of the letter grade obtained in that subject/course (excluding mandatory non-credit courses). Then 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

9.7 The student passes the subject / course only when GP ≥ 5 (C grade or above).

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

$$\mathbf{SGPA\ (S_i) = \sum (C_i\ X\ G_i) / \sum C_i}$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

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 in **all** Semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year second semester onwards, at the end of each semester, as per the formula:

$$\mathbf{CGPA = \sum (C_i\ X\ S_i) / \sum C_i}$$

where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

Illustration of calculation of SGPA					**Illustration of calculation of CGPA**			
Course /Subject	**Credits**	**Letter Grade**	**Grade Points**	**Credit Points**	**Sem.**	**Credits**	**SGPA**	**Credits x SGPA**
Course 1	4	A	8	4 x 8 = 32	Sem I	19	7	19 x 7= 133
Course 2	3	O	10	3 x 10 = 30	Sem II	19	6	19 x 6= 114
Course 3	3	C	5	3 x 5 = 15	Sem III	21	6.5	21 x 6.5 =136.5
Course 4	3	B	6	3 x 6 = 18	Sem IV	21	6	21 x 6 = 126
Course 5	1.5	A^+	9	1.5x9 = 13.5	Sem V	20	7.5	20 x 7.5 =150
Course 6	1.5	A	8	1.5x8 = 12	Sem VI	20	8	20 x 8 = 160
Course 7	1.5	B^+	7	1.5x7 = 10.5	Sem VII	20	8.5	20 x 8.5 =170
Course 8	1.5	A^+	9	1.5x9 = 13.5	Sem VIII	20	8	20 x 8 = 160
Total	**19**		**62**	**144.5**	**Total**	**160**		**1149.5**
SGPA = 144.5/19 = 7.60					**CGPA = 1149.5/160 = 7.18**			

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 For calculations listed in Item 9.6–9.10, performance in failed subjects/courses (securing **F** grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations. However, mandatory courses will not be taken into consideration.

10 PASSING STANDARDS

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

10.2 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. it will show the details of the courses registered (course code, title, no. of credits, grade earned etc.), credits earned, SGPA, and CGPA.

11. DECLARATION OF RESULTS

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

11.2 The conversion formula from CGPA to percentage of Marks:

Percentage of Marks = (final CGPA – 0.5) x 10

12 AWARD OF DEGREE

12.1 After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. degree the student shall be placed in one of the following four classes based on CGPA:

Class Awarded	Grade to be Secured	Remarks
First Class with Distinction	≥ 8 CGPA	From the aggregate marks secured from 160 Credits for Regular Students and 122 Credits for Lateral Entry Students.
First Class	≥ 6.5 to < 8 CGPA	
Second Class	≥ 5.5 to < 6.5 CGPA	
Pass Class	≥ 5.00 to < 5.5 CGPA	
FAIL	CGPA < 5	

12.2 First class with distinction will be awarded to those students who clear all the subjects in single attempt during their regular course of study by fulfilling the following conditions:

i. Should have passed all the subjects/courses in '**first appearance'** within the first 4 academic years (or 8 sequential semesters) for B.Tech. (Regular) and first 3 academic years (or 6 sequential semesters) for B.Tech. (LES) from the date of commencement of first year first semester for B.Tech. (Regular) and II year I semester for B.Tech. (LES).

ii. Should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters (6 sequential semesters for LES), starting from I year I semester (starting from II year I semester for LES) onwards.

iii. Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in '**first class with distinction'**.

12.3 **Award of Medals:** Students fulfilling the conditions listed under item 12.2 alone will be eligible for award of '**College Ranks**' and '**Medals**'.

12.4 **Graduation Day:** The College shall have its own Annual Graduation Day for the award of Degrees issued by the University.

12.5 **Transcripts:** After successful completion of prerequisite credits for the award of degree a transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

13 WITH HOLDING OF RESULTS

If the student has not paid the fees to the Institute 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 SUPPLEMENTARY EXAMINATIONS

Supplementary examinations for odd semester subjects will be conducted along with even semester regular examinations and vice versa.

15. TRANSITORY REGULATIONS

a) A student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the degree programme, may be considered eligible for readmission to the same subjects / courses (or equivalent subjects/ courses, as the case may be), and same professional electives / open electives (or from set / category of electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 8 years from the date of commencement of student's first year first semester).

b) A student who has failed in any subject under any regulation has to pass those subjects in the respective regulations.

c) 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 R20 Regulations. The performance evaluation of the student will be done as per the rules and regulations applicable at the time of admission(s) regarding award of grade and/or class as the case may be.

d) If a student readmitted to R20 Regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R20 Regulations will be substituted by another subject to be suggested by the CMRIT Academic Council.

e) **Promotion Rule:** Where the credits allotted to a semester/year under the regulations studied in are different from that under R20 regulations for the corresponding semester/year, the promotion rules of R20 vide section 7.3 shall be applied after normalization. Normalization is done by scaling down or up the number of credits of a semester/year under the previous regulations to equal the number of credits of the corresponding semester/year under R20 regulations and revising the secured credits also in the same proportion.

16 STUDENT TRANSFERS

There shall be no transfers from other colleges / streams.

17 RULES OF DISCIPLINE

17.1 Any attempt by any student to influence the teachers, examiners, faculty members and staff of Controller of Examination office for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice case and the student can be debarred from the college.

17.2 When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, student is awarded zero marks in that subject(s).

17.3 When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Malpractice Prevention Committee is final.

18. MALPRACTICE

18.1 Malpractice Prevention Committee: The committee shall examine the student's malpractice and indiscipline cases occurred, while conducting the examinations and recommend appropriate punishment to the Academic Council after taking explanation from the student and concerned invigilator as per the malpractice rules mentioned below. The committee consists of

a) Controller of Examinations - Chairman
b) Addl. Controller of Examinations.- Convener
c) Subject Expert - Member
d) Head of the Department of which the student belongs to - Member
e) The Invigilator concerned - Member

18.2 Malpractice Rules: Disciplinary Action for Improper Conduct in Examinations

S. No.	Nature of Malpractices / Improper Conduct	Punishment
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers 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.
1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that 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.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers 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 and project work 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 and sent to the Principal.
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 practical's 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 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 in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that 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 examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Addl. Controller of examinations / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the addl. Controller of examinations 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 addl. Controller of examinations, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that 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 also are 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.
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 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.	Student of the colleges 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. 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 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 the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the principal for further action to award suitable punishment.	

19. SCOPE

i) The Academic Regulations should be read as a whole, for the purpose of any interpretation.

ii) The above mentioned rules and regulations are applicable in general to both B.Tech. (Regular) and B.Tech. (LES), unless and otherwise specific.

iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

20. REVISION AND AMENDMENTS TO REGULATIONS

The Academic Council may revise 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 Academic Council.

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COURSE STRUCTURE

B.Tech. (CE) – R20 COURSE STRUCTURE

(Applicable from the batch admitted during 2020-21 and onwards)

I – Semester								
S. No.	Subject Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	20-BSC-101	Linear Algebra & Calculus	1,2,12		3	1	-	4
2	20-BSC-105	Engineering Chemistry	1,2,12		3	-	-	3
3	20-ESC-101	Basic Electrical & Electronics Engineering	1,2,3,12		3	-	-	3
4	20-ESC-103	Problem Solving with C Programming	1,2,3,12		3	-	-	3
5	20-BSC-106	Engineering Chemistry Lab	4		-	-	3	1.5
6	20-ESC-102	Basic Electrical & Electronics Engineering Lab	4		-	-	3	1.5
7	20-ESC-104	Problem Solving with C Programming Lab	4		-	-	3	1.5
8	20-ESC-108	IT & Engineering Workshop Practice	1,5,9,10		-	-	3	1.5
9	20-MC-101	NSS / Physical Education / Yoga	3,6,8,9,12		-	-	2	-
TOTAL					**12**	**01**	**14**	**19**

II – Semester								
S. No.	Subject Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	20-BSC-102	Advanced Calculus	1,2,12		3	1	-	4
2	20-BSC-107	Engineering Physics	1,2,12		3	1	-	4
3	20-HSMC-101	English for Engineers	10,12		2	-	-	2
4	20-ESC-105	Data Structures through C	1,2,3,12		3	-	-	3
5	20-ESC-107	Computer Aided Engineering Graphics	1,5,10		-	-	3	1.5
6	20-BSC-108	Engineering Physics Lab	4		-	-	3	1.5
7	20-HSMC-102	English Language and Communication Skills Lab	5,10		-	-	3	1.5
8	20-ESC-106	Data Structures through C Lab	4		-	-	3	1.5
9	20-MC-102	Environmental Science	1,6,7,12		2	-	-	-
TOTAL					**13**	**02**	**12**	**19**

III – Semester								
S. No.	Subject Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	20-ESC-201	Building Materials, Construction & Planning	1,6,12	1	3	-	-	3
2	20-ESC-203	Engineering Mechanics	1,2,12		3	-	-	3
3	20-CE-PC-211	Strength of Materials – I	1,2,12	1	3	-	-	3
4	20-CE-PC-212	Fluid Mechanics	1,2,12	1	3	-	-	3
5	20-CE-PC-213	Surveying	1,2,12	1	3	-	-	3
6	20-CE-PC-214	Surveying Lab	4,5,10	2	-	-	3	1.5
7	20-ESC-202	Computer Aided Civil Engineering Drawing Lab	4,5,10	2	-	-	3	1.5
8	20-HSMC-201	Business Communication Skills Lab	9,10		-	-	3	1.5
9	20-BSC-205	Social Innovation Lab	1 to 12	1,2	-	-	3	1.5
10	20-MC-201	Gender Sensitization Lab	9,12		-	-	2	-
TOTAL					**15**	**-**	**14**	**21**

IV – Semester								
S. No.	Subject Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	20-BSC-202	Numerical and Statistical Methods	1,2,12		3	1	-	4
2	20-CE-PC-221	Engineering Geology	1,2,12		3	-	-	3
3	20-CE-PC-222	Strength of Materials – II	2,12	1	3	-	-	3
4	20-CE-PC-223	Hydraulics & Hydraulic Machinery	2,12	1	3	-	-	3
5	20-CE-PC-224	Structural Analysis	2,12	1	3	-	-	3
6	20-CE-PC-225	Strength of Materials Lab	4	2	-	-	2	1
7	20-CE-PC-226	FM & HHM Lab	4	2	-	-	3	1.5
8	20-CE-PC-227	Engineering Geology Lab	4		-	-	2	1
9	20-BSC-204	Aptitude and critical thinking skills Lab	9,10		-	-	3	1.5
10	20-MC-202	Indian Culture and Constitution	8,12		2	-	-	-
TOTAL					**17**	**01**	**10**	**21**

Note: Summer Internship carried out during Summer Vacation between IV semester & V semester and evaluated in V semester.

V – Semester								
S. No.	Subject Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	20-CE-PC-311	Concrete Technology	3,8,12	1	3	-	-	3
2	20-CE-PC-312	Geo-Technical Engineering	1,2,12	1	3	-	-	3
3	20-CE-PC-313	Water Resources Engineering	2,3,12	1	3	-	-	3
4	20-CE-PC-314	Transportation Engineering	2,3,12	1	3	-	-	3
5	**Professional Elective – I**				3	-	-	3
	20-CE-PE-311	Construction Technology & Management	11,12	2				
	20-CE-PE-312	Advanced Structural Analysis	2,12	1				
	20-CE-PE-313	Modern Transportation Engineering	3,5,12	2				
6	20-CE-PC-315	Concrete Technology Lab	4,6	2	-	-	2	1
7	20-CE-PC-316	Geo-Technical Engineering Lab	4,6	2	-	-	3	1.5
8	20-CE-PC-317	Transportation Engineering Lab	4,7	2	-	-	3	1.5
9	20-CE-PC-318	Water Distribution Analysis and Design Software Lab (Using Water GEMS)	4,5,10	2	-	-	2	1
10	20-CE-PR-311	Summer Internship	1 to 12	1,2	-	-	-	1
11	20-MC-301	Coding Skills	2,3,4,5,12		1	-	2	-
TOTAL					**16**	**-**	**12**	**21**

VI – Semester								
S. No.	Subject Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	20-CE-PC-321	Environmental Engineering	3,6,7,12	1	3	-	-	3
2	20-CE-PC-322	Design of Reinforced Concrete Structures	3,8,10,12	2	3	-	-	3
3	20-CE-PC-323	Artificial Intelligence and Robotics	1,2,12	1	3	-	-	3
4	**Professional Elective – II**				3	-	-	3
	20-CE-PE-321	Foundation Engineering	2,3,8,12	2				
	20-CE-PE-322	Pavement Design	3,6,8,12	2				
	20-CE-PE-323	Irrigation Engineering	3,4,7,12	1				
5	**Open Elective – I**				3	-	-	3
	20-OEC-321	CE: Disaster Management	2,7,8,12					
	20-OEC-322	ME: Robotics	1,2,5,12					
	20-OEC-323	ECE: Electronic Measurements and Instrumentation	1,2,12					
	20-OEC-324	CSE: Java Programming	1,2,3,5,12					
6	20-CE-PC-324	Environmental Engineering Lab	4	2	-	-	3	1.5
7	20-CE-PC-325	Artificial Intelligence and Robotics Lab	4,5	2	-	-	2	1
8	20-CE-PC-326	Computer Aided Civil Engineering Design Lab	4,5,10	2	-	-	3	1.5
9	20-HSMC-301	Advanced English Communication Skills Lab	5,10		1	-	2	2
10	20-MC-302	Human Values and Professional Ethics	6,7,8,12		2	-	-	-
TOTAL					**18**	**-**	**10**	**21**

Note: Industry Oriented Mini-Project carried out during Summer Vacation between VI semester & VII semester and evaluated in VII semester.

VII – Semester								
S. No.	Subject Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	20-HSMC-411	Business Economics	11,12		3	-	-	3
2	20-CE-PC-411	Estimation & Costing	11,12	2	3	-	-	3
3	**Professional Elective – III**				3	-	-	3
	20-CE-PE-411	Watershed Management	6,7,12	1				
	20-CE-PE-413	Design of Steel Structures	3,8,10,12	2				
	20-CE-PE-415	Intelligence Transport Systems	2,3,10,12					
4	**Professional Elective – IV**				3	-	-	3
	20-CE-PE-412	Municipal and Hazardous Waste Management	2,3,6,7,12	1				
	20-CE-PE-414	Finite Element Analysis	2,3,4,12	2				
	20-CE-PE-416	Remote Sensing and GIS	2,5,7,12	2				
5	**Open Elective – II**				3	-	-	3
	20-OEC-411	CE: Green Building Technologies	1,2,7,12					
	20-OEC-412	ME: Drones	1,2,3,5,7,12					
	20-OEC-413	ECE: 5G Technologies	1,2,3,5,7,12					
	20-OEC-414	CSE: Database Management Systems	1,2,3,5,12					
6	20-CE-PC-412	BIM Technologies Lab	4,5,10	2	-	-	2	1
7	20-CE-PR-411	Industry Oriented Mini-Project	1 to 12	1,2	-	-	-	3
TOTAL					**15**	**-**	**02**	**19**

VIII – Semester								
S. No.	Subject Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	**Professional Elective – V**				3	-	-	3
	20-CE-PE-421	Ground Improvement Techniques	2,12,13	1				
	20-CE-PE-423	Prestressed Concrete	2,3,8,12	2				
	20-CE-PE-425	Traffic Engineering	3,5,6,12	2				
2	**Professional Elective – VI**				3	-	-	3
	20-CE-PE-422	Earthen Dams and Slopes Stability	2,6,7,8,12	1				
	20-CE-PE-424	Repair and Rehabilitation of Structures	2,4,7,12	2				
	20-CE-PE-426	Urban Public Transportation System	2,6,12	1				
3	**Open Elective – III**				3	-	-	3
	20-OEC-421	CE: Intellectual Property Rights	1,6,8,12					
	20-OEC-422	ME: Principles of Entrepreneurship	7,8,9,11,12					
	20-OEC-423	ECE: Precision Agriculture	1,2,3,5,6,12					
	20-OEC-424	CSE: Web Technologies	2,3,5,6,12					
4	20-CE-PR-421	Major Project	1 to 12	1,2	-	-	20	10
TOTAL					**09**	**-**	**20**	**19**

B.TECH.-I-SEMESTER SYLLABUS

LINEAR ALGEBRA & CALCULUS

Course	B.Tech.-I-Sem.	L	T	P	C
Subject Code	20-BSC-101	3	1	-	4

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	solve system of linear equations by using matrices	3	2	1
CO2	find Eigen values and Eigen vectors	3	2	1
CO3	analyze the nature of sequences and series	3	2	1
CO4	verify mean value theorems and evaluate improper integrals by using Beta and Gamma functions	3	2	1
CO5	find the extreme values of functions of two variables	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Matrices**	9
Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.		
II	**Eigen values and Eigen vectors**	11
Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation.		
III	**Sequences and Series**	4+6=10
Part A: Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences. Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test; Raabe's test.		
Part B: Cauchy's Integral test; Cauchy's root test Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.		
IV	**Calculus**	9
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 and Maclaurin's series (without proof). Definition of Improper Integral: Beta and Gamma functions and their applications.		
V	**Multivariable calculus (Partial Differentiation and applications)**	9
Definitions of Limit and continuity, Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.		
Textbooks:		
1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 36th Edition, 2010. 2. Advanced Engineering Mathematics by Erwin kreyszig, 9th Edition, John Wiley & Sons, 2006. 3. Calculus and Analytic Geometry by G.B.Thomas and R.L.Finney, 9th Edn., Pearson, Reprint, 2002.		
References:		
1. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008. 2. Higher Engineering Mathematics, Ramana B.V., TMH, 11th Reprint.		

ENGINEERING CHEMISTRY

Course	B.Tech.-I-Sem.	L	T	P	C
Subject Code	20-BSC-105	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	determine the hardness of water and various treatment methods	3	2	1
CO2	apply the concepts of electrochemistry and corrosion control	3	2	1
CO3	explain the principles of spectroscopy and its applications	3	2	1
CO4	illustrate the various fuels, synthesis of polymers and drugs	3	2	1
CO5	analyze the properties of engineering materials	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Water and its treatment**	9
Introduction - hardness of water - causes of hardness - types of hardness: temporary and permanent - expression and units of hardness - Estimation of hardness of water by complexometric method. Numerical problems. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning - Softening of water by ion exchange processes. Potable water and its specifications - Steps involved in the treatment of potable water - Desalination of water - Reverse osmosis.		
II	**Electrochemistry and Corrosion**	10
Electrochemistry: Introduction, conductance - specific, equivalent and molar conductance, Electrode-Types of electrodes - Construction and functioning of calomel electrode and glass electrode, Nernst equation - electrochemical series and its applications. Batteries: Primary (Lithium cell) and secondary batteries (Lead - acid storage battery and Lithium ion battery). **Corrosion**: Causes and effects of corrosion - Theories of chemical and electrochemical corrosion - mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Corrosion control methods - Cathodic protection - Sacrificial anode and impressed current cathodic methods.		
III	**Spectroscopic techniques and applications**	5+4=9
Part A: Introduction - Absorbance, Extinction coefficient - Principles of spectroscopy - UV - Visible spectroscopy: Beer's-Lamberts law - applications, IR spectroscopy.		
Part B: Basic concepts of nuclear magnetic resonance Spectroscopy- Spin-spin coupling, chemical shift. Introduction to Magnetic resonance imaging.		
IV	**Fuels, Polymers and Synthesis of drug molecules**	11
Fuels: Classification- solid fuels: coal – analysis of coal - proximate and ultimate analysis and their significance. Liquid fuels - Petroleum and its refining, Gaseous fuels - composition and uses of natural gas, LPG and CNG. **Polymers:** Definition - Classification of polymers with examples - Types of polymerization - addition and condensation polymerization with examples. Preparation, Properties, and engineering applications of PVC, Teflon and Nylon. **Synthesis of drug molecules**: Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.		
V	**Engineering Materials**	9
Cement: Portland cement, its composition, setting and hardening of Portland cement. **Refractories:** Classification and characteristics of refractories, properties and applications of Refractories. **Lubricants:** Classification of lubricants with examples - characteristics of a good lubricants - properties of lubricants: viscosity, cloud point, pour point, flash point and fire point. **Nano materials:** Introduction to nanomaterials, preparation of CNT'S by CVD method, properties of CNT'S. General applications of nanomaterials.		
Textbooks:		
1. Engineering Chemistry by P.C. Jain and M.Jain, Dhanpatrai Publishing Company, New Delhi 2010. 2. Engineering Chemistry by Rama Devi, Ch. V. Ramana Reddy and Rath, Cengage learning, New Delhi 2016.		
References:		
1. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd., New Delhi 2011.		

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Course	B.Tech.-I-Sem.	L	T	P	C
Subject Code	20-ESC-101	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	solve electrical circuits using circuit laws	3	3	2	1
CO2	elaborate the concepts of network theorems & single phase AC circuits	3	3	2	1
CO3	explain three phase AC circuits and P-N Junction Diode	3	3	2	1
CO4	evaluate the functioning of electronic devices and their applications	3	3	2	1
CO5	illustrate the configurations and biasing techniques of BJT	3	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Electrical Circuits**	11
Electrical circuit elements (R, L and C), Types of sources, Source Transformation, ohm's law Kirchhoff's Laws, Network reduction techniques - series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Mesh and Nodal Analysis.		
II	**DC Theorems and Single Phase AC Circuits**	8
DC Theorems: Superposition, Reciprocity, Thevenin's, Norton's and Maximum power transfer Theorems for DC excitation. Simple problems. **Single Phase AC Circuits:** Introduction, Sinusoidal alternating quantities, RMS values, Average values, form factor and peak factor, AC through Series RL, RC & RLC circuits.		
III	**Three Phase AC circuits & P-N Junction Diode**	5+5=10
Part-A: Three Phase AC circuits: Introduction, line voltage, line current relations power equation in star and delta connections in Three Phase systems, Advantages of Three Phase systems.		
Part-B: P-N Junction Diode: PN Junction diode- V-I Characteristics, Ideal versus Practical, Temperature dependence.		
IV	**Rectifiers and Special Purpose Devices**	9
Rectifiers: Diode as a Rectifier - Half Wave Rectifier, Full Wave rectifier with centre tapped transformer, Bridge Rectifier. **Special Purpose Devices:** Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as voltage regulator.		
V	**Bipolar Junction Transistor (BJT)**	10
Construction, Principle of Operation, Symbol, CE, CB, CC configurations. DC & AC load line, stability factor, Need for biasing & biasing techniques.		
Textbooks:		
1. Circuit Theory (Analysis and synthesis) - A. Chakrabarti, Dhanpat Rai & Co Pvt Ltd. 7th Ed, 2015. 2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006. 3. Electrical Technology- vol-II B L Theraja, S. Chand publications.		
References:		
1. Introduction to Electronic Devices and Circuits-Rober T. Paynter, Pearson Education. 2. Network Theory by Sudhakar, Shyam Mohan Palli, TMH. 3. Electronic Devices and Circuits – 2nd Edition by Muhammad H.Rashid, Cengage Learning.		

PROBLEM SOLVING WITH C PROGRAMMING

Course	B.Tech.-I-Sem.	L	T	P	C
Subject Code	20-ESC-103	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	write simple programs using C language	3	3	2	2
CO2	design structured programs using functions	3	3	2	2
CO3	develop programs using arrays, strings and pointers	3	3	2	2
CO4	construct programs for heterogeneous data	3	3	2	2
CO5	implement various file operations in C programming	3	3	2	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Programming**	11
Introduction to components of a computer system: primary and secondary memory, processor, Input/output devices, operating system, compilers, creating, compiling and executing a program. Introduction to Algorithms: Representation of Algorithm/Pseudo code, Flowchart, Structure chart with examples, Program development steps. **Introduction to C Programming Language:** identifiers, data types, variables , constants, Operators, Expression evaluation, precedence, Preprocessor commands, Conditional Branching and Loops: Writing and evaluation of conditions and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops.		
II	**Arrays and Functions**	8
Arrays: Concepts, using arrays in C, One dimensional, two dimensional arrays, multidimensional arrays, array applications- linear search, binary search and bubble sort, C program examples. **Functions:** Designing Structured Programs, Functions, user defined functions, Standard functions, Parameter passing in functions, Storage classes-auto, register, static, extern, recursion- recursive functions, differences between recursion and iteration, Simple programs, such as Finding Factorial, GCD, Fibonacci series etc., Limitations of recursion, example C programs.		
III	**Pointers and Strings**	5+5=10
Part A: Pointers: Defining pointers, pointers to pointers, Pointer Arithmetic, accessing arrays using pointers, void pointer, Null pointer, Dangling Pointer, dynamic memory allocation functions.		
Part B: Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strcmp, strstr, etc.), arrays of strings.		
IV	**Structures and Unions**	10
Structures - Defining structures, initializing structures, accessing structures, operations on structures, Nested structures, structures containing arrays, arrays of structures, structures and functions, self-referential structures, enum, typedef, bit fields; **Unions** - Defining unions, initializing unions, accessing unions, differences between Structures and unions, C programming examples.		
V	**File handling in C**	9
Files - Concept of a file ,Text and Binary files, Differences between text and binary files, File opening modes , Opening and Closing files, file input / output functions, file status functions (error handling), Random access using fseek, ftell and rewind functions, C programming examples.		
Textbooks:		
1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, 3rd Edition, Cengage Learning. 2. Programming in ANSI C, E. Balaguruswamy, TMH.		
References:		
1. The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, 2nd Edition, Pearson. 2. C: The Complete Reference, Herbert Schildt, TMH, 4th Edition.		

ENGINEERING CHEMISTRY LAB

Course	B.Tech.-I-Sem.	L	T	P	C
Subject Code	20-BSC-106	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	determine the hardness in water samples to solve societal problems	3
CO2	estimate the strength of the given solutions	3
CO3	analyze adsorption and viscosity of various fluids	3
CO4	synthesize the various organic compounds used in medical industry	3
CO5	verify and understand the distribution coefficient	3

List of Experiments: (Perform any 10 Experiments)

Week	Title/Experiment
	Volumetric Analysis
1	Determination of total hardness of water by complexometric method using EDTA.
2	Estimation of ferrous ion by dichrometry.
	Instrumentation
3	Estimation of HCl by Conductometric titrations.
4	Estimation of Acetic acid by Conductometric titrations.
5	Estimation of HCl by Potentiometric titrations.
6	Estimation of Fe^{2+} by Potentiometer using $KMnO_4$.
7	Estimation of copper by colorimetric method.
8	Estimation of amount of ferrous ion in Cement by colorimetric method.
	Preparations
9	Synthesis of Aspirin and paracetamol.
	Physical properties
10	Determination of viscosity of a liquid by using Ostwald's viscometer.
11	Verification of Freundlich adsorption isotherm-adsorption of acetic acid on charcoal.
12	Determination of partition coefficient of acetic acid between n-butanol and water.

References

1. Engineering Chemistry Lab manual - Department of FED - CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Assessment of ground water quality of specified area.
2. Determination of Viscosity of castor oil and groundnut oil.
3. Preparation of petroleum jelly.
4. Preparation of soaps and liquid hand wash.
5. Recycling of waste water.
6. Drinking water purification.
7. Estimation of manganese in pyrolusite.
8. Preparation of hand sanitizer.
9. Determination of P^H values of various soft drinks.
10. Studies on the effect of metal coupling on corrosion.

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

Course	B.Tech.-I-Sem.	L	T	P	C
Subject Code	20-ESC-102	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	design electrical circuits to verify circuit laws	3
CO2	evaluate network theorems	3
CO3	verify the V-I characteristics of various electronic devices	3
CO4	determine the efficiency of various rectifiers	3
CO5	illustrate the configurations of Bi-polar junction transistor	3

List of Experiments

Week	Title/Experiment
	Part-A: Electrical lab
1	Verification of KVL & KCL.
2	Verification of Superposition theorem.
3	Verification of reciprocity theorem.
4	Verification of maximum power transfer theorem.
5	Experimental determination of Thevenin's Theorem equivalent circuits.
6	Experimental determination of Norton's Theorem equivalent circuits.
	Part-B: Electronics Lab
1	Forward and reverse bias characteristics of PN-Junction Diode.
2	Zener diode V-I characteristics and Zener diode as voltage regulator.
3	Efficiency of Half wave rectifier.
4	Efficiency of Full wave rectifier.
5	Input & output characteristics of Transistor in CB configuration.
6	Input & output characteristics of Transistor in CE configuration.

References

1. Basic Electrical & Electronics Engineering Lab manual, FED, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Design a regulated power supply.
2. Design a voltmeter.
3. Design a voltage doubler circuit.
4. Design a line follower using DC motor.
5. Design an automatic fan controller.
6. Design a burglar alarm.
7. Design an automatic irrigation system using soil moisture sensor.
8. Design a Water level indicator using transistor.
9. Design a brake failure indicator.
10. Design an IR transmitter and receiver.

PROBLEM SOLVING WITH C PROGRAMMING LAB

Course	B.Tech.-I-Sem.	L	T	P	C
Subject Code	20-ESC-104	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	execute simple programs using C compiler	3
CO2	apply control statements in designing programs	3
CO3	design programs using functions, arrays, strings and pointers	3
CO4	construct programs for heterogeneous data	3
CO5	implement various file operations in C programming	3

List of Experiments

Week	Title/Experiment
I	**Familiarization with programming environment**
1. Write a program to print sample strings like "hello world", "Welcome to C Programming" with different formats using escape sequences. 2. Write a Program to print different data types in C and their ranges. 3. Write a Program to initialize, assign & print variables of different data types.	
II	**Operators**
1. Write a Program to demonstrate arithmetic operators. (+,-,*,/,%) 2. Write a Program to demonstrate relational operators.(<,>,<=,>=,==,!=) 3. Write a program to check equivalence of two numbers using conditional operator. 4. Write a Program to demonstrate pre increment and post increment. (++a, a++ where a is a value to be initialized)	
III	**Simple C programs**
1. Write a Program to read radius value from the keyboard and calculate the area of circle 2. Write a Program to calculate simple interest. 3. Write a Program to convert temperature. (Fahrenheit –Centigrade and vice-versa) 4. Write a program for computing the volume of sphere, cone and cylinder assume that dimensions are integers use type casting where ever necessary.	
IV	**Decision Statements**
1. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = distinction. Read percentage from standard input. 2. Write a Program to calculate roots of quadratic equation (using if-else). 3. Write a Program to perform arithmetic operations using switch case. 4. Write a Program to display colors using switch case (VIBGYOR).	
V	**Loops**
1. Write a program to calculate sum of individual digits of a given number. 2. Write a program to print prime numbers in the given range. 3. Write a program to read 2 numbers x and n then compute the sum of the Geometric Progression. $1+x+x^2+x^3+ - - - - - - - +x^n$ 4. Write a C program to construct a pyramid of numbers as follows: . 1 / 1 2 / 1 2 3 * / * * / * * * 1 / 2 3 / 4 5 6 1 / 2 2 / 3 3 3 / 4 4 4 4 * / * * / * * * / * * / *	
VI	**1-D arrays**
1. Write a program to store 10 elements in the 1-D array and print sum of the array. 2. Write a program to print minimum and maximum elements in the 1-D array. 3. Write a program to search the given element by using linear search and binary search. 4. Write a program to sort the given elements using bubble sort technique.	

VII	2-D arrays
1. Write a program to perform matrix addition. 2. Write a program to perform matrix multiplication. 3. Write a program to print the transpose of a matrix.	
VIII	**Functions**
1. Write a program to find product of two numbers using functions without arguments, without return type. 2. Write a program to find difference of two numbers using functions without arguments, with return type. 3. Write a program to find sum of two numbers using functions with arguments &without return type. 4. Write a program to find product of two numbers using functions with arguments, with return type.	
IX	**Functions and Recursion**
1. Write a program to swap two numbers using a) Call by Value b) Call by Reference. (Using pointers) 2. Write a program to calculate factorial, GCD and Fibonacci series of n terms using recursion and non-recursion functions. 3. Write C program that reads two integers x and n and calls a recursive function to compute x^n 4. Write a C program that reads two integers and calls a recursive function to compute ${}^nC_r$	
X	**Strings**
1. Write a program to demonstrate various string manipulations using built-in functions. 2. Write a program to print the given strings in ascending order. 3. Write a program to verify the given string is palindrome or not (without using built-in functions and with using built-in functions). 4. Write a program to concatenate two strings using arrays without using strcat.	
XI	**Structures**
1. Write a program to find total marks of individual student and average marks for 10 students using structures. 2. Write a program to illustrate passing an entire structure to a function. 3. Write a C Program to perform addition and multiplication of two complex numbers using structures.	
XII	**File operations**
1. Write a C program to display the contents of a file to standard output device. 2. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents. 3. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file). 4. Write a C program to count the number of times a character occurs in a text file.	
References	
1. Problem Solving with C Programming Lab Manual, FED, CMRIT, Hyd.	
Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.	
1. Pay roll management system. 2. Fee collection system. 3. Employee's Management System. 4. Library management. 5. Department store system. 6. Personal Dairy Management System. 7. Telecom Billing Management System. 8. Bank Management System. 9. Contacts Management. 10. Medical Store Management System.	

IT & ENGINEERING WORKSHOP PRACTICE

Course	B.Tech.-I-Sem.	L	T	P	C
Subject Code	20-ESC-108	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO5	PO9	PO10
CO1	execute simple programs using Sci Lab	3	3	2	2
CO2	design programs using conditional statements and loops	3	3	2	2
CO3	apply safety norms while handling the workshop equipment	3	1	3	2
CO4	prepare required models using various engineering trades	3	1	3	2
CO5	make use of various power tools	3	1	3	2

List of Experiments

Week	Title/Experiment
	Part-A: IT Workshop (Sci Lab)
1	**Introduction:** Why Sci Lab?, History, Its strengths, Competitors, Starting Sci Lab, Using Sci Lab as a calculator, Quitting Sci Lab.
2	**Basics:** Familiar with Sci Lab windows, Basic Operations, Sci Lab - Data types, Rules about variable names, Predefined variables.
3	**Programming-I:** Vector, Matrix, Array Addressing, Built-in functions, Mathematical Operations, Dealing with strings (Array of characters), Array of array (cell) concept.
4	**Programming-II:** Script file, Input commands, Output commands, Structure of function file, Inline functions, Feval command, Comparison between script file and function file.
5	**Conditional statements and Loop:** Relational and Logical Operators, If-else statements, Switch-case statements, For loop, While loop, Special commands (Break and continue), Import data from large database, Export data to own file or database.
6	**Plotting-I:** In-built functions for plotting, Multiple plotting with special graphics.
7	**Plotting-II:** Curve fitting, Interpolation, Basic fitting interface.
	Part-B: Engineering Workshop
8	**House Wiring:** Power point, light fitting and switches.
9	**Carpentry:** Study of tools and joints; Practice in planning, chiseling, marking and sawing.
10	**Carpentry:** Joints: Cross joint, T joint, Dove tail joint.
11	**Fitting:** Study of tools, practice in filing, cutting, drilling and tapping.
12	**Fitting:** Male and female joints, stepped joints**.**
13	**Tin Smithy:** Preparation of Open scoop, Cylinder, square/rectangular tray.
14	**Demonstration of Power Tools:** Bench drilling machine, hand drilling machine, power hacksaw, grinding machine, lathe machine, wood cutting machine and welding machine.

References

1. IT & Engineering Workshop Practice Manual, FED, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Design a mathematical model to explain the functioning of Global positioning system (GPS)
2. Design a mathematical model for the construction of flyover.
3. Model any art craft using mathematical calculations (electrical / non-electrical).
4. 2-D plotting using SCI-lab.
5. 3-D plotting using SCI-lab.
6. Make Round tee pipe.
7. Design electrical wiring plan for a house.
8. Prepare decorative series lights / dim & bright lighting.
9. Preparation of door stoppers / hinges.
10. Preparation of tool handles.

NATIONAL SERVICE SCHEME (NSS)/PHYSICAL EDUCATION/YOGA MANDATORY COURSE (NON-CRIDIT)

Course	B.Tech.-I-Sem.	L	T	P	C
Subject Code	20-MC-101	-	-	2	-

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO6	PO8	PO9	PO12
CO1	harness physical literacy and lifelong engagement	3	3	3	3	3
CO2	use aesthetic appreciation	2	1	2	3	3
CO3	build competence and confidence to face challenges	1	2	1	3	3
CO4	develop Sports related values and attitudes	3	3	2	2	3
CO5	follow appropriate etiquette and sports	1	1	2	3	3

List of Activities/Events

NATIONAL SERVICE SCHEME (N.S.S.)

The programme aims to inculcate social welfare in students, and to provide service to society without bias. NSS volunteers work to ensure that everyone who is needy gets help to enhance their standard of living and lead a life of dignity. In doing so, volunteers learn from people in villages how to lead a good life despite a scarcity of resources. It also provides help in natural and man-made disasters by providing food, clothing and first aid to the disaster victims.

S. No.	Name of the Activity	S. No.	Name of the Activity
1	First-aid	9	Anti-Ragging Awareness
2	Blood donation camp	10	Social Activities Awareness
3	Traffic awareness program	11	Cyber Crime
4	Environmental Awareness	12	Digital India
5	Swachh Bharat Abhiyan	13	Substance Abuse Awareness Program (SAAP)
6	Health awareness program	14	Fire Safety Awareness
7	Garments / Essential Education Material Collection and distribution	15	Telanganaku Haritha Haram (Sapling Plantation)
8	Non-formal education		

PHYSICAL EDUCATION / YOGA

The aim of course is to make Physical Education as an integral part of Educational System. Students studying in the colleges should have the benefit of Physical Education to improve their health during the course of college education. It is designed to ensure that on completion of this training they would attain the minimum prescribed standard.

Name of the Individual Event		Name of the Team Event	
S. No.	Event	S. No.	Event
1	Badminton	1	Basketball
2	Gymnastics	2	Football
3	Judo	3	Hockey
4	Swimming	4	Kabaddi
5	Table Tennis	5	Kho –Kho
6	Tennis	6	Volleyball
7	Weight Lifting and Power Lifting	7	Cricket
8	Wrestling	8	Hand ball
9	**Yoga**	9	Throw ball
10	Archery	10	Badminton
11	Body Building	11	Table Tennis
12	Carroms	12	Tennis
13	Chess	13	Swimming
14	Boxing	14	Carroms
15	Taekwondo	15	Taekwondo
16	Fencing	16	Fencing
17	Athletics	17	Athletics

B.TECH.-II-SEMESTER SYLLABUS

ADVANCED CALCULUS

Course	B.Tech.-II-Sem.	L	T	P	C
Subject Code	20-BSC-102	3	1	-	4

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	solve linear and non-linear ordinary differential equations	3	2	1
CO2	solve linear and non-linear partial differential equations	3	2	1
CO3	evaluate the line, surface and volume integrals and convert them from one to another by using multiple integrals	3	2	1
CO4	determine vector field, scalar field, gradient, divergence and curl by using vector differentiation	3	2	1
CO5	solve the line, surface and volume integrals by using vector integration	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Differential Equations**	11
Exact & Reducible to exact, Linear and Bernoulie's Differential Equations. Applications; Newton's law of cooling, law of natural growth and decay. Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, $e^{ax}V(x)$, $xV(x)$,method of Variation of parameters.		
II	**Partial Differential Equations**	8
Formation of partial differential equations-by elimination of arbitrary constants and arbitrary functions–solutions of first order linear (Lagrange) equations and nonlinear equations (Four standard types) – Method of Separation of Variables.		
III	**Multiple Integration**	5+5=10
Part A: Double integrals (Cartesian &polar), change of order of integration in double integrals, Change of variables (Cartesian to polar).		
Part B: Applications: areas and volumes (Cartesian), Triple integrals (Cartesian).		
IV	**Vector Differentiation**	9
Vector Differentiation: Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Scalar potential functions. Solenoidal and Irrational vectors, Vector Identities.		
V	**Vector Integration**	10
Vector Integration: Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and related Problems.		
Textbooks:		
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010 2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006 3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.		
References:		
1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes. 2. S. L. Ross, Differential Equations, 3rd Edition, Wiley.		

ENGINEERING PHYSICS

Course	B.Tech.-II-Sem.	L	T	P	C
Subject Code	20-BSC-107	3	1	-	4

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	illustrate the interference and diffraction phenomena of light	3	2	1
CO2	compare various crystal systems and characterization techniques	3	2	1
CO3	examine the mechanism of various lasers and holography	3	2	1
CO4	demonstrate the propagation of light in optical fiber	3	2	1
CO5	analyze the properties of nanomaterials	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Interference & Diffraction**	9
Interference of light - Principle of Superposition, Interference of light, Conditions for sustained Interference, Young's double slit experiment, Interference in thin films (reflected geometry), Newton's Rings. Diffraction – Fresnel & Fraunhofer Diffraction, Fraunhofer Diffraction due to Single slit, Double slit (qualitative), Diffraction Grating – Grating spectrum.		
II	**Crystallography & X-Ray Diffraction**	9
Unit Cell, Space Lattice**,** Lattice Parameters, Crystal Systems, Bravais Lattices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems. Bragg's Law, X-Ray diffraction methods: Laue Method, Powder Method.		
III	**Lasers**	5+5=10
Part - A: Characteristics of Lasers, Absorption, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and Relation between them, Population Inversion, Lasing Action, Ruby Laser, Helium-Neon Laser.		
Part - B: Semiconductor Diode Laser: Homo-junction and Hetero-junction laser, Applications of Lasers; Holography: recording and reconstruction of hologram.		
IV	**Fiber Optics**	9
Principle of Optical Fiber, Construction of Fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers: Step Index and Graded Index Fibers. Attenuation in Optical Fibers, Application of Optical Fiber in Communication Systems, Optical fiber endoscope, Optical fiber temperature sensor.		
V	**Nano - Science & Technology**	9
Introduction, surface to volume ratio, quantum confinement, density of states in 2-D, 1-D and 0-D (qualitatively), fabrication: bottom–up (Sol-Gel, Precipitation), Top-down (Ball milling, CVD). Characterization techniques of nanomaterials (XRD, SEM & TEM) and their applications.		
Textbooks:		
1. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand Publications, 2017. 2. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.		
References:		
1. "Optics" by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017. 2. "Solid State Physics" by A. J. Dekker, Mc Millan Publishers, 2011.		

ENGLISH FOR ENGINEERS

Course	B.Tech.-II-Sem.	L	T	P	C
Subject Code	20-HSMC-101	2	-	-	2

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO10	PO12
CO1	acquire proficiency in RAWLS skills	3	1
CO2	demonstrate the acquired language in written and spoken contexts	3	1
CO3	express, restate and respond appropriately by comprehending the given data	3	1
CO4	develop proficiency to succeed in academic activities, research and career	3	1
CO5	excel in professional and social etiquette	3	1

Syllabus

Unit	Title/Topics	Hours
I	**The Raman Effect**	7
Vocabulary Building: The Concept of Word Formation -The Use of Prefixes and Suffixes. **Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions. **Reading:** Reading and Its Importance - Techniques for Effective Reading. **Basic Writing Skills:** Sentence Structures - Use of Phrases and 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.		
II	**Ancient Architecture in India**	11
Vocabulary: Synonyms and Antonyms. **Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement. **Reading:** Improving Comprehension Skills – Techniques for Good Comprehension. **Writing:** Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint, Letter of Requisition, Job Application with Resume.		
III	**Blue Jeans**	4+6=10
Part A: Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English. **Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.		
Part B: Reading: Sub-skills of Reading- Skimming and Scanning. **Writing**: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events - **Classifying**- Providing Examples or Evidence.		
IV	**What Should You Be Eating**	9
Vocabulary: Standard Abbreviations in English. **Grammar:** Redundancies and Clichés in Oral and Written Communication. **Reading**: Comprehension- Intensive Reading and Extensive Reading. **Writing: Writing Practices** - Writing Introduction and Conclusion - Information Transfer - Essay Writing-Précis Writing.		
V	**How a Chinese Billionaire Built Her Fortune**	9
Vocabulary: Technical Vocabulary and their usage. **Grammar:** Common Errors in English. **Reading:** Reading Comprehension-Exercises for Practice. **Writing: Technical Reports** - Introduction – Characteristics of a Report – Categories of Reports; **Formats**- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.		
Textbooks:		
1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.		
References:		
1. Swan, M. (2016). Practical English Usage. Oxford University Press. 2. Zinsser, William. (2001). On Writing Well. Harper Resource Book. 3. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.		

DATA STRUCTURES THROUGH C

Course	B.Tech.-II-Sem.	L	T	P	C
Subject Code	20-ESC-105	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	classify different data structures to design efficient programs	3	3	2	2
CO2	identify appropriate sorting and searching techniques	3	2	2	2
CO3	illustrate operations and applications of linear data structures	3	3	2	2
CO4	explain various concepts of non-linear data structures	3	3	2	2
CO5	choose an appropriate hashing technique for a given problem	3	3	2	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Data Structures, Searching and Sorting**	11
Basic concepts - Introduction to data structures, classification of data structures, operations on data structures, abstract data type, algorithms, different approaches to design an algorithm, recursive algorithms. **Searching and Sorting techniques -** Linear search and binary search, Bubble sort, selection sort, insertion sort, quick sort, merge sort, and comparison of sorting algorithms.		
II	**Linear Data Structures**	8
Stack - Primitive operations, implementation of stacks using Arrays, applications of stacks: arithmetic expression conversion and evaluation. **Queue -** Primitive operations; Implementation of queues using Array, Types of Queue: Simple queue, circular queue and priority queue, applications of linear queue.		
III	**Linked Lists**	5+5=10
Part A: Linked lists -Introduction, singly linked list, representation of a linked list in memory, operations on a single linked list: Traversing, searching, insertion, deletion. Applications of linked lists: Polynomial representation and sparse matrix manipulation.		
Part B: Types of linked lists - Doubly linked lists, Circular linked lists, linked list representation and operations of Stack, linked list representation and operations of queue.		
IV	**Non Linear Data Structures**	10
Trees - Basic Tree Terminologies, binary tree, binary tree representation, array and linked representations, binary tree traversal, Binary Search Tree: properties and operations, Balanced search trees: AVL tree, application of trees.		
V	**Graphs and Hashing**	9
Graphs- Basic terminologies and representations, graph implementation, graph search and traversal algorithms, Application of graphs. **Hashing and Collision-** Introduction, hash tables, hash functions, collisions, applications of hashing.		
Textbooks:		
1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson, 2nd Edition, 1996. 2. Ellis Horowitz, SatrajSahni, Susan Anderson Freed, "Fundamentals of Data Structures in C", Universities Press, 2nd Edition 2008.		
References:		
1. ReemaThareja, "Data Structures using C", Oxford University Press, 2nd Edition, 2014. 2. S. Lipschutz, "Data Structures", Tata McGraw Hill Education, 1st Edition, 2008. 3. Tanenbaum, Langsam, Augenstein, "Data Structures Using C", Pearson, 1st Edition, 2003.		

COMPUTER AIDED ENGINEERING GRAPHICS

Course	B.Tech.-II-Sem.	L	T	P	C
Subject Code	20-ESC-107	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO5	PO10
CO1	apply engineering drawing concepts in technical graphic communication	3	3	2
CO2	construct conic sections using various methods	3	3	2
CO3	draw orthographic projections of points, lines, planes and solids	3	3	2
CO4	draw development of solid surfaces	3	3	2
CO5	draw the conversions of orthographic to isometric projections & vice versa	3	3	2

List of Experiments

Week	Title/Experiment
1	Introduction to engineering drawing and AutoCAD software, Lettering, dimensioning practice and Geometrical Constructions.
2	Conic sections: General method, Construction of Ellipse, Parabola.
3	Construction of Hyperbola, Epicycloid.
4	Construction of hypocycloid, involutes.
5	Orthographic Projections: Principles of Orthographic projections, Projections of Points.
6	Projections of lines simple position, inclined to one plane.
7	Projections of Lines inclined to both the planes.
8	Projections of planes inclined to one plane and both the planes.
9	Projections of Solids simple position.
10	Projections of Solids inclined to one plane.
11	Projections of Solids inclined to both the planes.
12	Development of surfaces: Development of Prisms and Cylinders, Pyramids and Cones.
13	Isometric projections: isometric views of lines, planes and solid figures; Conversion of Isometric to Orthographic views (3D to 2D).
14	Conversion of Orthographic to Isometric views (2D to 3D).

Textbooks

1. Engineering Drawing N.D. Bhatt, Charotar.
2. A Text Book of Engineering Drawing, Basant Agarwal.

References

1. A Text Book of Engineering Drawing, Dhawan R K, S. Chand.
2. Engineering Graphics with Auto CAD, James D Bethune, Pearson Education.

Micro-Projects: Student must submit a report on one of the following Micro–Projects using AutoCAD before commencement of second internal examination.

1. Draw the orthographic projections of knuckle joint.
2. Draw the orthographic projections of Socket and spigot cotter joint.
3. Draw the orthographic projections of glass bottle.
4. Draw the orthographic Projections of Connecting rod of IC Engine.
5. Draw the isometric projections of Horse chess coin.
6. Draw the Pipe truss design.
7. Draw a 3-D bolt and nut with Threads.
8. Draw a 3-D Cross head pattern.
9. Draw the pipe vice.
10. Draw the satellite dish and Antenna.

ENGINEERING PHYSICS LAB

Course	B.Tech.-II-Sem.	L	T	P	C
Subject Code	20-BSC-104	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	demonstrate the electrical properties of a semiconductor	3
CO2	compare practical results with theoretical calculations in electrical circuits	3
CO3	demonstrate the properties of lasers and optical fibers	3
CO4	find the energy gap of a semiconductor and identify its band structure	3
CO5	examine electrical resonance in LCR circuits	3

List of Experiments

(Minimum 10 experiments to be conducted)

Week	Title/Experiment
1	Determination of frequency of an Electronic Vibrator – Melde's Experiment.
2	Calculation of the rigidity modulus of a given wire - Torsional pendulum.
3	Newton's Rings-Radius of curvature of Plano convex lens.
4	Determination of Energy Gap of a Semiconductor.
5	Time constant of an R-C Circuit.
6	Stewart and Gee's method - Magnetic field along the axis of current carrying coil.
7	Bending Losses of Fibers & Evaluation of numerical aperture of given fiber.
8	Determination of Resonance frequency of an LCR circuit.
9	Determination of the characteristics of a Solar Cell.
10	Diffraction Grating-Determination of wavelengths of a LASER source.
11	Determination of the characteristics of a Light Emitting Diode.
12	Calculation of Hall Voltage across a semiconductor sample.

Reference

1. Engineering Physics Lab Manual, FED, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Determine the Horizontal component of earth's magnetic field using Tangent law.
2. Determine refractive index of a liquid using Newton's rings.
3. Design a tank circuit for a given resonance frequency and verify resonance principle.
4. Determine the width of slit using single slit diffraction pattern.
5. Determine dispersive power of liquids by using spectrometer and hallow prism.
6. Convert mechanical energy to light energy using principle of energy conservation.
7. Design a mobile phone detector.
8. Design a counter using Photo cell characteristics.
9. Determine Fermi energy of a given semiconductor material.
10. Design a circuit to detect breakage in a conducting wire.

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Course	B.Tech.-II-Sem.	L	T	P	C
Subject Code	20-HSMC-102	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO5	PO10
CO1	identify the nuances of the language through multimedia experience	3	3
CO2	express clearly with right accent, intonation to overcome MTI	3	3
CO3	demonstrate formal and informal English in real life scenarios	3	3
CO4	develop speaking and listening skills	3	3
CO5	appraise communication and correspond effectively	3	3

List of Experiments

Week	Title/Experiment
PART – A: COMPUTER ASSISTED LANGUAGE LEARNING (CALL) LAB	
1 2	Introduction to Phonetics -Speech Sounds -Vowels and Consonants
5	Pronunciation I: Syllable Division, Accent & Stress, Stress Shift
8	Pronunciation II: Intonation and Rhythm – Situational Dialogue
11	Errors in pronunciation – the Interference of Mother Tongue (MTI)
14	Listening Comprehension (Specific & General)
PART – B: INTERACTIVE COMMUNICATION SKILLS (ICS) LAB	
3 4	JAMs
6 7	Role Play: Situational Dialogues
9	Introduction to a Structured Talk
10	Descriptions & Formal Presentations
12 13	Communication at Workplace and Interview Skills

References

1. English Language and Communication Skills Lab Manual, FED, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Common Errors in English
2. Listening Skills
3. Phonetics
4. Writing Skills
5. Reading Skills
6. Letter Writing
7. Report Writing
8. Vocabulary
9. Body Language
10. Functional English

DATA STRUCTURES THROUGH C LAB

Course	B.Tech.-II-Sem.	L	T	P	C
Subject Code	20-ESC-106	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	implement various searching and sorting techniques	3
CO2	demonstrate basic operations of stack and queues using arrays and linked lists	3
CO3	apply stack data structure to solve various computing problems	3
CO4	demonstrate and apply different methods for traversing graphs	3
CO5	construct binary search tree	3

List of Experiments

Week	Title/Experiment
I	**Searching Techniques**
Write C programs for implementing the following searching techniques. a. Linear search. b. Binary search.	
II	**Sorting Techniques**
Write C programs for implementing the following sorting techniques to arrange a list of integers in ascending order. a. Bubble sort. b. Insertion sort. c. Selection sort.	
III	**Sorting Techniques**
Write C programs for implementing the following sorting techniques to arrange a list of integers in ascending order. a. Quick sort. b. Merge sort	
IV	**Implementation of Stack and Queue**
a. Write C programs to design and implement Stack and its operations using Arrays. b. Write C programs to design and implement Queue and its operations using Arrays.	
V	**Applications of Stack**
a. Write C program by using Stack operations to convert infix expression into postfix expression. b. Write C program by using Stack operations for evaluating the postfix expression.	
VI	**Implementation of Single Linked List**
Write a C program that uses functions to perform the following operations on single linked list. a. Creation b. insertion c. deletion d. traversal	
VII	**Implementation of Circular Single Linked List**
Write a C program that uses functions to perform the following operations on Circular linked list. a. Creation b. insertion c. deletion d. traversal	
VIII	**Implementation of Double Linked List**
Write a C program that uses functions to perform the following operations on double linked list. a. Creation b. insertion c. deletion d. traversal in both ways.	
IX	**Implementation of Stack Using Linked List**
Write a C program to implement stack using linked list.	
X	**Implementation of Queue Using Linked List**
Write a C program to implement queue using linked list.	
XI	**Graph Traversal Techniques**
Write C programs to implement the following graph traversal algorithms: a. Depth first search. b. Breadth first search.	
XII	**Implementation of Binary Search Tree**
Write a C program that uses functions to perform the following: a. Create a binary search tree. b. Traverse the above binary search tree recursively in pre-order, post-order and in-order.	
References	
1. Data Structures through C Lab Manual, FED, CMRIT, Hyd.	

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Write a program to create a one dimensional array at run time using a user defined function with user given number of elements into it. Also write separate functions that would allow you to insert and delete elements into/from this array at any arbitrary location.
2. WAP to add and subtract following polynomials $5x^2 – 3xy + y – 2x^2 – y^2+5xy – x + y$ using array.
3. Write a program to create one dimensional - two dimensional and three dimensional arrays in memory and then verify the various address calculation formulae for any arbitrary element of these arrays.
4. Write a program to implement a sparse matrix for the given matrix A.
5. Write a program to implement a queue using stack operations.
6. WAP to convert the following expression to its postfix equivalent using stack ((A+B)* D) ^ (E – F)
7. II. A+ (B * C – (D / E ^ F) * G) * H Where ^: raise to the power
8. Implement a program to evaluate any given postfix expression. Test your program for the evaluation of the equivalent postfix form of the expression (- (A*B)/D) ↑ C+E – F * H * I for A = 1 - B = 2 - D = 3 - C = 14 - E = 110 - F = 220 - H = 16.78 - I = 364.621.
9. WAP to declare a priority queue using two-dimensional array - store elements and priority. Display the elements according to priority from higher to lower.
10. Let $X = (x_1 - x_2 - \dots x_n)$ -$Y = (y_1 - y_2 - \dots y_n)$ be two lists with a sorted sequence of elements. Write a program to merge the two lists together as a single list Z with m + n elements. Implement the lists using array and singly linked list.
11. Write a menu driven program which will maintain a list of mobile phone models - their price - name of the manufacturer – storage capacity etc. - as a doubly linked list. The menu should make provisions for inserting information pertaining to new mobile phone models - delete obsolete models - and update data such as price besides answering queries such as listing all mobile phone models within a price range specified by the user and listing all details given a mobile phone model.

ENVIRONMENTAL SCIENCE
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-II-Sem.	L	T	P	C
Subject Code	20-MC-102	2	-	-	-

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO6	PO7	PO12
CO1	identify the role of ecosystem for livelihood	3	3	3	2
CO2	interpret methods to sustain environmental resources	3	3	3	2
CO3	outline bio-diversity and its relevance to ecological balance	3	3	3	2
CO4	explain laws and legislations on environmental protection	3	3	3	3
CO5	evaluate technologies for achieving sustainable development	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Ecosystem**	6
Introduction to ecosystem: Definition, Scope and Importance; Classification of ecosystem; Structure and functions of ecosystem food chain food web, ecological energetic, eco-pyramids, carrying capacity; Biogeochemical cycles (Carbon and Nitrogen Cycles), flow of energy.		
II	**Natural Resources**	7
Renewable and Non–renewable resources–Importance, uses, classification of natural resources (i) forest: deforestation, timber extraction & conservation (ii) water: conflicts over water, dams – benefits &effects; use and over exploitation of water resources, (iii) mineral :use and exploitation, effects on mining, (iv) energy resources: growing needs, renewable and non renewable energy sources, use of alternative energy (v) land resources: land degradation, landslides, soil erosion and desertification; role of an individual in conservation of natural resources and equitable use.		
III	**Biodiversity**	3+2=5
Part A: Definition and levels of biodiversity, Values of biodiversity Bio– geographical classification of India; hot spots of biodiversity; India as a mega diversity nation; Threats to biodiversity; Endangered and endemic species of India.		
Part B: Conservation of biodiversity: In–situ and Ex–situ conservation; Case studies.		
IV	**Environmental Pollution & Control Technologies**	8
Types of environmental pollution; **Air pollution**: major air pollutants, sources, effects, control measures, National Air Quality Standards. Water pollution: sources, impacts & control technologies- ETP, watershed management, rain water harvesting, Water Quality standards. Soil pollution: sources, causes & impacts on modern agriculture. Noise pollution. Solid waste Management- causes, effects and control measures; E-waste. **Global Environmental Issues and Treaties**: Global warming, ozone layer depletion. International protocol, Kyoto and Montreal protocol. Population Explosion.		
V	**Environmental Acts, EIA & Sustainable Development**	6
Environment Protection Acts: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act and Forest Conservation Act, Environment (Protection) Act, 1986. EIA: conceptual facts, base line data acquisition, EIS, EMP. **Sustainable development**-causes & threats, strategies for achieving sustainable development; CDM and concept of green building, life cycle assessment(LCA); Ecological foot print. **Role of Information Technology** in Environment - Remote Sensing, GIS.		
Textbooks:		
1. Environmental Science by Y. Anjaneyulu, B S Publications (2004). 2. Environmental studies by Rajagopalan R (2009), Oxford University Press, New Delhi.		
References:		
1. Environmental Science and Technology by M. Anji Reddy (2007), B.S Publications. 2. Environmental Studies by Anubha Kaushik (2006), 4thedn, New age International Publications		

B.TECH.-III-SEMESTER SYLLABUS

BUILDING MATERIALS, CONSTRUCTION & PLANNING

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-ESC-201	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO6	PO12	PSO1
CO1	explain physical properties of construction materials	3	3	2	3
CO2	demonstrate various building components and services	3	3	2	3
CO3	illustrate brick, stone masonry, finishing and form works	3	3	2	3
CO4	choose different types of constructions for structural components	3	3	2	3
CO5	originate building plan by using rules and bye-laws	3	3	2	3

Syllabus

Unit	Title/Topics	Hours
I		10
Stones and Bricks: Building stones–classifications and quarrying-properties and manufacture of structural requirements - dressing; Bricks - Composition of Brick earth. **Cement, Wood and Glass:** Cement - Ingredients of cement - manufacture - Chemical composition. Wood - structure - types and properties - seasoning - defects; alternate materials for wood - GI / fibre reinforced glass bricks, steel & aluminum.		
II		10
Building Components: Lintels, Arches, walls, vaults -stair cases - types of floors, types of roofs - flat, curved, trussed ; foundations - types; DPC; 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; Fire protection - Fire Hazards - Classification of fire resistant materials and constructions.		
III		4+4=8
Part A: Masonry and Finishing: Brick masonry - types - bonds; Stone masonry - types; Composite masonry - Brick-stone composite Concrete, Reinforced brick.		
Part B: Finishers: Plastering, Pointing, Painting, Claddings - Types - Tiles - ACP **Form work:** Requirements - Standards - Scaffolding - Design; Shoring, Underpinning.		
IV		12
Building Construction: Sub Structure Construction - Techniques of Box jacking - Pipe Jacking - under water construction of diaphragm walls and basement-Tunneling techniques - Piling techniques - sinking cofferdam - cable anchoring and grouting - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation; Super Structure Construction- Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks - in-situ pre-stressing in high rise structures		
V		8
Building Planning: Principles of building planning, classification of buildings and building bye-laws.		
Textbooks:		
1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications 2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Pub.		
References:		
1. Building Materials by Duggal, New Age International. 2. Concrete Technology by M.S. Shetty, S. Chand & Company Ltd.		

ENGINEERING MECHANICS

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-ESC-203	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	analyze the resultant of a system of forces using principles of mechanics	3	2	1
CO2	apply the conditions of static equilibrium to particles and rigid bodies	3	2	1
CO3	determine mechanical efficiency of simple lifting machines, centroid and centre of gravity of simple sections	3	2	1
CO4	compute the second moment of inertia of various laminas and bodies	3	2	1
CO5	solve the problems involving kinetics and virtual work of particles	3	2	1

SYLLABUS

Unit	Title/Topics	Hours
I	**Introduction to Engineering Mechanics**	10
Introduction to Engineering Mechanics – Basic Concepts, Force-types, characteristics- Principle of transmissibility. Classification of force system, Resultant of Coplanar Concurrent forces and concurrent force system in space. Lami's theorem, Triangle law of Forces-Polygon law of Forces-Parallelogram Law of Forces .Resolution and composition of Forces, Moment of Force and its Application – Varignon's theorem, Couples. Resultant of coplanar Parallel force system.		
II	**Equilibrium of Systems of Forces and Friction**	9
Equilibrium of Systems of Forces: Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of coplanar concurrent, parallel force Systems and concurrent force system in space. **Friction:** Definitions-Types of Friction – Limiting Friction – laws of Static and Dynamic Frictions – Angle of friction- Angle of Repose- Cone of Friction-Equilibrium of rigid body on an Inclined plane Application of Friction – Ladder, Wedge and Screw friction.		
III	**Simple Lifting Machines and Center of Gravity**	5+4=9
Part A: Simple Lifting Machines: Basic definitions: effort, Load, mechanical advantage, velocity ratio, efficiency. Simple screw jack, Differential Screw jack.		
Part B: Center of Gravity: Centre of gravity of simple solids (from basic principles), centre of gravity of composite solids.		
IV	**Area and Mass Moment of Inertia**	10
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. **Mass Moment of Inertia**: Mass Moment of Inertia of circular plate, cylinder, cone and sphere.		
V	**Kinetics of Rigid Bodies and Virtual Work**	10
Kinetics of Rigid Bodies: Types of motion, D'Alemberts principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; kinetic of rigid body rotation. **Virtual Work:** Virtual displacements, Principle of virtual work for particle and ideal system of rigid bodies.		
Textbooks:		
1. Singer's Engineering Mechanics Statics and Dynamics, K.Vijaya Kumar Reddy, et al, BSP. 2. Engineering Mechanics, Irving Shames, G. Krishna Mohan Rao, Prentice Hall.		
References:		
1. A Text of Engineering Mechanics, YVD Rao, K. Govinda Rajulu, M. Manzoor Hussain, Academic Publishing Company.		

STRENGTH OF MATERIALS - I

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-CE-PC-211	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12	PSO1
CO1	determine the stress and strain of various materials	3	3	2	3
CO2	sketch the SFD & BMD for beams of various supports and loads	3	3	2	3
CO3	analyze flexural and shear stresses in a beam	3	3	2	3
CO4	determine the deflections in beams under various loads & support	3	3	2	3
CO5	evaluate principal stresses, strains and various theories of failure	3	3	2	3

Syllabus

Unit	Title/Topics	Hours
I		10
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.		
II		9
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 cantilver, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.		
III		5+5=10
Part-A: 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.		
Part-B: Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, I and T sections.		
IV		9
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.		
V		10
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.		
Textbooks:		
1. Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd. 2. Strength of Materials by S. Ramamrutham, Dhanpath Rai Publishing Company, Pvt., Ltd. 3. Strength of Materials by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.		

FLUID MECHANICS

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-CE-PC-212	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12	PSO1
CO1	identify properties and influences of fluids on motion	3	3	2	3
CO2	derive the stream function from a velocity field	3	3	2	3
CO3	apply the equation of motion in flow measurements	3	3	2	3
CO4	determine energy and losses of closed conduit flow	3	3	2	3
CO5	analyze boundary layer concept on fluid flow	3	3	2	3

Syllabus

Unit	Title/Topics	Hours
I	**Fluid Properties & Statics**	10
Fluid Properties & Statics: Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges and Manometers: differential. Hydrostatic forces on submerged plane, Horizontal, Vertical and inclined Center of pressure; Buoyancy and flotation.		
II	**Fluid Kinematics**	9
Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions.		
III	**Fluid Dynamics and Measurement of Flow**	5+5=10
Part A: Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for flow, (Navier–stokes equations (Explanationary)) Momentum equation and its application.		
Part B: Measurement of Flow: Pitot tube, Venturi meter and Orifice meter – classification of orifices, flow over rectangular, triangular and trapezoidal notches - Broad crested weirs.		
IV	**Closed Conduit Flow**	9
Closed Conduit Flow: Reynold's experiment – Characteristics of Laminar & Turbulent flows. Laws of Fluid friction – Darcy's equation, variation of friction factor with Reynold's number – Moody's Chart, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Siphon,Water hammer.		
V	**Boundary Layer Theory**	10
Boundary Layer Theory: Approximate Solutions of Navier Stoke's Equations – Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers (no derivations) BL in transition, separation of BL, control of BL.		
Textbooks:		
1. Fluid Mechanics by Modi and Seth, Standard book house. 2. Introduction to Fluid Machines by S.K.Som & G.Biswas (TMH Publishers Pvt. Ltd.)		
References:		
1. Fluid Mechanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi. 2. Fluid Mechanics and hydraulic machines by Dr.R.K.Bansal - Laxmi Pub. (P) Ltd., New Delhi.		

SURVEYING

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-CE-PC-213	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12	PSO1
CO1	apply the concepts of surveying to measure the distances and directions	3	3	3	3
CO2	identify different methods of leveling to draw levels and contour maps	3	3	3	3
CO3	solve problems on areas and volumes; measure angles by Theodolite	3	3	2	3
CO4	extend methods of trigonometry & tacheometry and design the simple curves	3	3	2	3
CO5	acquaint with EDM, GPS and Total Station	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction and Basic Concepts**	9
Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Code of Signals. **Measurement of Distances and Directions: Linear distances-** Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods. **Prismatic Compass**- Bearings, included angles, Local Attraction, Magnetic Declination.		
II	**Leveling**	9
Leveling: Basics definitions, types of levels and leveling staves, temporary adjustments, methods of leveling, 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.		
III	**Areas, Volumes and Theodolite Surveying**	6+2=8
Part-A: Areas: Determination of areas consisting of irregular boundary and regular boundary, introduction to Planimeter. **Volumes:** Computation of areas for level section with and without transverse slopes, and introduction to two level sections, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.		
Part B: Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.		
IV	**Traversing, Tacheometric Surveying and Curves**	10
Traversing: Classifications of traversing and methods of traversing. **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, Introduction to compound curves.		
V	**Modern Surveying**	12
Modern Surveying: Total Station and Global Positioning System: Basic principles, classifications, applications. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS – space segment, control segment and user segment, satellite orbits.		
Textbooks:		
1. Chandra A M, "Plane Surveying", New Age International Pvt. Ltd., Publishers, New Delhi. 2. Chandra A M, "Higher Surveying", New Age International Pvt. Ltd., Pub., New Delhi. 3. Duggal S K, "Surveying (Vol – 1 & 2), TMH. New Delhi, 2004.		
References:		
1. Surveying (Vol-1,2,3), by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain –LP, New Delhi 2. Surveying by BHAVIKATTI; Vikas publishing house ltd.		

SURVEYING LAB

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-CE-PC-214	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO10	PSO2
CO1	find the distances, directions and positions of stations	3	2	2	3
CO2	identify reduced levels for L.S and C.S of road profiles	3	3	2	3
CO3	measure the distance, height between two inaccessible points, horizontal and vertical angles	3	3	2	3
CO4	determine the area, traverse, elevation , contour and stakeout	3	3	2	3
CO5	develop curve and resection for various item of work	3	3	2	3

List of Experiments

Week	Title/Experiment
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

References

1. Surveying Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Plot the given area in Auto Cad.
2. Draw the given traverse in Auto Cad.
3. Draw contour map of the give area.
4. Determine the height of given object using total station.
5. Mark the position of columns for the given plan.
6. Determination of horizontal distance between two inaccessible points using T.S.
7. Mark the curve on the field for given data.
8. To locate the new point by using two known points.
9. Draw the given plan on the field.
10. Prepare the coordinates for the given plan

COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-ESC-202	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO10	PSO2
CO1	make use of basic Auto CAD commands for drafting	3	3	3	3
CO2	prepare the plans for single and multistoried buildings	3	3	3	3
CO3	develop sections and elevations for various buildings	3	3	3	3
CO4	draw the detailing of building components	3	3	3	3
CO5	construct the building drawing as per standards	3	3	3	3

List of Experiments

S.No.	Title/Experiment
1	Introduction to computer aided drafting
2	Software for CAD – Introduction to different software's
3	Practice exercises on CAD software
4	Drawing of plans of buildings using software a) Single storeyed buildings b) multi storyed buildings
5	Developing sections and elevations for a) Single-storied buildings b) Multi-storied buildings
6	Detailing of building components like Doors, Windows, Roof Trusses etc. using CAD software's
7	Exercises on development of working drawings of buildings

References

1. Computer Aided Civil Engineering Drawing Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Draw a plan, elevation and section of residential building.
2. Draw a plan, elevation and section of multistoried building.
3. Draw a plan, elevation and section of 100 bedded hospital building.
4. Draw a plan, elevation and section of educational institution building.
5. Draw a plan, elevation and section of industrial structure.
6. Draw a plan, elevation and section of Auditorium.
7. Draw a plan, elevation and section of hostel building.
8. Draw a plan, elevation and section of function hall.
9. Draw a plan, elevation and section of outdoor stadium.
10. Draw a plan, elevation and section of public parking and multi-level parking.

BUSINESS COMMUNICATION SKILLS LAB

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-HSMC-201	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	demonstrate verbal and written skills effectively	3	3
CO2	develop professional correspondence skills	3	3
CO3	make use of soft skills to become a professional team member	3	3
CO4	apply knowledge of decision making, leadership, motivation	3	3
CO5	exhibit confidence in facing the interview process	3	3

List of Experiments

Week	Title/Experiment
1	Introduction to Business English - Functional English.
2	Fundamentals of Grammar - Sentence Structure - Parts of Speech - Articles - Prepositions - Subject - Verb Agreement, Question Tags, Speeches, Voices, Tenses etc.
3	Synonyms and Antonyms. Homonyms and Homophones, Word Formation, Idioms and Phrases, Analogy, One-word Substitutes.
4	Spotting errors, Sentence Corrections using Grammar concept knowledge.
5	Verbal logics - Para jumbles.
6	Paragraph writing, Picture description, Text Completion, Essay writing.
7	Verbal Reasoning - Reading Comprehensions, Cloze passages etc.
8	Critical Reasoning: Statements - Arguments, Assumptions, Conclusions, Assertions & Reasons.
9	**Importance of soft skills in personal and professional spheres:** Introduction to Soft Skills**,** Self awareness and Self esteem, Discipline, Integrity, Attitude, Change and Adaptability.
10	**People Skills:** Relationships - Personal & Professional Relationships - Rapport Building - Personal Space; Definition of Motivation - Motivation - Self-motivation; Time Management - Stephen Covey's time management.
11	**Teamwork:** Definition of Team, Team Dynamics - Specialization and Teamwork - Rewards of Teamwork.
12	**Leadership:** Definition of Leadership, Leading a Team, Leadership Qualities - Leader vs Manager - Leadership Styles.
13	**Problem Solving and Decision Making:** Definitions - Problem Solving and Decision Making - Hurdles in Decision Making - Case studies.
14	**Preparation for Interviews:** Body Language - Posture - Dressing and Grooming - Researching the Industry and the Organization- Types of Interviews - First Impressions - Dos and Don'ts of an Interview.

Activities

1. Regular practice tests.
2. Quiz, crossword, word-search and related activities.
3. Picture description including description of photos/images/posters/advertisement analysis etc.
4. Five-minute presentations about concepts learnt
5. JAM and picture narration.
6. Mock interviews.

References

1. Business Communication Skills Lab Manual, FED, CMRIT, Hyd.

SOCIAL INNOVATION LAB

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-BSC-205	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PSO2
CO1	illustrate social innovation	3
CO2	identify the problems	3
CO3	choose suitable design processes	3
CO4	develop a prototype using suitable platform	3
CO5	prepare a report using project management techniques and ethics	3

List of Experiments

Week	Title/Experiment
1	**Introduction to Engineering and Social Innovation**
Introduction to engineering, difference between science, engineering and technology. History of social innovation, core definitions, core elements and common features of social innovation, a topology of social innovations, fields for social innovation.	
2	**Stages and Process of social innovation**
Different sectors for social innovation and stages of social innovation. Prompts - identifying needs, Proposals - generating ideas, Prototyping - testing the idea in practice, Sustaining-developing a business model.	
3	**Social and economic change**
The shape of the economy to come, understanding social change-individuals, movements and organizations.	
4	**Analysis and Prototyping**
Basic components and applications, data acquisition, examples for prototyping.	
5	**Design and Platform based development**
Engineering design process, multidisciplinary facet of design. Introduction to PCB design. Introduction to various platform based development programming and its essentials.	
6 - 8	**Choose any one of the following or other platform for implementation**
Arduino: Introduction to sensors, transducers and actuators and its interfacing with Arduino.	
Mobile App Development using android: Installation of android studio, setup of AVD, layouts, UI components, working with Firebase, simple authentication App.	
Mobile App Development using MIT App inventor: Create an account in MIT App inventor, working with UI components and blocks, App development using MIT App inventor, authentication using firebase, AI using MIT App inventor.	
Multi-platform Application: Installation of flutter, create widgets, layers and simple authentication app using flutter.	
Web Application: Install virtual environment for FLASK, create web app using FLASK with routing.	
9	**Project Management and Ethical Dilemmas**
Significance of team work, importance of communication in engineering profession. Identify and apply moral theories and codes of conduct for resolution of ethical dilemmas.	
10	**Case Studies**
Report writing and documentation, presentation of the case studies with a focus on impact and vision on society.	
References	
1. Social Innovation Lab Manual, Department of FED, CMRIT, Hyd.	

GENDER SENSITIZATION LAB
(MANDATORY COURSE- NON- CREDIT)

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-MC-201	-	-	2	-

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO12
CO1	identify gender issues in contemporary India	2	3
CO2	explain gender roles, spectrum, relationships etc	3	2
CO3	analyze gender issues related to sexual harassment and violence	3	3
CO4	assess gender and human rights	3	3
CO5	adapt to the societal need to end prejudices and achieve gender equality	2	3

Syllabus

Unit	Title/Topics	Hours
I	**Understanding Gender**	6
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.		
II	**Gender Roles and Relations**	6
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.		
III	**Gender and Labour**	4+4=8
Part-A: Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics.		
Part-B: Fact and Fiction. Unrecognized and Unaccounted work. Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.		
IV	**Gender - Based Violence**	6
The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".* Domestic Violence: Speaking Out: Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life".		
V	**Gender and Culture**	6
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.		
Textbooks:		
2. Towards a world of equals, A bilingual textbook on gender, Telugu Akademi, Hyderabad.		
Note: Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".		

B.TECH.-IV-SEMESTER SYLLABUS

NUMERICAL AND STATISTICAL METHODS

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-BSC-202	3	1	-	4

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	solve transcendental, linear and non-linear system of equations	3	2	1
CO2	find the solutions using numerical integrals and ODE	3	2	1
CO3	differentiate among random variables involved in the probability models	3	2	1
CO4	test hypothesis for small and large samples along with significance level	3	2	1
CO5	fit correlation, regression coefficients and association of attributes	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Algebraic and transcendental Equations and Curve Fitting**	9
Algebraic and transcendental Equations: Introduction, Bisection Method, Method of False position, Iteration method and Newton Raphson method. **Curve Fitting**: Fitting a linear, second degree, exponential and power curve by method of least squares.		
II	**Numerical Integration and Solution of Ordinary Differential Equations**	9
Numerical Integration: Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule. **Solution of Ordinary Differential equations:** Taylor's series, Picard's method of successive approximations, Euler's method, Runge - Kutta method (second and fourth order)		
III	**Probability, Random variables and Distributions**	6+4=10
Part A: Probability & Random variables: Random variables, discrete and continuous random variables, probability distribution function, probability density function and mathematical expectations.		
Part B: Distributions: Binomial, Poisson and Normal distributions.		
IV	**Sampling Theory and Test of Hypothesis for Large Samples**	12
Sampling Theory: Introduction, Population and samples, Sampling distribution of means and variances **Test of Hypothesis For Large Samples** : Introduction, Hypothesis, Null and Alternative Hypothesis, Type I and Type II errors, Level of significance, One tail and two-tail tests, Tests concerning one mean and proportion, two means-proportions and their differences. Point estimation, Maximum error of estimate and Interval estimation.		
V	**Test of Hypothesis for Small Samples**	8
Test of Hypothesis for Small Samples: t - Test, F-Test and χ^2- Test for goodness of fit and independence of attribute. Point estimation, maximum error of estimate and Interval estimation. Correlation and regression-Rank Correlation.		
Textbooks:		
1. Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning Pvt. Ltd. 2. Fundamentals of Mathematical Statistics by S. C. Gupta & V. K. Kapoor, S. Chand Publishers.		
References:		
1. Numerical Methods for Scientific and Engineering Computation by M.K.Jain, S.R.K.Iyengar and R.K.Jain, New Age International Publishers. 2. Probability and Statistics for Engineers and Sciences by Jay L. Devore, Cengage Learning. 3. Mathematics for engineers and scientists by Alan Jeffrey, 6^{th} Edition, CRC press.		

ENGINEERING GEOLOGY

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-CE-PC-221	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	explain weathering process and mass movement	3	2	3
CO2	classify the different minerals and rocks	3	2	3
CO3	identify the geological structures of the rocks and ground water potential	3	2	2
CO4	adapt geophysical principles for site selection	3	2	3
CO5	assess natural hazards and select sites for mass structures	3	2	2

Syllabus

Unit	Title/Topics	Hours
I	**Basic Geosciences**	10
Basic Geosciences: Definition of Geology and Engineering Geology, Main and applied branches of Geology, Importance of Geology and its branches from civil engineering point of view, case study on geological draw backs, Internal structure of the Earth and its composition. **Physical Geology:** Weathering, Effect of weathering on rocks, Importance of weathering for dams, reservoirs and tunnels; Geological work of Rivers, Geological work of wind.		
II	**Mineralogy and Petrology**	10
Mineralogy: Definition of mineral, Importance, physical properties and advantages of minerals. Role of study of physical properties of minerals in the identification of minerals. **Petrology:** Definition of rock: Geological classification of rocks. Structures and textures of igneous, sedimentary and metamorphic rocks and distinguishing features of Mega-scopic and microscopic study of rocks.		
III	**Structural Geology**	4+4=8
Part A: Outcrop, 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.		
Part B: Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.		
IV	**Earth Quakes and Geophysical Studies**	10
Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale. Landslides, their causes and effect; measures to be taken to prevent their occurrence. Importance of study of ground water, earth quakes and landslides. **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.		
V	**Geology of Dams, Reservoirs and Tunnels**	10
Geology of Dams, Reservoirs and Tunnels: Types of dams and selection, geological considerations in the selection of a dam site, analysis of dam failures of the past. Geological factors influencing water tightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations in tunneling over break and lining in tunnels.		
Textbooks:		
1. Engineering Geology by N. Chennakesavulu, Mc-Millan, India Ltd. 2005 2. Engineering Geology for Civil Engineers – P.C. Varghese PHI 3. Engineering Geology by Parbin Singh, S.K. Kataria & Sons. 4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications		
References:		
1. F.G. Bell, Fundamental of Engineering Geology Butterworths, Publications, New Delhi, 1992. 2. Krynine and Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers. 3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.		

STRENGTH OF MATERIALS – II

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-CE-PC-222	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO12	PSO1
CO1	determine torsion in springs and shafts	3	3	3
CO2	evaluate crippling load of columns using various end conditions	3	2	3
CO3	analyze direct and bending stresses of various structures	3	2	3
CO4	find the stresses and deformations in thick and thin cylinders	3	2	3
CO5	analyze unsymmetrical bending and find shear centre for various sections	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Torsion of Circular Shafts and Springs**	10
Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: T/J = q/r = Nθ/L – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion. **Springs:** Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.		
II	**Columns and Struts**	9
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 – Rankine – Gordon formula – Long columns subjected to eccentric loading.		
III	**Direct and Bending Stresses**	5+4=9
Part A: Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of chimneys.		
Part B: determination of stresses in the case of retaining walls and dams – conditions for stability – stresses due to direct loading and bending moment about both axis.		
IV	**Thin and Thick Cylinders**	10
Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells. **Thick Cylinders:** Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.		
V	**Unsymmetrical Bending and Shear Centre**	10
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 - Deflection of beams under unsymmetrical bending. **Shear Centre:** Introduction - Shear centre 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.		

HYDRAULICS & HYDRAULIC MACHINERY

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-CE-PC-223	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO12	PSO1
CO1	explain the concepts of channel flows	3	3	3
CO2	develop empirical relationships of a hydraulic model and prototype	3	3	3
CO3	determine hydrodynamic forces of jets on various vanes	3	2	3
CO4	select suitable turbine for given heads	3	2	3
CO5	estimate the efficiency of centrifugal and reciprocating pumps	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		101
Open Channel Flow: Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's formulae for uniform flow– Most Economical sections. Critical flow: Specific energy-critical depth – computation of critical depth – critical sub-critical and super critical flows. Non uniform flow-Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- for surface profiles - Rapidly varied flow, hydraulic jump, energy dissipation. Surges – Types.		
II		8
Hydraulic Similitude: Dimensional Analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities, dimensionless numbers – model and prototype relations.		
III		5+5=10
Part A: Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes.		
Part B: Basics of Turbo Machinery (Contd...): Jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency.		
IV		9
Hydraulic Turbines: Layout of a typical Hydropower installation – Heads and efficiencies classification of turbines- pelton wheel-Francis turbine-Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and function efficiency. Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitation and preventive measures.		
V		10
Centrifugal Pump: installation details-classification-types 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 pump:** Basics, types, air vessels, slip Classification of Hydropower plants - Definition of terms - load factor, utilization factor, capacity factor, estimation of hydropower potential.		
Textbooks:		
1. Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, SBH, New Delhi. 2. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications, New Delhi.		
References:		
1. Fluid Mechanics by Dr. A. K. Jain Khanna Publishers 2016. 2. Open Channel flow by K. Subramanya, TMH.		

STRUCTURAL ANALYSIS

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-CE-PC-224	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO12	PSO1
CO1	evaluate degree of indeterminacy and forces in the frames	3	2	3
CO2	apply the energy theorems for trusses and analyze three hinged arches	3	2	3
CO3	analyze the propped cantilever and fixed beam under various loads	3	2	3
CO4	analyze continuous beams by slope deflection method	3	2	3
CO5	sketch the influence line diagrams for moving loads	3	2	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Structures & Indeterminacy and Analysis of Perfect Frames**	11
Introduction to Structures And Indeterminacy: Equilibrium and compatibility equations - types of supports and reactions, Classification of frames- plane and space frames, pin jointed and rigid jointed frames, Static and kinematic indeterminacies of beams and frames. Relative Merits of indeterminate structures over determinate structures. **Analysis of Perfect Frames:** Types of frames - Perfect, Imperfect and Redundant pin jointed frames. - Analysis of determinate pin jointed frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.		
II	**Energy Theorems and Three Hinged Arches**	9
Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Unit Load Method. Deflections of simple beams and pin- jointed plane trusses. **Three Hinged Arches:** Introduction - Types of Arches - Comparison between Three hinged and two hinged Arches. Linear Arch. Eddy's theorem. Analysis of Three hinged arches. Normal Thrust and radial shear in an arch. Geometrical properties of parabolic and circular arch. Three hinged circular arch at different levels. Absolute maximum BMD for a three hinged arch.		
III	**Propped Cantilever and Fixed Beams**	4+5=9
Part A: 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 UDL, central point load, eccentric load, number of point loads, UVL, couple and combination of loads.		
Part B: Shear force and Bending moment diagrams for Propped Cantilever and Fixed Beams-effect of sinking of support, effect of rotation of a support.		
IV	**Continuous Beams and Slope Deflection Method**	9
Continuous Beams: Introduction-Continuous beams. Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang. Effects of sinking of supports. **Slope Deflection Method:** Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Determination of static and kinematic indeterminacies for frames. Analysis of Single Bay - Single storey Portal Frames by Slope Deflection Method Including Side Sway. SFD & BMD and Elastic curve.		
V	**Moving Loads and Influence Lines**	10
Introduction on moving loads, Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section - Point loads, UDL longer than the span, UDL shorter than the span- two point loads with fixed distance between them and several point loads- Influence lines for forces in members of Pratt and Warren trusses.		
Textbooks:		
1. Theory of Structures by S. Ramamrutham and R. Narayan, Dhanpathi Rai Publishing Company. 2. Structural Analysis Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers.		
References:		
1. Structural Analysis Vol I & II by G.S.Pandit and S.P.Gupta, TMH. 2. Basic Structural Analysis by K.U.Muthu *et al.*, I.K.International Publishing House Pvt., Ltd.		

STRENGTH OF MATERIALS LAB

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-CE-PC-225	-	-	2	1

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PSO2
CO1	analyze stress-strain relationship for given material	3	3
CO2	determine shear modulus of shaft and stiffness of spring	3	3
CO3	assess the flexural strength for given member	3	3
CO4	find the hardness and compressive strength of given material	3	3
CO5	measure the strain in material using electrical resistance strain gauge	3	3

List of Experiments

Week	Title/Experiment
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.

References

1. Strength of Materials Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Determination of compressive strength of different wood specimens which are locally available
2. Verify Maxwell's Reciprocal theorem for a cantilever beam.
3. Impact resistance of aluminum and wood.
4. Determine the rigidity modulus of open coil helical spring.
5. Determine the modulus of elasticity of reinforced concrete beam by bending test.
6. Effect of surface modification (carburization) on hardness.
7. Study of rigidity modulus of friction weld joints.
8. Theoretical Analysis of a cantilever beam for hollow cross section
9. A Methodology to predict deflections in a triangle cross section simply supported beam
10. Theoretical Study of stress - strain for high heat resisting materials.

FM & HHM LAB

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-CE-PC-226	-	-	2	1

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PSO2
CO1	determine the C_d for venturimeter, various notches and orifice meters	3	3
CO2	find the major and minor losses in pipes	3	3
CO3	verify the Bernoulli's equation and study the flow in open channel	3	3
CO4	analyze the performance of pumps, various turbines and effect of water hammer	3	3
CO5	calculate impact of force of Jet on different types of Vanes	3	3

List of Experiments

Week	Title/Experiment
1	Calibration of Venturimeter.
2	Calibration of Orifice meter.
3	Determination of Coefficient of discharge for a small orifice.
4	Determination of friction factor (major losses) for a given pipe and Coefficient of sudden expansion/contraction (minor losses) in pipes
5	Calibration of contracted Rectangular notch/Triangular notch / cippoletti notch.
6	Verification of Bernoulli's equation.
7	Study of flow in Open Channel (applying Chezy's and Manning's equations).
8	Study of Hydraulic Jump in Open Channel.
9	Performance characteristics of a multi stage centrifugal pump.
10	Study of Water Hammer due to sudden closure of valve
11	Performance test on Pelton Wheel Turbine.
12	Performance test on Francis turbine.
13	Performance characteristics of Reciprocating pump.
14	Study the Impact of jet on Vanes.

References

1. FM & HHM Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Determination of co-efficient of discharge for Pitot tube.
2. Study the Reynolds number for different types of flows.
3. Determine the loss of head at the entrance and exit of the pipe.
4. Draw the hydraulic gradient line and total energy line for an inclined pipe.
5. Determine the metacentric height of a floating body.
6. Study the characteristics of stream line, streak line and stream tube types of flows.
7. Calibration of simple U-tube and inverted U-tube manometer.
8. Conduct performance test on Reciprocating pump.
9. Fabricate a Pelton wheel prototype model
10. Draw the hydraulic gradient line and total energy line for an inclined pipe.

ENGINEERING GEOLOGY LAB

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-CE-PC-227	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	analyze the physical properties of minerals	3
CO2	identify the various rocks	3
CO3	examine the various rocks using microscopic study	3
CO4	interpret and draw sections for geological maps	3
CO5	locate ground water table using electrical resistivity meter	3

List of Experiments

Week	Title/Experiment
1	Study of physical properties and identification of minerals referred under theory.
2	Megascopic description and identification of rocks referred under theory.
3	Microscopic study of rocks.
4	Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.
5	Simple Structural Geology problems.
6	Electrical resistivity meter.
Lab Examination Pattern:	
1	Description and identification of SIX minerals
2	Description and identification of Six (including igneous, sedimentary and metamorphic rocks)
3	Interpretation of a Geological map along with a geological section.
4	Simple strike and Dip problems.
5	Microscopic identification of rocks.

References

1. Engineering Geology Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Identify the different rocks of your surroundings.
2. Vertical electrical sounding to determine fracture distribution.
3. Geohydrogical investigation using vertical electrical sounding.
4. A report on earth formation by using vertical electrical sounding.
5. Geophysical and soil characterization of newly constructed areas.
6. A report on one year ground water level of your surrounding area.
7. Write the geological report on nearest dam site.
8. Identify the minerals and rocks of your village.
9. A report on mineral availability in India based on geological map.
10. A report on geological structures in your area.

APTITUDE AND CRITICAL THINKING SKILLS LAB

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-BSC-204	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	build proficiency in quantitative reasoning	3	3
CO2	improve critical thinking skills	3	3
CO3	enhance analytical skills	3	3
CO4	demonstrate quantitative aptitude concepts	3	3
CO5	adapt principles of quantitative aptitude to achieve qualitative results	3	3

List of Experiments

Week	Title/Experiment
1	Basic concepts, combined mean, average principles, wrong values taken, number added or deleted, average speed.
2	**Percentages** - Basic Concepts, conversions, finding percentages from given numbers, quantity increases or decreases by given percentage, population increase by given percentage, comparisons, consumption when a commodity price increase or decrease and applications.
3	**Data Interpretation -** Introduction to Data Interpretation, quantitative and qualitative data, Tabular Data, Line Graphs, Bar Chart, Pie Charts, X-Y Charts. **Gamification** - Deductive Logical Thinking.
4	Number Series, Letter Series, Series completion and correction, Coding and Decoding. Word analogy-Applied analogy, Classifications, verbal classification. **Gamification** - Inductive Logical Thinking.
5	**Reasoning Logical Diagrams -** Simple diagrammatic relationship, Multi diagrammatic relationship, Venn-diagrams, Analytical reasoning. **Gamification** - Grid Motion, Motion Challenge, Colour The Grid. **Reasoning Ability -** Blood Relations, Seating arrangements, Directions, Decision making.
6	**Number Systems:** Basic Concepts, Number Systems: Natural numbers, whole numbers, integers, fractions, Rational Numbers, Irrational Numbers, Real Numbers, Divisibility Rules, Logic Equations, Remainder theorem, Unit digit calculation. **Gamification** – Switch Challenge **Progressions & Inequalities:** Basic Concepts, Types: arithmetic, geometric, harmonic progression and applications.
7	**Profit and Loss:** Basic Concepts, discounts, marked price and list price, dishonest shopkeeper with manipulated weights, successive discounts etc. **Interest (Simple and Compound):** Basic Concepts, Yearly, Half-yearly, and quarterly calculations, multiples, differences between simple and compound interest. **Gamification** – Digit Challenge.
8	**Ratio and Proportion:** Basic Concepts of ratio and proportion, continued or equal proportions, mean proportions, invest proportion, alternative proportion, division proportion, compound proportion, duplication of ratio, finding values, coins and currencies, etc. **Gamification** – The Same Rule.
9	**Speed, Time and Distance:** Basic Concepts, Single train problems, two train problems: some point same side, some point opposite sides, relative speed, different points meeting at common points, different points same side (different timings vs. same timings), ratios, number of stoppages, average speed, etc.
10	**Time and Work:** Basic Concepts, comparative work, mixed work, alternative work, middle leave and middle join, ratio efficiency.
11	**Permutations and combinations:** Basic Concepts, differences between permutations and combinations, always together-never together, alternative arrangement, fixed positions,
12	

	double fixations, items drawing from a single group, items drawing from a multiple group, total ways of arrangement with repetitions and without repetitions, dictionary, handshakes or line joining between two points or number of matches , sides and diagonals, etc.
13	**Clocks and Calendars:** Basic Concepts, Angle between minute hand and hour hand, reflex angle, hours hand angle, time gap between minute hand and hour hand, relative time: coincide, opposite sides and right angle, mirror images, faulty clock (slow/fast), miscellaneous, calendar. **Gamification** - Overall Revision.
14	**Geometry and Mensuration:** Basic concepts, types of angles. **Plane figures:** rectangles, squares, triangles, quadrilateral, areas, perimeters, etc. **Solid figures:** cubes, cuboids, cylinders-area (total surface area and lateral surface area), volumes, perimeters. **Others:** Parallelogram, Rhombus, Trapezium, Circle, Sector, Segment, Cone, Sphere, Hemisphere, etc.
References	
1. Aptitude and critical thinking skills Lab Manual, FED, CMRIT, Hyd.	

INDIAN CULTURE AND CONSTITUTION
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-IV-Sem.	L	T	P	C
Subject Code	20-MC-202	3	-	-	-

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO8	PO12
CO1	identify paradigm shift in indian culture	3	3
CO2	explain features of languages, religions and holy books	3	3
CO3	illustrate provisions of Indian constitution	3	3
CO4	appreciate the structure of Indian administration system	3	3
CO5	appraise the role of Election Commission of India	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Indian Culture**	10
Indian Culture: Characteristics of Indian culture, significance of geography on Indian culture, society in India through ages, religions in ancient period, caste system, communalism and modes of cultural exchange.		
II	**Indian Languages, Religions and Literature**	9
Indian Languages, Religions and Literature: Evolution of script and languages in India, the Vedas and holy books of various religions. religion and philosophy in India; ancient period – Prevedic, Vedic religion, Buddhism and Jainism.		
III	**Indian Constitution and Union Administration**	5+5=10
Part A: Indian Constitution: Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Fundamental Rights and Duties.		
Part B: Union Administration: Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.		
IV	**State and District Administration**	10
State Administration: Governor: Role and Position, CM and Council of ministers, State Secretariat: Structure and functions Election Commission: Role and Functioning. **District's Administration**: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.		
V	**Local Administration and Election Commission**	9
Local Administration: Introduction to local self government, Organizational Hierarchy (Different departments), ZP administration, Mandal level and Village level administration. **Election Commission:** Role, structure and Functions of Election Commission of India. Introduction to different welfare boards.		
Reference:		
1. A Hand Book on Indian Culture and Constitution, FED, CMRIT, Hyderabad.		

B.TECH.-V-SEMESTER SYLLABUS

CONCRETE TECHNOLOGY

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PC-311	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO8	PO12	PSO1
CO1	explain properties of cement and aggregate as per IS codes	2	3	3	3
CO2	determine the properties of fresh concrete	3	3	2	3
CO3	examine hardened concrete properties using various methods	3	3	2	3
CO4	design concrete mix as per standard codes	3	3	2	3
CO5	make use of special concretes	3	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Cement and Admixtures**	9
Cement: Portland cement-chemical composition-Hydration, Setting of cement- structure of hydrated cement- tests on physical properties - different grades of cement - significance of grades of cement. **Admixtures:** Types of admixtures - mineral and chemical and chemical admixtures. Uses of mineral admixtures.		
II	**Aggregates**	10
Aggregates: Classification of aggregates – mechanical properties of aggregate like shape, texture, strength etc..- Specific gravity, Bulk Density, porosity, adsorption and moisture content – bulking of sand – Deleterious substance in aggregate – soundness of aggregate – Alkali aggregate reaction- Thermal properties – sieve analysis- fineness modulus- Grading curves- Grading of fine and coarse aggregates – Gap graded aggregate.		
III	**Fresh Concrete**	5+5=10
Part-A: Workability – Factors affecting workability – Measurement of workability by different tests- setting times of concrete- Effect of time and temperature on workability – Segregation and bleeding of concrete.		
Part-B: Steps in manufacture of concrete – Quality of Mixing water.		
IV	**Hardened Concrete and Testing of Hardened Concrete**	10
Hardened Concrete: Water / Cement ratio – Abram's Law – Gelspace ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compressive & tensile strength. **Testing of Hardened Concrete:** Compression tests – Tension tests– Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT. 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.		
V	**Mix Design and Special Concretes**	9
Mix Design: Factors in the choice of mix proportions – Data required for mix design- Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by– BIS Method. **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- making of SCC – Measuring abilities of SCC.		
Textbooks:		
1. Properties of Concrete by A. M. Neville Pearson 5th edition Education ltd 2016. 2. Concrete Technology by M. S. Shetty. – S. Chand & Co. 2004.		
References:		
1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.		

GEO-TECHNICAL ENGINEERING

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PC-312	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12	PSO1
CO1	explain engineering properties of soil and their applications	3	3	3	3
CO2	describe permeability and seepage of soils	3	3	3	3
CO3	analyze theories of stress distribution and compaction mechanism	3	3	2	3
CO4	determine consolidation characteristics of soils	3	3	2	3
CO5	estimate the shear strength of soils under different drainage conditions	3	3	2	3

Syllabus

Unit	Title/Topics	Hours
I		10
Introduction: Soil formation and structure – moisture content – Mass- volume relationship – Relative density. **Index Properties of Soils:** Grain size analysis – Sieve Analysis – consistency limits and indices – I.S. Classification of soils.		
II		9
Permeability: Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability– Permeability of layered soils – In-situ permeability tests (Pumping in & Pumping out test). **Effective Stress & Seepage Through Soils:** Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.		
III		5+5=10
Part-A: Stress Distribution in Soils: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.		
Part-B: Compaction: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.		
IV		9
Consolidation: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.		
V		10
Shear Strength of Soils: Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio.		
Textbooks:		
1. Soil Mechanics and Foundation by by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications Pvt. Ltd., New Delhi. 2. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).		
References:		
1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors. 2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Book House, Delhi.		

WATER RESOURCES ENGINEERING

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PC-313	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO12	PSO1
CO1	illustrate the process of hydrological cycle	3	2	3	3
CO2	construct various hydrographs	3	3	2	3
CO3	analyze ground water occurrence and radial flow into wells	3	3	3	3
CO4	describe the irrigation system	3	2	3	3
CO5	design irrigation canals and cross drainage works	3	3	2	3

Syllabus

Unit	Title/Topics	Hours
I		10
Introduction to engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data - Adjustment of record - Rainfall Double Mass Curve. Runoff-Factors affecting Runoff – Runoff over a Catchment - Empirical and Rational Formulae. Abstraction from rainfall-evaporation, factors affecting evaporation, measurement of evaporation-Evapotranspiration- Penman and Blaney & Criddle Methods - Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.		
II		9
Distribution of Runoff-Hydrograph Analysis Flood Hydrograph-Effective Rainfall – Base Flow-Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function -Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa – S-hydrograph, Synthetic Unit Hydrograph.		
III		5+5=10
Part A: Ground water Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcy's law.		
Part B: Radial flow to wells in confined and unconfined aquifers. Types of wells - Well Construction.		
IV		10
Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility –Crop Rotation, preparation of land for Irrigation, standards of quality for Irrigation water. Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors affecting duty- Design discharge for a water course. Depth and frequency of Irrigation, Irrigation Efficiencies-Water Logging.		
V		9
Classification of canals, Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standards for a canal design canal lining. Design Discharge over a catchment, Computation of design discharge-rational formulae etc., Flood Routing, Flood Forecasting. Cross Drainage works: types, selection of site, design principles of aqueduct, siphon aqueduct and super passage.		
Textbooks:		
1. Engineering Hydrology by K. Subramanya,TMH, 2014. 2. Applied hydrology by V.T. Chow, D.R. Maidment and L. W TMH, 2014 3. Irrigation and Water Resources & Water Power by P. N. Modi, Standard Book House		
References:		
1. Irrigation and water power engineering by Punmia & Lal, Laxmi pub., Pvt. Ltd., New Delhi 2. Engineering Hydrology by Jayarami Reddy, Laxmi publications Pvt. Ltd., New Delhi		

TRANSPORTATION ENGINEERING

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PC-314	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO12	PSO1
CO1	develop the plan and alignment of highway networks	3	3	2	3
CO2	design highway geometrics	3	3	3	3
CO3	apply the traffic rules & regulations for free flow of traffic	3	3	3	3
CO4	explain various types of intersections and its limitations	3	2	2	3
CO5	select suitable materials for construction & maintenance of highways	3	3	2	3

Syllabus

Unit	Title/Topics	Hours
I		9
Highway Development and Planning: Highway Development in India, Necessity for Highway Planning, Different road development plans; Classification of Roads, Road Network Patterns, Highway Alignment, Factors affecting Alignment- Engineering Surveys, Drawings & Reports, Highway Project.		
II		10
Highway Geometric Design: Importance of Geometric Design, Design controls and Criteria, Highway Cross Section Elements, Sight Distance Elements, Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance, Design of Horizontal Alignment, Design of Super elevation and Extra widening, Design of Transition Curves-Design of Vertical Alignment, Gradients, vertical curves.		
III		5+5=10
Part-A: Traffic Engineering & Regulations: Basic Parameters of Traffic-Volume, Speed and Density, Traffic Volume Studies, Data Collection and Presentation, Speed studies, Data Collection and Presentation, Origin & Destination studies, Parking Studies, On street & Off street Parking.		
Part-B: Road Accidents, Causes and Preventive Measures, Accident Data Recording, Condition diagram and Collision diagrams, Traffic Signs, Types and Specifications, Road Markings, Need for Road Markings, Types of Road Markings, Design of Traffic Signals, Webster Method.		
IV		9
Intersection Design: Types of Intersections, Conflicts at Intersections, Requirements of At-Grade Intersections, Types of At-Grade Intersections, Channelized and Unchannelized Intersections, Traffic Islands, Types of Grade Separated Intersections, Rotary Intersection, Concept of Rotary, Design Factors of Rotary, Advantages and Limitations of Rotary Intersections.		
V		10
Highway Material, Construction & Maintenance: Highway Material Characterization: Subgrade Soil, Stone Aggregates, Bitumen Materials, Construction of Gravel Roads, Construction of water bound macadam roads, Construction of bituminous pavements: Surface dressing, bitumen bound macadam, Bituminous concrete, Construction of cement concrete pavements, Construction of joints in cement Concrete pavements, joint filler &seal, Pavement failures, Maintenance of highways, Highway drainage.		
Textbooks:		
1. Highway Engineering – S.K.Khanna & C.E.G.Justo, Nemchand & Bros., 7th Edition, 2000. 2. Traffic Engineering & Transportation Planning–Dr.L.R.Kadyali, Khanna Publications, 6th Edn.		
References:		
1. Principles of Traffic and Highway Engineering –Garber & Hoel, Cengage Learning. 2. Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali & Dr.N.B.Lal– Khanna Pub.		

CONSTRUCTION TECHNOLOGY & MANAGEMENT
(Professional Elective – I)

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PE-311	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO11	PO12	PSO2
CO1	explain the fundamentals of CTPM	3	3	3
CO2	plan earthwork and construction facilities	3	3	3
CO3	make use of project management and control techniques	3	3	3
CO4	illustrate model BIM and safety in construction	3	3	3
CO5	originate and negotiate contracts and tenders using codes	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		9
Management -Fundamentals of construction project management: Introduction, Project Initiation and Planning.		
II		10
Planning of construction facilities - Earthwork construction - Equipment for construction, Construction Finances – decision making, Cement concrete construction- Construction of Piles - Construction of Cofferdams - Construction of Tunnels.		
III		5+5=10
Part-A: Development of project activity, Network Diagram, Program Evaluation and Review Technique.		
Part-B: Critical Path Method, Crashing of project, Cost Optimization, Resource leveling and smoothing, Investment Analysis.		
IV		9
Introduction to Building Information Modelling (BIM), Lean construction, and Integrated Project Delivery in construction, Invoicing, Preparation of RA bill, Safety in construction, Estimation.		
V		10
Contracts: Contracts in construction, fundamentals of delay analysis and claims; Advances in construction management, tender and tender document - Deposits by the contractor - Arbitration. Negotiation - M. Book - Muster roll –stores.		
Textbooks:		
1. Construction Project Management: Theory and Practice, Kumar Neeraj Jha, Pearson. 2. Project Planning and Control with PERT and CPM, Punmia B.C., Laxmi Publi, New Delhi.		
References:		
1. Construction Management and Planning, Sengupta, B. Guha, H. Tata McGraw-Hill Publications. 2. PERT & CPM Principles and Applications, L.S. Srinath, East-West Press Pvt. Ltd. 3. BIS Code for Tender Document.		

ADVANCED STRUCTURAL ANALYSIS
(Professional Elective - I)

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PE-312	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO12	PSO1
CO1	analyze portal frame using various methods	3	3	3
CO2	analyze two hinged arches	3	3	3
CO3	analyze multi storey frames using various approximate methods	3	3	3
CO4	analyze the continuous beams and frames using matrix method	3	3	3
CO5	construct influence lines for beams and analyze trusses	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Moment Distribution Method: Analysis of Single Bay Single Storey Portal Frames including side Sway. Analysis of inclined frames. **Kani's Method:** Analysis of Continuous Beams including settlement of Supports. Analysis of Single Bay Single Storey and Single Bay two Storey Frames by Kani's Method including side Sway. Shear force and bending moment diagrams. Elastic Curve.		
II		9
Slope Deflection Method: Analysis of Single Bay Single Storey Portal Frames by Slope Deflection Method including side Sway. Shear force and bending moment diagrams. Elastic curve. **Two Hinged Arches:** Introduction - Classification of Two hinged Arches - Analysis of two hinged parabolic arches - Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.		
III		5+5=10
Part-A: Approximate Methods of Analysis: Introduction - Analysis of multi-storey frames for lateral loads: Portal Method. Cantilever method.		
Part-B: Analysis of multi-storey frames for gravity (vertical) loads. Substitute Frame method.		
IV		10
Matrix Methods of Analysis: Introduction - Static and Kinematic Indeterminacy - Analysis of continuous beams including settlement of supports, using stiffness method. Analysis of pin-jointed determinate plane frames using stiffness method- Analysis of single bay single storey frames including side sway, using stiffness method. Analysis of continuous beams up to three degree of indeterminacy using flexibility method. Shear force and bending moment diagrams. Elastic curve.		
V		9
Influence Lines for Indeterminate Beams: Introduction - ILD for two span continuous beam with constant and variable moments of inertia. ILD for propped cantilever beams. **Indeterminate Trusses**: Determination of static and kinematic indeterminacies - Analysis of trusses having single and two degrees of internal and external indeterminacies- Castigliano's second theorem.		
Textbooks:		
1. Structural Analysis Vol - I & II by Vazarani and Ratwani, Khanna Publishers. 2. Structural Analysis Vol - I & II by Pundit and Gupta., Tata McGraw Hill Publishers.		
References:		
1. Basic Structural Analysis by C.S.Reddy, TMH. 2. Matrix Analysis of Structures by Pundit and Gupta, TMH. 3. Advanced Structural Analysis by A.K.Jain, Nem Chand Bros.		

MODERN TRANSPORTATION ENGINEERING
(Professional Elective – I)

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PE-313	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO5	PO12	PSO2
CO1	illustrate classification of highway system	2	2	3	3
CO2	outline the features of port and harbour engineering	2	2	3	3
CO3	make use of GIS applications in transportation engineering	3	3	3	3
CO4	develop an effective railway transportation system	3	3	3	3
CO5	adapt airport engineering techniques	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Functional Classification of Highway System: Design Controls – Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed. Objectives of Geometric Design, Cross Section Elements: Design specifications; Pavement Surface characteristics – Skid Resistance, Road Roughness; Camber, Objectives, design standards. Specifications for hill roads.		
II		9
Port and Harbour Engineering: Requirements of Port And Harbour, Classification of Port & Harbour, Features of A Harbour, Planning of Harbour, Breakwaters, Dry Docks, Jetties, Aprons, Transit Shed And Warehouses, Navigational Aids, Maintenance of Port And Harbours, Inland Water Transport.		
III		5+5=10
Part-A: Application of GIS in Transportation Engineering: Intelligent information system for road accessibility study.		
Part-B: GIS data base design for physical facility planning, Decision support systems for land use planning.		
IV		10
Railway Engineering: Introduction Role of railways in transportation; Comparison of railway and highway transportation; Development of railway systems with particular reference to India; Classification of railways Permanent way – Components and their functions – Rail joints – Welding of Rails – Creep of Rails – Rail fixtures & Fastenings. Track Geometric design – Points & Crossings – Track drainage –Layout of Railway stations and yards – Signals – Interlocking – Track circuiting – Track Maintenance.		
V		9
Airport Engineering: Factors affecting Selection of site for Airport – Aircraft Characteristics-Geometric Design of Runway - Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.		
References:		
1. Highway, Railway, Airport and Harbour Engineering, Dr. K.P. Subramanian, Scitech Publications India Pvt. Ltd. 2. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna. 3. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers. 4. Airport Engineering, Rangwala, Charotar Publishing House.		

CONCRETE TECHNOLOGY LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PC-315	-	-	2	1

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO6	PSO2
CO1	assess the properties of cement	3	3	3
CO2	analyze properties of aggregates	3	3	3
CO3	examine the properties of fresh concrete	3	3	3
CO4	determine the strength of hardened concrete	3	3	3
CO5	conduct non-destructive tests on concrete elements	3	3	3

List of Experiments

S.No.	Title/Experiment
I	**Tests on Cement**
	1. Normal Consistency and fineness of cement. 2. Initial setting time and final setting time of cement. 3. Specific gravity of cement. 4. Soundness of cement. 5. Compressive strength of cement.
II	**Tests on Aggregate**
	1. Sieve Analysis and gradation charts. 2. Bulking of sand. 3. Bulk and compact densities of fine and coarse aggregates.
III	**Tests on Fresh Concrete**
	1. Slump test 2. Compaction Factor test 3. Vee-bee Test 4. Flow Table Test
	Self Compacting Concrete
	1. Flow Test 2. V funnel 3. L Box
1V	**Tests on Hardened Concrete**
	1. Compression test on cubes 2. Flexure test 3. Splitting Tensile Test 4. Modulus of Elasticity
V	**Non Destructive Test of Concrete**
	1. Rebound hammer 2. Ultrasound pulse Velocity (UPV)
References	
1. Concrete Technology Lab Manual, Department of Civil Engineering, CMRIT, Hyd.	
Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.	
1. Find fineness of Flyash using 75micron sieve 2. Find specific gravity of locally available aggregates. 3. Find compressive strength of flyash mortar. 4. Conduct Sieve analysis test and determine the zone of fine aggregate 5. Determine bulk and compact densities of locally available fine and coarse aggregate. 6. Prepare M20 grade concrete and measure its slump and compaction factor at 0Min, 30min and 60min. 7. Find compressive strength of blended cement concrete. 8. Find water absorption of locally available fine and coarse aggregates 9. Assess quality of concrete by using rebound hammer test. 10. Assess the quality of existing concrete by using UPV test.	

GEO-TECHNICAL ENGINEERING LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PC-316	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO6	PSO2
CO1	determine the index properties of soils	3	3	3
CO2	analyze the grain size of soil	3	3	3
CO3	measure the water flow through soil media	3	3	3
CO4	find the strength properties of soils	3	3	3
CO5	assess the compaction characteristics of soil	3	3	3

List of Experiments

(Any **Ten** experiments may be completed**)**

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

References

1. Geo-Technical Engineering Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Field density of any road construction.
2. Estimate the volume of any pit.
3. Comparison of shear strength Properties for various soil types (Sand &Museum).
4. Comparison of compressive strength Properties of different soil samples using Flyash as additive.
5. Atterberg limits for red and black clay.
6. Estimate the hydraulic conductivity (Permeability) of two different soil samples.
7. To find the thermal properties of soils.
8. To estimate the gradation characteristics of embankment soil.
9. Specific gravity for various waste products or by-product materials.
10. Model prototype for electro-osmosis test or stratification of soils and its permeability.

TRANSPORTATION ENGINEERING LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PC-317	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO7	PSO2
CO1	determine various properties of aggregates	3	3	3
CO2	find various properties of bitumen	3	3	3
CO3	test strength of bitumen using marshal stability apparatus	3	3	3
CO4	estimate the traffic volume count at mid blocks and junctions	3	3	3
CO5	measure the speed of vehicles and area for parking	3	3	3

List of Experiments

Week	Title/Experiment
1	Determination of Aggregate Crushing value
2	Determination of Aggregate Impact Value
3	Determination of Specific Gravity and water absorption.
4	Determination of Aggregate Abrasion Value
5	Determination of Flakiness Index and Elongation Index of C.A.
6	Penetration Test on Bitumen.
7	Ductility Test on Bitumen.
8	Softening point of Bitumen.
9	Marshal Stability Test
10	Traffic Volume counts-Mid Blocks
11	Traffic Volume counts-Junctions
12	Spot speed studies.
13	Parking studies.

References

1. Transportation Engineering Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Compare the properties of normal aggregates and recycled aggregates.
2. Collect locally available CA and find Flakiness and Elongation index and suggest for road works
3. Compare the properties of bitumen and modified bitumen
4. Collect bitumen samples and conduct required tests to decide grade of bitumen
5. Study the engineering properties of bitumen mixes using marshal stability testing machine.
6. Design of pavement thickness by studying sub grade strength (CBR test).
7. Study the traffic volume at intersection near your college circle.
8. Traffic signal design at four-phase intersection.
9. Conduct traffic volume survey from Kompally to Medchal and suggest to reduce traffic.
10. Conduct a survey on Medchal road and study the spot speed.

WATER DISTRIBUTION ANALYSIS AND DESIGN SOFTWARE LAB (Using Water GEMS)

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PC-318	-	-	2	1

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO10	PSO2
CO1	explain the Hydraulic model	3	3	3	3
CO2	make use of Water distribution network model software	3	3	3	3
CO3	develop an existing or new networks in software	3	3	3	3
CO4	analyze input data for a network using flex tables	3	3	3	3
CO5	estimate the water quality using software	3	3	3	3

List of Experiments

S.No.	Title/Experiment
1	Introduction to Software (Water GEMS Software).
2	Basic Fundamentals of Hydraulics to create a model.
3	Create a Water distribution Network model with fire flow/Micro station/Pumps or Valves.
4	Entering Input data using Flex Tables for a Distribution Network.
5	Assigning values and simulating the Network.
6	Computing the total network and obtaining Results.
7	Analyzing the model with results.
8	Layout Existing network in software.
9	Analysis of water age of existing network Model.
10	Analysis of Water quality in existing network.

References

1. Water Distribution Analysis and Design Software Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Creating different Hydraulic Models.
2. Analyze an existing Distribution network and validating.
3. Creating a new model of distribution network with pumps and valves.
4. Designing an water distribution network based on demand capacity
5. Develop a network of Dead end or Tree system.
6. Develop a network of Grid Iron or Reticulation Interlaced system.
7. Develop a network of Circle or Ring system.
8. Develop a network Radial system.
9. Analyze the input data in flex tables.
10. Compare the water distribution software with other different software's.

SUMMER INTERNSHIP

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-CE-PR-311	-	-	-	1

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PSO2
CO1	utilize the domain knowledge with modern tools to solve real world problems	3
CO2	analyze the industrial processes that results in the end product / service	3
CO3	extend global needs for professional ethics, responsibility and communication	3
CO4	function well as an individual, member or leader in diverse teams	3
CO5	make use of engineering knowledge for societal sustenance	3

Guidelines

S. No.	Title
1	The student has to complete the internship for a period of 4 weeks during summer vacation between IV Semester and V Semester.
2	The internship can be carried out in any industry / R&D Organization / Research Institute / Premier Educational Institutes like IITs, NITs and IIITs etc.
3	The registration process of internship should be completed before the commencement of IV-semester end examinations.
4	The registration process for internship involves: a) Students have to approach respective course coordinator with name of proposed company / organization in which they wish to carry out internship. b) The Department shall nominate guide to supervise the interns. c) Student has to obtain a no objection certificate (NOC) in the prescribed format from the department and submit the same to the respective organization. d) Student has to submit acceptance letter issued by the respective organization to the course coordinator.
5	The internal guide has to visit place of internship at least once during student's internship.
6	The students shall report the progress of the internship to the guide in regular intervals and seek advice.
7	After the completion of Internship, students shall submit a final report along with internship and attendance certificates to the course coordinator with the approval of internal guide.
8	The evaluation of internship shall be done during V-Semester.
9	The student has to give a PPT presentation for duration of 10 to 15 minutes in the presence of departmental evaluation committee consists of Head of the Department, Internal Guide and Two Senior Faculty from the respective departments.
10	After the successful presentation by the student, the evaluation committee recommends the result as satisfactory for the internship. In case of students who have not registered for internship / not submitted the internship certificate and report, the V-Semester result will not be declared till completion.

CODING SKILLS
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	20-MC-301	1	-	2	-

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO5	PO12
CO1	solve real world problems using C & DS	3	3	3	3	3
CO2	solve real world problems using DBMS	3	3	3	3	3
CO3	solve real world problems using Python	3	3	3	3	3
CO4	solve real world problems using Java, HTML, JavaScript	3	3	3	3	3
CO5	solve real world problems using any one emerging technology	3	3	3	3	3

List of Experiments

Week	Title/Experiment
	PART-A (Mandatory)
1	**C&DS:** Loops statements, control structures, functions, arrays, structures and unions.
2	**C&DS:** Pointers, strings, linked lists, stacks and queues.
3	**C&DS:** Sorting, searching algorithms, trees and graphs.
4	**DBMS:** Database creation, normalization, transactions and triggers.
5	**Python:** OOP concepts, control statements, list, tuple, set and dictionary.
6	**Python:** Exception handling and regular expressions.
7	**Java:** OOP concepts.
8	**Java:** String manipulations, exception handling.
9	**HTML & JavaScript:** Tags, table, lists, XHTML, HTML5, form validation using JS.
10	**Node.JS:** Simple Programs using promise and async.
	ReactJS: Features, Environment setup and installation, components, Strings, State, Props and Validation, handling RestAPI's.
	PART-B (Either DevOps/.Net/Rust/Julia or any emerging technologies)
11	**DevOps:** Introduction, architecture, life cycle, DevOps Vs agile.
	.Net: Introduction to ASP.Net, control, architecture, framework.
	Rust: Introduction, environment setup, data types, variables, constant.
	Julia: Introduction, initialization and installation, OOPs, object reference, variables.
12	**DevOps:** Workflows, version control - GIT.
	.Net: Introduction to C#, OOPs concepts, exception handling.
	Rust: Strings, operators, decision making, loops.
	Julia: Introduction to REPL, tab completion, seeking help from Julia.
13	**DevOps:** Continuous integration & deployment - Jenkins. Build tool - Maven.
	.Net: Introduction to VB.Net, multi-threading. Introduction to ADO.Net.
	Rust: Function, tuple, array.
	Julia: Data types, type assignment.
14	**DevOps:** Containers and virtual development - Docker and Vagrant. Configuration management tools - Ansible, Puppet, Chef.
	.Net: Introduction to AJAX, routing, publishing and engine creation.
	Rust: Ownership, borrowing, slices, structure, enum, module, error handling.
	Julia: Representation of different number types, mathematical functions.
Reference	
1. Coding Skills Manual, Department of CSE, CMRIT, Hyd.	

B.TECH.-VI-SEMESTER SYLLABUS

ENVIRONMENTAL ENGINEERING

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-CE-PC-321	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO6	PO7	PO12	PSO1
CO1	analyze characteristics of water and water demand	3	3	2	3	3
CO2	explain various stages in water treatment systems	3	3	3	3	3
CO3	make use of various components for water supply systems	3	3	2	3	3
CO4	construct sewerage system	3	3	3	3	3
CO5	identify various waste water treatment techniques	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		9
Introduction: Waterborne diseases - protected water supply - Population forecasts, design period - types of water demand - factors affecting - fluctuations - fire demand - water quality and testing - drinking water standards: sources of water - Comparison from quality and quantity and other considerations - intakes - infiltration galleries.		
II		10
Layout and general outline of water treatment units – sedimentation – principles – design factors – Jar test-optimum dosage of coagulant, coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices- Miscellaneous treatment methods.		
III		5+5=10
Part-A: Distribution systems requirement – method and layouts -Design procedures- Hardy Cross and equivalent pipe methods pipe – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines.		
Part-B: Pump house - Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water overflows combined flow.		
IV		10
Characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D.Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainge – components requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming – dilution.		
V		9
Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters – standard and high rate filters, ASP – Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.		
Textbooks:		
1. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers. 2. Water supply and sanitary Engineering by S.C. Rangwala, Charotar Publishing House, Pvt. Ltd.		
References:		
1. Text book of Environmental Engineering by P. Venugopal Rao, PHI. 2. Water Supply Engineering, Vol 1, waste water Engineering Vol II, B.C. Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt. Ltd, New Delhi.		

DESIGN OF REINFORCED CONCRETE STRUCTURES

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-CE-PC-322	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO8	PO10	PO12	PSO2
CO1	explain the various design concepts of RC structures	2	3	2	3	3
CO2	design RC beams using limit state method	3	3	3	3	3
CO3	design various types of RC slabs	3	3	3	3	3
CO4	design various RC Columns based on loading conditions	3	3	3	3	3
CO5	design various RC footings and stair cases	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Concepts of RC Design**	5
Limit state method – Material Stress–Strain curves – Safety factors – Characteristic values– Stress block parameters – IS-456:2000 – Working stress method.		
II	**Design of Beams, Shear, Torsion and Bond**	14
Design of Beams: Limit state analysis and design of singly reinforced, doubly reinforced, T, and L beam sections. **Shear, Torsion and Bond:** Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing Limit state design for serviceability for deflection, cracking and codal provision.		
III	**Slabs**	5+5=10
Part-A: Design of one-way slabs and Two-way Slabs using I.S. coefficients.		
Part- B: Design of Continuous slabs, Cantilever slab using I.S. coefficients.		
IV	**Short And Long Columns**	10
Axial loads, uni-axial and bi-axial bending I.S. Code provisions.		
V	**Design of Footings**	9
Isolated (square, rectangle) and Combined Footings. Design of Stair Case.		
Textbooks:		
1. Design of Reinforced Concrete Structures by S. Ramamrutham, Dhanpath Rai Publishing Co. Pvt. Ltd. 2. Limit state design of reinforced concrete by P. C. Varghese, Prentice Hall of India, New Delhi.		
References:		
1. Fundamentals of reinforced concrete design by M. L. Gambhir, PHI, New Delhi. 2. Reinforced Concrete design by N. Krishna Raju and R. N. Pranesh, New Age International Publishers, New Delhi. 3. Reinforced concrete design by S. Unnikrishna Pillaiand Devdas Menon, TMH.		

ARTIFICIAL INTELLIGENCE AND ROBOTICS

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-CE-PC-323	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12	PSO1
CO1	explain the concepts of artificial intelligence	3	3	3	3
CO2	illustrate various heuristic search techniques	3	3	3	3
CO3	relate AI techniques in industrial robotics	3	3	3	3
CO4	analyze the robot motion through direct kinematics	3	3	3	3
CO5	develop program to control industrial robots	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
AI Introduction: Artificial Intelligence, AI problems, AI techniques, the level of the model, criteria for success. Defining the problem as a state space search, problem characteristics, production systems, search: issues in the design of search programs, un-informed search, BFS, DFS.		
II		9
Heuristic Search Techniques: What is heuristic?, heuristic function, introduction to search techniques: generate – and – test, hill climbing, best-first search, problem reduction, constraint – satisfaction, means- ends analysis.		
III		5+5=10
Part-A: Knowledge Representation: Procedural vs declarative knowledge, representations & approaches to knowledge representation, forward vs backward reasoning, matching techniques, expert systems.		
Part-B: Introduction to Industrial Robots: History, types of robots, robot subsystems, resolution, repeatability and accuracy, degrees of freedom, robot configurations and concept of workspace, mechanisms and transmission, end effectors and different types of grippers, actuators, applications of robots.		
IV		10
Robot Kinematics: transformation matrices and their arithmetic, link and joint description, denavit-hartenberg parameters, frame assignment to links, direct kinematics.		
V		9
Robotic Programming: Lead through programming, robot programming as a path in space, motion interpolation, WAIT, SIGNAL AND DELAY commands, branching capabilities and limitations, robot languages: textual robot languages, generation, robot language structures, elements in function.		
Textbooks:		
1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 3rd Edition, TMH, 2008. 2. Industrial Robotics, Groover M P, TMH. 3. Robotics, Fu K S, TMH.		
References:		
1. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010. 2. Robot Dynamics and Controls, Spony and Vidyasagar, John Wiley. 3. Robotics and Control, Mittal R K &Nagrath, TMH.		

FOUNDATION ENGINEERING
(Professional Elective – II)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-CE-PE-321	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO8	PO12	PSO2
CO1	explain the various methods of soil exploration	3	3	3	3	3
CO2	determine the slope failures using various methods	3	2	3	3	3
CO3	analyze earth retaining structures using various theories	3	3	3	3	3
CO4	illustrate various types foundations	2	2	3	3	3
CO5	make use of well foundation based on site requirements	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		9
Soil Exploration: Need-Methods of soil exploration–Boring and Sampling methods–Penetration Tests–Plate Load Tests-Pressure meter-Planning of Program and preparation of soil investigation report.		
II		10
Slope Stability: Infinite and finite slopes – types of failures – factors of safety of finite slopes - stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number – Stability of earth dams under different conditions.		
III		5+5=10
Part-A: Earth Pressure Theories: Rankine's theory of earth pressure- earth pressure in layered soils – Coloumb's earth pressure theory - Coloumb's graphical method.		
Part-B: Retaining Walls: Types of retaining walls – stability of retaining walls against overturning, bearing capacity and drainage from backfill.		
IV		11
Shallow Foundations - Strength Criteria: Types – choice of foundation – Location of depth – Safe bearing capacity – Terzaghi, Meyerhof, Skempton and IS Methods. **Shallow Foundations - Settlement Criteria:** Safe bearing pressure based on N value - allowable bearing pressure; safe bearing capacity – plate load test– allowable settlements of structures. **Pile Foundation:** Types of piles – Load carrying capacity of piles based on static pile fourmula – Dynamic formulae – Pile load tests – Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.		
V		8
Well Foundations: Types – Different shapes – Components of wells – functions and Design Criteria – Sinking of wells – Tilts and shifts.		
Textbooks:		
1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age International Pvt. Ltd. 2. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering by V.N.S. Murthy, Taylor and Francis Group.		
References:		
1. Analysis and Design of Substructures–Swami Saran, Oxford and IBH Publishing Company Ltd 2. Geotechnical Engineering by S.K.Gulhati & Manoj Datta – TMH.		

PAVEMENT DESIGN
(Professional Elective – II)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-CE-PE-322	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO6	PO8	PO12	PSO2
CO1	identify various factors affecting the pavement design	2	3	3	3	3
CO2	analyze the stresses in pavements	3	3	3	3	3
CO3	design the flexible and rigid pavements using various methods	3	3	3	2	3
CO4	determine the characteristics of materials for pavement design	2	2	3	3	3
CO5	design pavement for low volume roads and over lays	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.		
II		9
Stresses in Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. **Stresses in Flexible Pavements:** Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts **Stresses in Rigid Pavements:** Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars.		
III		5+5=10
Part-A: Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods.		
Part-B: Design of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.		
IV		10
Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Effects and Methods of Stabilization and Use of Geo Synthetics.		
V		9
Design of Pavement for Low Volume Roads: Pavement design for low volume roads, rural road designs - code of practices. **Design of Over Lays:** Types of Overlays, Suitability, Design of Overlays.		
Textbooks:		
1. Highway Engineering, S.K.Khanna, Justo and Veeraragavan. A, Nem Chand and Brothers. 2. Pavement Design, R. Srinivasa Kumar, Universities Press.		
References:		
1. Principles and Practice of Highway Engineering, L.R. Kadiyali and N.B.Lal, Khanna Publ.. 2. IRC: 37& 58 Codes for Flexible and Rigid Pavements Design. 3. IRC: SP: 72 & 62 Codes for Design of Low volume Flexible and Rigid Pavements.		

IRRIGATION ENGINEERING
(Professional Elective - II)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-CE-PE-323	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO7	PO12	PSO1
CO1	explain site selection for dams and reservoirs	2	3	3	3	3
CO2	analyze gravity dams and its stability	3	3	3	3	3
CO3	design earth dams and spillways	3	3	3	3	3
CO4	outline diversion head works	2	2	2	3	3
CO5	construct cross drainage works using design principles	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Introduction to Dams: Types of dams, merits and demerits, factors affecting selection of type of dam, factors governing selecting site for dam, types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve.		
II		9
Gravity dams: Forces acting on a gravity dam, concepts and criteria; causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, stability analysis, drainage galleries.		
III		5+5=10
Part-A: Earth dams: Types of earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage.		
Part-B: Spillways: Types of spillways, design principles of ogee spillways, types of spillway gates - cavitations on spillway - design feature- design principles and design of spillways - chute spillways -energy dissipation - stilling basins.		
IV		10
Diversion Head works: Types of Diversion head works-diversion and storage head works, weirs and barrages, layout of diversion head works, components. Causes and failure of hydraulic structures on permeable foundations, Bligh's creep theory, Khosla's theory, determination of uplift pressure, impervious floors using Bligh's and Khosla's theory, exit gradient, functions of u/s and d/s sheet piles.		
V		9
Cross drainage works: Types, selection of site, design principles of aqueduct, siphon aqueduct and super passage. Canal structures I: types of falls and their location, design principles of Sarda type fall, trapezoidal notch fall and straight glacis fall. Canal structures II: canal regulation works, principles of design of distributory and head regulators, canal outlets, types of canal modules.		
Textbooks:		
1. Irrigation engineering and hydraulic structures by S.K Garg, Khanna publishers. 2. Irrigation, Water Power and Water Resources Engineering by Arora, K.R., Standard Publishers.		
References:		
1. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers 2. Water resources engineering by Satyanarayana Murthy. Challa, New Age International Publishers		

DISASTER MANAGEMENT
(Open Elective - I)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-OEC-321	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO7	PO8	PO12
CO1	analyze impact of disasters	3	2	3	3
CO2	choose suitable disaster management mechanism	3	3	3	3
CO3	make use of appropriate measures for capacity building to reduce risks	2	2	3	2
CO4	develop strategies to cope up with disasters	3	3	3	3
CO5	build disaster management plan	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Understanding Disaster, Hazards and Vulnerabilities**	10
Understanding Disaster: Concept of Disaster - Different approaches - Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional). **Hazards and Vulnerabilities:** Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; Vulnerability and disaster risk. ***Task:*** *Identify various types of hazards in your area.*		
II	**Disaster Management Mechanism**	9
Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief. ***Task:*** *Prepare a hypothetical risk mitigation plan.*		
III	**Capacity Building**	5+5=10
Part-A: Concept - Structural and Nonstructural Measures Capacity Assessment. ***Task:*** *Prepare a capacity assessment of the disaster risk management system in your state.*		
Part-B: Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels. ***Task:*** *Prepare a case study on initiatives of NDRF and Legislative Support.*		
IV	**Coping with Disaster**	9
Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management. ***Task:*** *Prepare a case study on role of mass media in coping up with disaster.*		
V	**Planning for disaster management**	10
Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India Organizational structure for disaster management in India - Preparation of state and district, Disaster management plans. ***Task:*** *Prepare a case study on proactive and reactive disaster management plans.*		
Textbooks:		
1. Manual on Disaster Management, National Disaster Management, Agency Govt of India. 2. Disaster Management by Mrinalini Pandey Wiley 2014. 3. Disaster Science and Management by T. Bhattacharya, TMH, 2015		
References:		
1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BSP 2009. 2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)		

ROBOTICS
(Open Elective-I)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-OEC-322	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO5	PO12
CO1	illustrate principles and functioning of the robot	3	2	2	2
CO2	perform kinematic analysis for end-effector positioning	3	3	3	2
CO3	integrate sensors for robot	3	3	3	2
CO4	design control laws for a robot	3	3	2	2
CO5	develop robot programming for various applications	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Robotics**	10
Types and components of a robot, Classification of robots, classification with respect to geometrical configuration (anatomy), closed-loop and open- loop control systems. Social issues and safety. ***Task:*** *Study components and anatomy of a real robot system.*		
II	**Robot Kinematics**	9
Kinematics systems, Definition of mechanisms and manipulators, Kinematic Modeling: Translation and Rotation Representation, Coordinate transformation, Homogeneous Coordinate representation, DH parameters. ***Task:*** *Forward kinematics and validate using sodhana software*		
III	**Sensors and Vision System**	5+5=10
Part-A: Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. ***Task:*** *Positioning and orientation of robot arm.*		
Part-B: Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean / Similarity / Affine / Projective transformations Vision applications in robotics. ***Task:*** *Image Processing using open CV*		
IV	**Robot Control**	10
Basics of control: Transfer functions, Control laws: P, PD, PID. ***Task:*** *Control experiment using Robot arm for pick and place.*		
V	**Control Hardware and Interfacing**	9
Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications. ***Task:*** *Study the architecture of Robot via FLD.*		

Textbooks:

1. Niku Saeed B., "Introduction to Robotics: Analysis, Systems, Applications", PHI, New Delhi.
2. Mittal R.K. and Nagrath I.J., "Robotics and Control", Tata McGraw Hill.

References:

1. Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, 2014.
2. Ghosal, A., "Robotics", Oxford, New Delhi, 2006.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Open Elective-I)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-OEC-323	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	apply the fundamental concepts of measuring instruments	3	2	2
CO2	distinguish signal generators and signal analyzers	3	3	2
CO3	make use of oscilloscopes	3	2	2
CO4	identify various transducers	3	3	2
CO5	develop bridges for various measuring parameters	3	2	2

Syllabus

Unit	Title/Topics	Hours
I	**Block Schematics of Measurement**	10
Performance characteristics-static characteristics, dynamic characteristics; measuring instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC voltmeters and Current Meters, Ohmmeters, Multi-meters; meter protection; Extension of Range; True RMS Responding voltmeters; specifications of instruments. ***Task:*** *Study the effects of measuring instruments.*		
II	**Signal Analyzers**	9
AF, HF Wave Analyzers, Heterodyne wave Analyzers, Power Analyzers; capacitance-voltage Meters; oscillators; signal generators-sweep frequency generators: AF, RF, pulse and square wave, arbitrary waveform & function generators and Specifications. ***Task:*** *Design an Attenuator.*		
III	**Oscilloscopes**	5+5=10
Part-A: Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, CRO Probes. Applications-measurement of Time period and frequency specifications. ***Task:*** *Simulate Electronic Multi-meter.*		
Part-B: Special Purpose Oscilloscopes: introduction to dual trace, dual beam CROs, sampling oscilloscopes, storage oscilloscopes, digital storage CROs. ***Task:*** *Simulate DSO.*		
IV	**Transducers**	10
Classification of transducers; force and displacement transducers; resistance thermometers; hotwire anemometers; LVDT; thermocouples, Synchros, special resistance thermometers; digital temperature sensing system; Piezoelectric; variable capacitance transducers; magneto strictive transducers. ***Task:*** *Design DAC and ADC.*		
V	**Bridges**	9
Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge; measurement of physical parameters-flow, displacement, level, humidity, moisture, force, pressure, vacuum level, temperature measurements; data acquisition systems. ***Task:*** *Design Wheatstone Bridge Measurement.*		
Textbooks:		
1. Electronic Instrumentation: H.S.Kalsi-TMH 2nd Edition 2004. 2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D.Cooper: PHI 5th Edition, 2003.		
References:		
1. Electronic Instrumentation and Measurements- David A. Bell, Oxford Univ. Press, 1997. 2. Electronic Measurements and Instrumentation K. Lal Kishore, Pearson Education 2010.		

JAVA PROGRAMMING
(Open Elective-I)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-OEC-324	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO12
CO1	write simple java programs using OOP concepts	3	2	2	3	2
CO2	develop programs using inheritance and polymorphism	3	2	3	3	2
CO3	create packages and interfaces	3	2	3	3	2
CO4	build efficient code using multithreading and exception handling	3	2	3	3	2
CO5	design real-time applications using applets	3	2	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Java Basics**	10
History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, OOP concepts, concepts of classes, objects, constructors, methods, this keyword, parameter passing, recursion. ***Task:*** *Write a Java program that creates a user interface to perform integer divisions.*		
II	**Inheritance and Polymorphism**	9
Types of inheritance, member access rules, super uses, using final with inheritance, the object class and its methods, method overloading and overriding, dynamic binding, abstract classes and methods. ***Task:*** *Write a Java program to implement overloading and overriding.*		
III	**Packages, Inner classes and Interfaces**	5+5=10
Part-A: Packages and Inner classes: Defining, creating and accessing a package, CLASSPATH, importing packages, inner classes – local, anonymous and static. ***Task:*** *Write a Java program to demonstrate the package.*		
Part-B: Interfaces: Defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces, differences between classes and interfaces. ***Task:*** *Write a Java program to implement interfaces.*		
IV	**Exception handling and Multithreading**	9
Exception handling: Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. **Multithreading:** Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication. ***Task:*** *Write a Java program that implements a multi-thread application that has three threads.*		
V	**Applets**	10
Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. ***Task:*** *Develop an applet in Java that displays a simple message.*		
Textbooks:		
1. Java the complete reference, 8th Edition, Herbert Schildt, TMH.		
References:		
1. Java How to Program, H. M. Dietel and P. J. Dietel, 6th Edition, Pearson Education, PHI. 2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.		

ENVIRONMENTAL ENGINEERING LAB

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-CE-PC-324	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PSO2
CO1	analyze various properties of water and waste water	3	3
CO2	determine optimum dosage of coagulant	3	3
CO3	identify break - point chlorination	3	3
CO4	examine the biological characteristics of water and waste water	3	3
CO5	assess the quality of water and waste water	3	3

List of Experiments

Week	Title/Experiment
1	Determination of P^H and Turbidity
2	Determination of Conductivity and Total dissolved solids (Organic and Inorganic)
3	Determination of Alkalinity
4	Determination of Acidity
5	Determination of Chlorides
6	Determination of Iron
7	Determination of Dissolved Oxygen
8	Determination of Nitrates
9	Determination of Optimum dose of coagulant
10	Determination of Chlorine demand
11	Determination of total Phosphorous
12	Determination of B.O.D
13	Determination of C.O.D
14	Presumptive Coliform test

References

1. Environmental Engineering Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. p^H and Electrical Conductivity value of different samples.
2. Estimation of total Hardness of bore water.
3. Determination of Calcium and Magnesium hardness of bore water.
4. Determination of Alkalinity and Acidity of different samples.
5. Determination of chlorides in water and soil.
6. Estimation of total solids, dissolved solids in Surface water and sub-surface water sample.
7. Determination of dissolved oxygen of pond water with D.O Meter &Winkler's Method.
8. Physical parameters-Temperature, Turbidity.
9. B.O.D/COD of different samples.
10. Determination of chlorine demand for municipal water.

ARTIFICIAL INTELLIGENCE AND ROBOTICS LAB

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-CE-PC-325	-	-	2	1

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PSO2
CO1	illustrate various search techniques	3	3	3
CO2	solve real-time problems using graph theory	3	3	3
CO3	estimate the accuracy and repeatability of the robot arm	3	3	3
CO4	develop programming for robot trajectory motion	3	3	3
CO5	experiment with robot arm for palletizing, pick and place	3	3	3

List of Experiments

Week	Title/Experiment
1	Write a program to implement BFS Traversal.
2	Write a program to implement DFS Traversal.
3	Write a program to implement A* Search.
4	Write a program to implement Travelling Salesman Problem.
5	Write a program to implement Graph Coloring Problem.
6	Estimation of accuracy, repeatability and resolution.
7	Robot arm pick and place experiment.
8	Robot arm palletizing experiment.
9	Robot programming exercises.
10	Machine loading and unloading

References

1. Artificial Intelligence and Robotics Lab Manual, Dept. of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

2. Intelligent vehicles using Artificial Intelligence.
3. Smart ICU Predictive detection of deterioration of seriously ill patients using Artificial Intelligence.
4. Artificial Intelligence Innovation.
5. Prevention against Cyber security Threats using Artificial Intelligence.
6. Efficient, Scalable Processing of Patient Data using Artificial Intelligence.
7. Building a mobility device using ultrasonic sensor.
8. Building a mobility device using line follower method.
9. Program the robot manipulator for pick and place of selected objects.
10. Program the robot manipulator for stop and proceed in trajectory path.
11. Program for identification of object colour and shape.

COMPUTER AIDED CIVIL ENGINEERING DESIGN LAB

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-CE-PC-326	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO10	PO12	PSO2
CO1	make use of STAAD Pro software for analysis and design	3	3	3	3	3
CO2	design various components of building	3	3	3	3	3
CO3	design the single and multi-storeyed building	3	3	3	3	3
CO4	design the over head tank of various shapes	3	3	3	3	3
CO5	analyze and design trusses and plane frames	3	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Introduction to STAAD Pro Software
2	Design of beams for various supports and loads
3	Design of single storey building with various/fixed supports and loads
4	Design of multi-storied building with various/fixed supports and loads
5	Design of RCC Rectangular Over Head Tank
6	Design of RCC Circular Over Head Tank
7	Analysis of truss using STAAD Pro
8	Analysis of Plane frames using STAAD. Pro

References

1. Computer Aided Civil Engineering Design Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Design a simply supported RCC beam carrying UDL entire span & point load at the centre.
2. Design a column to carry an axial load.
3. Design a Continuous beam subjected to UDL.
4. Design and Detailing of Two way Slab.
5. Design and Detailing of Raft foundation.
6. Design a 2D-RCC Frame subjected to Lateral loads.
7. Design and Detailing of over head Tank.
8. Design a two storied RCC frame 3 bays of equal span having fixed supports.
9. Analysis of a truss subjected to any loading.
10. Analysis of a Plane frame subjected to any loading.

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-HSMC-301	1	-	2	2

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO5	PO10
CO1	assess and utilize vocabulary in an effective way	3	3
CO2	interpret interpersonal relationships	3	3
CO3	elaborate academic reading and writing skills	3	3
CO4	formulate appropriate communication techniques in various contexts	3	3
CO5	adapt to different work-place and socio-cultural scenarios	3	3

List of Experiments

Week	Title/Experiment
1	Self-Introduction, Role Play, Simple Exercises on Personality Development, Vocabulary Test.
2	Non-verbal Communication & Personality-Development – self assessment- attitude – self-esteem.
3	Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms, Phrases, Collocations, Technical vocabulary.
4	Reading Skills - General Vs Local Comprehension - reading for facts& details - understanding pictures, figures and graphs - guessing meaning from context - Skimming, Scanning, Inferring Meaning.
5	Unseen passages on various topics for Reading Comprehension.
6	Different types of Writing - Formal Letter Writing - Cover Letter - Resume - Email - Memos - SOP.
7	Technical Reports, Research Proposals, Thesis Writing (abstract, synopsis, thesis statement, conclusion, etc.) - Editing - understanding Plagiarism and its Tools.
8	Presentations - styles (oral and written) - tools - Inforgraphics - cross-cultural communication.
9	Oral presentations (Audience-centered, JAMs, Seminars, etc.) Written presentations (Posters, PPTs, Pictures, etc.)
10	Dynamics of Group Discussion - organization of ideas - rubrics of evaluation.
11	GD sessions for practice.
12	Interview Skills – Do's & Don'ts pre, during & post interview techniques – research about job profile and Mock Interviews.

References

1. Advanced English Communication Skills Lab Manual, FED, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Role Play / Debate
2. Office Communication
3. Presentation Skills
4. Public Speaking
5. Interview Skills
6. Telephone Skills
7. Article Writing
8. Workplace etiquette
9. Video Resume / resume writing
10. Group Discussion

HUMAN VALUES AND PROFESSIONAL ETHICS
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	20-MC-302	2	-	-	-

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO6	PO7	PO8	PO12
CO1	identify values and ethics and its relation to individual excellence	3	3	3	2
CO2	outline the ten commandments and try to apply in professional career	2	2	3	2
CO3	illustrate modern percepts of ethics, CSR and Corporate Governance	3	3	3	2
CO4	analyze the purpose of professional code of ethics and whistle blowing	3	3	3	2
CO5	practice student professional/technical societies/associations activities	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Human Values**	7
Concept of Human Values - Ethics & types – Morality – Beliefs - Professional and Engineering Ethics -Ethics in Corporate Sector - Bearing of Human Values on Ethics, Morals, integrity, Equity, Caring, Sharing, Honesty, Cooperation, Commitment, Empathy, Modesty, Self-Confidence, Self-Reliance, Character, and Spirituality - Role of Yoga and meditation towards human excellence.		
II	**Concept of Virtues, Character, and Fundamental Rights**	6
List & Theories of Virtues-Values & Virtues - Moral Unity and Integrity - Honesty - Eight Ways of Misusing the Truth - Civic Virtues - Courage - Generosity in Character - Fundamental Rights.		
III	**Senses of Responsibility and Engineering Ethics**	3+3=9
Part-A: Concept of Responsibility: Spirituality, Religion, Super naturality, and Faith - The Golden Rule in Religious Ethics. Corporate Governance and Corporate Social Responsibility.		
Part-B: Concept of Engineering Ethics: Ethics in Hindu Mythology - Dharma - Development of Modern Precepts of Ethics.		
IV	**Codes of Conduct**	6
Purpose of Professional Ethical Codes and Limitations -Internal Conflicts - Professional Societies and Codes of Ethics - Corporate Codes of Ethics- Moral Issues - International Moral Code - Confidentiality – Whistle blowing, the Seven Social Sins.		
V	**Role of Professional/Technical Society/Association**	7
Attributes of a Profession - Professional Engineer & Respective Professional Associations & Technical Societies (ISTE, FIE, CSI, ACT, IETE, IEEE, SAE, ACE, Etc.) - Characteristics of a Professional. Student Professional/Technical Society Activity through institutional student chapter.		
Textbooks:		
1. D R Kiran, Professional Ethics and Human Values, MGH Publishers,		
References:		
1. R.S. Naagaraazan, Human Values & Professional Ethics, NAIP 2. Subramanian R., Professional ethics, Oxford University press		

B.TECH.-VII-SEMESTER SYLLABUS

BUSINESS ECONOMICS

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-HSMC-411	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO11	PO12
CO1	outline the concepts of business management & economics	3	2
CO2	identify demand function to predict sales using linear regression	3	2
CO3	adapt production, price, market and cost analysis functions	3	2
CO4	estimate enterprise requirements under risky economic environment	2	3
CO5	assess the operational and financial performance of an enterprise	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Fundamentals of Business Management & Economics and Demand Analysis**	10
Concept of Management, Functions, Scope and Levels of management, Concept of Business/Managerial Economics, nature, characteristics and Scope, Law of Consumption, Demand and Supply. ***Task:*** *Derive a function for Law of Consumption, demand and supply using MS-Excel.*		
II	**Demand Analysis**	10
Factors influencing Demand and Types of Demand, Types of Demand Elasticity, Methods of Demand Forecasting. ***Task:*** *Fit a trend line for sales using MS-Excel.*		
III	**Production, Price, Markets & Cost Analysis**	4+4=8
Part A: Production Analysis: Types of Production functions, Economies of Scale, Pricing objectives & methods. ***Task:*** *Derive production function using MS-Excel.*		
Part-B: Cost Analysis: Price - Output decisions under perfect and monopoly competitions, Types Costs, CVP Analysis, Computation of BEP and its applications. ***Task:*** *Find BEP for a desired profit using MS-Excel.*		
IV	**Investment Analysis & Indian Economic Environment**	10
Types of Capital Requirements, factors influencing working capital, Techniques of Capital Budgeting, Comments on Union Budgets and Flow of Credit, Steps in IPOs & trading of shares. ***Task:*** *Determine IRR for a capital budgeting project using standard notations through MS-Excel.*		
V	**Financial Statement Analysis and Type of Undertakings**	10
Types, Uses and Limitations of various ratios, Features of Sole-Trader, Partnership, Joint Stock Companies and PSUs. ***Task:*** *Forecast overall performance for a decade with ratios using MS-Excel.*		
References:		
1. Managerial Economics& Financial Analysis A.R. Aryasri. Tata McGraw Hill. 2. Financial Institutions and Markets, LM Bhole, Kindle Edition. 3. Managerial Economics, RL Varshney & KL Maheshwari, Sultan Chand & Sons. 4. Industrial Engineering and Management, O. P. Khanna, Dhanpat Rai & Sons.		

ESTIMATION & COSTING

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PC-411	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO11	PO12	PSO2
CO1	find the various quantities of building items	3	3	3
CO2	estimate earthwork for roads and canals	3	3	3
CO3	analyze the cost for various civil work items	3	3	3
CO4	determine the quantity of reinforcement and classify the contracts	3	3	3
CO5	evaluate the cost of buildings using NBC	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
General items of work in Building – Standard Unit Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating. Detailed Estimates of Buildings.		
II		9
Earthwork for roads and canals.		
III		5+5=10
Part-A: Rate Analysis – Working out data for various items of work over head and contingent charges.		
Part-B: Rate Analysis (Contd…) – Working out data for various items of work over head and contingent charges.		
IV		10
Reinforcement bar bending and bar requirement schedules. Contracts – Types of contracts – Contract Documents – Conditions of contract.		
V		9
Valuation of buildings. Standard specifications for different items of building construction.		

Textbooks:

1. Estimating and Costing by B.N. Dutta, UBS Publishers, 2000.
2. Estimating and Costing by G.S. Birdie.

References:

1. Standard Schedule of rates and standard data book by public works department.
2. I.S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering work – B.I.S)
3. Estimation, Costing and Specifications by M.Chakraborthi; Laxmi publications.
4. National Building Code.

WATERSHED MANAGEMENT
(Professional Elective – III)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PE-411	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO6	PO7	PO12	PSO1
CO1	illustrate concept of watershed and its sustainable development	3	3	2	3
CO2	identify causes of soil erosion	3	3	2	3
CO3	design rain water harvesting structure	3	3	3	3
CO4	propose the methods of artificial recharge for groundwater	3	3	3	3
CO5	explain measures for reclamation of saline soils	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Introduction, concept of watershed, need for watershed management, concept of sustainable development. Hydrology of small watersheds.		
II		9
Principles of soil erosion- causes of soil erosion, types of soil erosion, estimation of soil erosion from small watersheds, Control of soil erosion, methods of soil conservation – structural and non-structural measures.		
III		5+5=10
Part-A: Principles of water harvesting, methods of rainwater harvesting.		
Part-B: Design of rainwater harvesting structures.		
IV		10
Artificial recharge of groundwater in small watersheds-, methods of artificial recharge.		
V		9
Reclamation of saline soils -. Micro farming -, biomass management on the farm.		
Textbooks:		
1. Murthy, V.V.N. and M.K. Jha Land and Water Management, Kalyani Publishers. 2. Watershed Management Muthy, J. V. S.,New Age International Publishers.		
References:		
1. Watershed Hydrology by R Suresh, Standard Publishers and Distributors, Delhi. 2. Watershed Management by Madan Mohan Das and M.D. Saikia, Prentice Hall of India.		

DESIGN OF STEEL STRUCTURES
(Professional Elective - III)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PE-413	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO8	PO10	PO12	PSO2
CO1	explain the properties of steel and design various connections	3	3	3	3	3
CO2	design the members subjected to tension and compression	3	3	3	3	3
CO3	design the members subjected to flexure	3	3	3	3	3
CO4	design various eccentric connections	3	3	3	3	3
CO5	design plate girder and roof truss elements	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Materials: Making of iron and steel, Types of structural steel, Mechanical properties of structural steel, Concept of plasticity, yield strength- loads and load combinations, wind loads on roof truss, local buckling, Concept of limit state design, different limit states as per IS 800-2007,Deflection limits, serviceability, Bolted connections, welded connections ,design strength, Efficiency of joint.		
II		9
Design of Tension members: Design of Tension Members, design strength of members. **Compression Members**: Design of compression members, buckling class, Slenderness ratio, strength design, laced, battened columns, Column base, slab base.		
III		5+5=10
Part-A: Design of beams: Plastic moment, bending and shear strength, laterally supported beams design.		
Part-B: Design of beams (Contd..): Built up sections, large plates , web buckling, crippling, deflection of beams.		
IV		9
Eccentric connections: Design of eccentric connections with brackets, beam end connections, web angle, Un-stiffened and stiffened seated connections bolted and welded types.		
V		10
Plate girder: Components of plate girder, optimum depth, design of main section, design of end bearing and intermediate stiffeners, connection between flange and web, design of flange splices and web splices. **Roof Truss:** Parts of a truss - Design of purlin- Design of truss joints.		
Textbooks:		
1. Design of steel structures: N. Subramanian, Oxford university Press 2. Limit state Design of steel structures, S. K. Duggal, Tata McGrawHill		
References:		
1. Design of steel structures by Ramchndra 1&2, Scientific Publishers Journals Dept 2. Design of steel structures S. S. Bhavikatti, IK int Publication House, New Delhi, 2010		

INTELLIGENCE TRANSPORT SYSTEMS
(Professional Elective – III)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PE-415	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO10	PO12	PSO2
CO1	explain the fundamentals of ITS	2	2	3	2	3
CO2	outline the sensor technologies and data requirements of ITS	3	3	3	2	3
CO3	identify various ITS user services	3	3	3	3	3
CO4	select appropriate ITS technology based on site conditions	3	3	3	2	3
CO5	design and implement ITS components	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Fundamentals of Intelligence Transport Systems (ITS)**	10
Definition of ITS, the historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS		
II	**Sensor technologies and Data requirements of ITS**	9
Importance of telecommunications in the ITS. Information Management, Traffic Management Centers (TMC).Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centers; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.		
III	**ITS User Needs and Services and Functional areas**	5+5=10
Part-A: Introduction, Advanced Traffic Management systems (ATMS), Advanced Traveler Information systems (ATIS), Commercial Vehicle Operations (CVO).		
Part-B: Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS).		
IV	**ITS Architecture**	10
Regional and Project ITS architecture; Concept of operations; ITS Models and Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation; ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS planning.		
V	**ITS applications**	9
Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions Automated Highway Systems- Vehicles in Platoons – Integration of Automated Highway Systems.		
Textbooks:		
5. Highway, Railway, Airport and Harbour Engineering, Dr. K.P. Subramanian, Scitech Publications India Pvt. Ltd. 6. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna.		
References:		
1. Highway Engineering, C.E.G. Justo and S.K.Khanna, Nem Chand and Brothers. 2. Airport Engineering, Rangwala, Charotar Publishing House.		

MUNCIPAL AND HAZARDOUS WASTE MANAGEMENT
(Professional Elective - IV)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PE-412	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO6	PO7	PO12	PSO1
CO1	explain the sources of solid waste and its impact	3	2	3	3	3	3
CO2	describe the process of solid waste and its management	3	3	3	3	3	3
CO3	illustrate the process of handling hazardous wastes	3	3	3	3	3	3
CO4	classify various biomedical waste management systems	3	3	3	3	3	3
CO5	apply e-waste management techniques	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		7
Solid Waste: Definition of solid wastes, types of solid wastes, sources, Industrial, mining, agricultural and domestic, characteristics, solid waste problems, impact on environmental health.		
II		12
Collection, Segregation, Transport and Management of Municipal Solid Wastes: Handling and segregation, Collection and storage of municipal solid wastes; analysis of Collection systems.transfer stations, labeling and handling of hazardous wastes. Solid waste processing technologies. Mechanical and thermal volume reduction. Biological and chemical techniques for energy and other resource recovery: composting, types, vermicomposting, termigradation, fermentation. Incineration of solid wastes. Disposal in landfills: site selection, design, and operation of sanitary landfills; Leachate and landfill gas management; landfill closure and post-closure environmental monitoring; landfill remediation. Regulatory aspects of municipal solid waste management.		
III		5+5=10
Part-A: Hazardous Waste and Management: Hazardous waste definition. Physical and biological routes of transport of hazardous substances, sources and characterization. Sampling and analysis of hazardous wastes,proximate analysis,survey analysis,directed analysis,handling, collection, storage and transport.		
Part-B: Hazardous waste treatment technologies TSDF concept, Physical, chemical and thermal treatment of hazardous waste: solidification, chemical fixation, encapsulation, pyrolysis and incineration. Hazardous waste land fills,Site selections, design and operation. HW reduction, recycling and reuse, Regulatory aspects of HWM/HWM rules.		
IV		10
Biomedical Waste Management: Classification, collection, segregation treatment and disposal. radioactive waste: definition, low level and high level radioactive wastes and their management, radiation standards.		
V		9
E-Waste Management: Waste characteristics, generation, collection, transport and disposal, regulatory aspects of e waste, global strategy, recycling.		
Textbooks:		
1. Hazardous waste management Charles A. Wentz. Second edition 1995. TMH. 2. Integrated solid waste management George Tchobanoglous, Hilary Theisen & Sammuel A. Vigil.		
References:		
1. Hazardous waste management by Prof. Anjaneyulu. 2. Criteria for hazardous waste landfills - CPCB guidelines 2000. 3. Standard handbook of Hazardous waste treatment and disposal by Harry M.Freeman,TMH.		

FINITE ELEMENT ANALYSIS
(Professional Elective – IV)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PE-414	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO12	PSO2
CO1	explain the fundamentals of FEA	3	2	3	3	3
CO2	formulate the stiffness matrix for 1-D element	3	3	3	3	3
CO3	compute the stiffness matrix for 2-D and 3-D element	3	3	2	3	3
CO4	analyze the plates using FEA	3	3	3	3	3
CO5	apply non-linear finite element analysis	3	3	2	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Introduction: Concepts of FEA - steps involved - merits and demerits - energy principles - Discretization - Raleigh - Ritz method of functional approximation. Principles of Elasticity: Stress equations - strain displacement relationships in matrix form plane stress, plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.		
II		9
One dimensional element: Stiffness matrix for beam and bar elements - shape functions for 1-D elements. Two dimensional element: Different types of elements for plane stress and plane strain analysis - displacement models - generalized coordinates - shape functions - convergent and compatibility requirements - geometric invariance - natural coordinate system - area and volume coordinates - generation of element stiffness and nodal load matrices.		
III		5+5=10
Part A: Isoparametric formulation: Concept - different isoparametric elements for 2D analysis - formulation of 4-noded and 8-noded isoparametric quadrilateral elements - Lagrange elements - serendipity elements.		
Part B: Axi-Symmetric Analysis: bodies of revolution – axi-symmetric modeling - strain displacement relationship - formulation of axi-symmetric elements. Three dimensional FEM: Different 3-D elements-strain-displacement relationship –formulation of hexahedral and isoparametric solid element.		
IV		10
Finite Element Analysis of Plates: Introduction, Basic theory of plate bending - thin plate theory - stress resultants - Mindlin's approximations - formulation of 4-noded isoperimetric quadrilateral plate element – Shell Element.		
V		9
Non-linear finite analysis: Introduction to non-linear finite analysis - basic methods - application to special structures.		
Textbooks:		
1. Introduction to Finite Element Analysis, S.Md.Jalaludeen, Anuradha Publications, Print-2012. 2. Introduction to Finite element Method, JN Reddy, McGraw Hill Higher Education.		
References:		
1. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu, PHI. 2. Finite element analysis, theory and programming by GS Krishna Murthy, TMH. 3. Finite Element Analysis, S.S. Bhavikatti, New Age International Publishers.		

REMOTE SENSING AND GIS
(Professional Elective – IV)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PE-416	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO5	PO7	PO12	PSO2
CO1	illustrate the principles of photogrammetry	2	3	2	3	3
CO2	make use of remote sensing process	3	3	2	3	3
CO3	utilize GIS principles in real life	3	3	2	3	3
CO4	explain the concepts of topology, OBVDM and tomography	3	3	2	3	3
CO5	develop the geospatial data model with various file formats	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		9
Introduction to Photogrammetry: Principles and types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement to single vertical aerial photograph, height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.		
II		10
Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation),Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.		
III		5+5=10
Part-A: Geographic Information System: Introduction to GIS; components of a GIS; Geo spatial Data: Spatial Data- Attribute data-Joining Spatial and attribute data; GIS Operations: Spatial Data Input – Attribute data Management -Data display Data Exploration – Data Analysis.		
Part-B: Coordinate Systems: Geographic coordinate System: approximation of the Earth, Datum; Map Projections: Types of Map Projections – Map projection parameters – Commonly used Map Projections- Projected coordinate Systems.		
IV		9
Vector Data Model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape fire; Data models for compost feature Object Based Vector Data Model; Classes and their Relationship; The geo-base data model; Geometric representation of Spatial Feature and data structure, Tomography rules.		
V		10
Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion, Integration of Raster and Vector data. **Data Input**: Metadata, on version of Existing data, creating new data; remote sensing data, filed data.		
Textbooks:		
1. Remote Sensing and GIS, M. Anji Reddy JNTU Hyderabad, B.S. Publications. 2. Basics of remote sensing & GIS by A. Kumar, Laxmi publications.		
References:		
1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W Young, PHI. 2. Introduction to GIS, Kang,Tsurg Charg.Tata McGraw Hill Education Private Ltd.		

GREEN BUILDING TECHNOLOGIES
(Open Elective-II)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-OEC-411	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO7	PO12
CO1	explain the fundamentals of energy use and processes in building	3	2	2	2
CO2	identify indoor environmental requirement and its management	3	3	3	2
CO3	assess the impact of solar radiation on buildings	3	3	3	2
CO4	evaluate end-use energy utilization and requirements	3	3	2	2
CO5	adapt audit procedures for energy management	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications. ***Task:*** *Analyze the characteristics of energy use and its management of dwellings.*		
II	**Indoor environmental requirement and management**	9
Thermal comfort - Ventilation and air quality - Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement. ***Task:*** *Perform a case study on ventilation illumination and air quality in a building.*		
III	**Climate, solar radiation and their influences**	5+5=10
Part A: Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation. ***Task:*** *Conduct a case study on climate changes.*		
Part B: Temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings. ***Task:*** *Conduct a case study on solar radiation.*		
IV	**End-use, energy utilization and requirements**	10
Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building - Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope. ***Task:*** *Perform a case study on energy utilization in a building.*		
V	**Energy management options**	9
Energy audit and energy targeting - Technological options for energy management. ***Task:*** *Perform a case study on energy management.*		
Textbooks:		
1. Michael Bauer, Peter Mosle and Michael Schwarz, Green Building, Guidebook for Sustainable Architecture, Springer, Heidelberg, Germany. 2. Norbert Lechner, Heating, Cooling, Lighting - Sustainable Design Methods for Architects‖, Wiley, New York.		
References:		
1. James Kachadorian, The Passive Solar House: Using Solar Design to Heat and Cool Your Home‖, Chelsea Green Publishing Co., USA.		

DRONES
(Open Elective-II)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-OEC-412	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO7	PO12
CO1	explain concepts of creative industries	3	3	3	3	3	3
CO2	outline the needs of creative industries	3	3	3	3	3	3
CO3	illustrate deployment and deadly abilities of drones	3	3	3	3	3	3
CO4	adapt price based data routing in dynamic IoT	3	3	3	3	3	3
CO5	make use of security in UAV/Drone communications	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
The creative industries: Concepts, Measurement, economic impact of the creative industries: Scenarios and theoretical models - Scenarios, Theoretical models, Measuring the economic impact of the creative industries - Direct impact of the creative industries. ***Task:*** *Implementation methods for photography in creative industries.*		
II	**Creative Industries' Needs: A Latent Demand**	8
Introduction, creative industries and film, emerging technologies - creative industries, importance of emerging technologies for creative industries, challenges. ***Task:*** *Comply on VR, AR and Drones together for Creative industries.*		
III	**Deployment and Deadly Abilities**	7+7=14
Part-A: The Deployment of Drones: The private invasion, The media invasion, The agricultural invasion, The commercial invasion, The medical invasion, The transportation invasion, The communication invasion, The controlled invasion. ***Task:*** *Develop design thinking method for drone application in agriculture fields.*		
Part-B: The Deadly Abilities of Drones: Drones in the police force, Drones in the military force, Drones in the animal world, Drones in the insect world. ***Task:*** *Recognize Do's and Don'ts of drone flying*		
IV	**Price Based Data Routing in Dynamic IoT**	8
Introduction, Background, IoT system model – IoT model, IoT node – Residual energy and power model, Load and buffer space, Delay, Trust, Pricing model, Communication model, Adaptive routing approach, Use case and theoretical analysis. ***Task:*** *Design an IoT model for any Drone application.*		
V	**Security in UAV/Drone Communications**	9
Introduction - PLS for UAV Systems - UAV as a mobile relay (UAV Relay), UAV as a mobile transmitter BS (UAV-BS), UAV as mobile jammer (UAV-Jammer), UAV as a flying UE (UAV-UE), One UAV as a cooperative jammer and another as a transmitter, Additional common attacks in UAV Systems - Attacker classification, Attack-type classification. ***Task:*** *Jamming of UAV remote control systems using software defined radio.*		
Textbooks:		
1. Virginia Santamarina-Campos et.al., "Drones and the Creative Industry Innovative Strategies for European SMEs", Springer, 2018 2. Fadi Al-Turjman, "Drones in IoT-enabled Spaces", CRC Press, 2019 3. Billy Crone, "Drones, Artificial Intelligence, & the Coming Human Annihilation", Get A Life Ministries, 2018.		
References:		
1. Ryan Nagelhout, "The Modern Nerd's Guide to Drone Racing", Gareth Stevens, 2018.		

5G TECHNOLOGIES
(Open Elective-II)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-OEC-413	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO7	PO12	PSO1
CO1	explain basic principles of 5G communication	3	3	2	2	3	3	3
CO2	identify the 5G new radio, core network, mobile networks	3	3	2	2	3	3	3
CO3	analyze the physical architecture of 5G and its challenges	3	3	2	2	3	3	3
CO4	design the modulation and multiple access technique for 5G	3	3	2	2	3	3	3
CO5	evaluate the various channels, layers and links used in 5G	3	3	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to 5G Wireless Communications**	9
Introduction, Usage Scenario, Specifications and Use Cases, Performance - Speed, Latency, Standards, NR, Spectrum, Unlicensed Spectrum, Technology, Concerns, Interference Issues, Surveillance Concerns, Health Concerns. ***Task:*** *Write a program on SSBSC Modulation and Demodulation using SDR.*		
II	**5G Wireless Networks**	10
Cellular Systems Overview, Basics of New Radio (NR), Next Generation Core Network, Mobile Network Technologies, Network Softwarization and Slicing, Cell Clustering, Physical Infrastructure Improvements, Enabling Technologies, Multi-Tenancy Support. ***Task:*** *Write a program on Sampling and Quantization.*		
III	**Wireless Systems, Standards and architecture for 5G**	5+7=12
Part-A: Systems and Standards: Technology, Challenges, Requirement, High Speed, High Capacity, Massive Connected Devices, Ultra-low Latency and Ultra-High Reliability, Energy Saving, Cost Saving, Radio Technology, Utilization of High Frequency Bands, Massive Element Antenna Technologies. ***Task:*** *Write a program on Digital Quadrative Amplitude Modulation and Demodulation.*		
Part-B: Architecture, Generalized Physical Architecture, Radio Access Network, Evolved Packet Core, IP Multimedia Subsystem, Architecture of 5G, Security Architecture. ***Task:*** *Write a program on Bit Error Rate measurement of DQAM.*		
IV	**Modulation and Multiple Access Techniques for 5G**	8
Multiple Access Schemes, Basic Concept of OFDM, The Principles of OFDM, OFDM Technology, Requirements, Cyclic Prefix OFDM, Multipath Signal Transmission, CP Design in 5G NR, DFT-s-OFDM, DFT-S-OFDM and OFDMA, Modulation Considerations. ***Task:*** *Write a program on OFDM Transmitter and Receiver.*		
V	**Channels for 5G Wireless Communications**	9
Logical Channels for NR, Transport Channel, Logical, Transport and Physical Channel Mapping, Propagation Channel Model, Channel Models, Channel Hierarchy, Communications System Channel Mapping, NR Physical Layer Data Channels. ***Task:*** *Write a program on Bit Error Rate Measurement of M-ARYPSK.*		
Textbooks		
1. Fundamentals of 5G Wireless Communications: V. K. Sachan, Jay Devi Sachan, MPH. 2. Index Modulation for 5G Wireless Communications: Miaowen Wen, Xiang Cheng, Springer.		
References		
1. 5G Mobile and Wireless Communications Technology: AFIF OSSEIRAN Ericsson JOSE F. MONSERRAT, and PATRICK MARSCH, Cambridge University Press.		

DATABASE MANAGEMENT SYSTEMS
(Open Elective-II)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-OEC-414	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO12
CO1	design databases using E-R model	3	3	3	3	2
CO2	construct database using relational model	3	3	3	3	2
CO3	formulate SQL queries to interact with database	3	3	3	3	2
CO4	make use of transaction control commands	3	3	3	3	2
CO5	apply normalization on database to eliminate redundancy	3	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Database Systems and Database Design**	11
Introduction to Database Systems: Introduction and applications of DBMS, Purpose of data base, History of database, Database architecture - Abstraction Levels, Data Independence, Database Languages, Database users and DBA. **Introduction to Database Design:** Database Design Process, Data Models, ER Diagrams - Entities, Attributes, Relationships, Constraints, keys, Generalization, Specialization, Aggregation, Conceptual design with the E-R model for large Enterprise. ***Task:*** *Conceptual Designing using ER Diagrams.*		
II	**Relational Model**	9
Introduction to the relational model, Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design: E-R to relational, Introduction to views, Destroying/altering tables and views. ***Task:*** *Converting ER Model to Relational Model.*		
III	**SQL Basics and Functions**	4+4=8
Part-A: SQL Basics: DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, in operator. ***Task:*** *Creation of Tables using SQL commands.*		
Part-B: Functions: Aggregate functions, Built-in functions - numeric, date, string functions, set operations. ***Task:*** *Practice Queries using Aggregate Operators.*		
IV	**Sub-queries and Transaction control commands**	10
Sub-queries: Introduction, correlated sub-queries, use of group by, having, order by, join and its types, Exist, Any, All, view and its types. **Transaction control commands:** ACID properties, concurrency control, Commit, Rollback, save point, cursors, stored procedures, Triggers. ***Task:*** *Practicing Sub queries and Joins.*		
V	**Normalization**	10
Introduction, Normal forms - 1NF, 2NF, 3NF, BCNF, 4NF and 5NF, concept of De-normalization and practical problems based on these forms. ***Task:*** *Implement normalization with an example.*		
Textbooks:		
1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, TMH. 2. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 6th Edition, TMH.		

BIM TECHNOLOGIES LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PC-412	-	-	2	1

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO10	PSO2
CO1	make use of BIM commands for modelling	3	3	3	3
CO2	construct BIM elements like beams, columns, walls, slabs	3	3	3	3
CO3	generate context models of the existing built with natural environment	3	3	3	3
CO4	examine different elements individually or as a whole	3	3	3	3
CO5	create the different views of the building	3	3	3	3

List of Experiments

S. No.	Title/Experiment
1	Introduction to BIM
2	View controls - pan, zoom, rotate
3	Section a 3D view
4	Setting up levels and grids
5	Modelling of walls
6	Modelling of doors and windows.
7	Modelling a column and beam
8	Adding components
9	Modelling of floors
10	Modelling of ceilings & roofs
11	Modelling of stairs and railings
12	Modelling of parking ramp
13	create topographic surface

References

1. BIM Technologies Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Ten storied apartment Building with four flats in each floor and contains each flat 150 square meter with 2 BHK.
2. Model a four storey shopping mall having 5000 square meter area in each floor.
3. Model Auditorium hall with 2000 seat capacity.
4. Model Hospital Building with 1000 Beds capacity.
5. Model a College Building
6. Model a Convention Centre.
7. Model a ware house
8. Model a office building with three stair cases
9. Model a Hotel with at least 100 rooms.
10. Model a Hostel with a capacity of 1000 students

INDUSTRY ORIENTED MINI-PROJECT

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PR-411	-	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PSO2
CO1	identify the problem statement, assess the scope and develop a prototype	3
CO2	execute the project using modern tools and prepare the report	3
CO3	demonstrate leadership, management skills for project development with ethics	3
CO4	function effectively as individual / member / leader in project teams	3
CO5	make use of engineering knowledge for societal sustenance	3

Guidelines

S. No.	Title
The objective of the industry oriented mini-project work is to imbibe students with technical, analytical and innovative ideas to facilitate with theoretical and practical learning pertaining to relevant domain of interest. An individual or a peer of 2-5 students work under the guidance / mentorship of a departmental faculty and industry expert with the aim of addressing solution to real world / societal problems using various R&D/industrial techniques. The team work fosters the communication and leadership skills among peers to survive and exercise during their career.	
1	Survey and study of published literature on the approved / assigned topic.
2	Conduct preliminary Analysis / Modeling / Simulation / Experiment / Design / Feasibility / ethnographical study.
3	Prepare an abstract/synopsis on the opted topic and submit to the Guide/Supervisor for approval.
4	Prepare an Action Plan for conducting the investigation, including team work.
5	Apply suitable methodology for Designing / Modeling / Simulation / Experimentation.
6	Develop an end product/process along with conclusions, recommendations and future scope.
7	Prepare and submit the final dissertation in the prescribed format to the Department.
8	Present and execute the industry oriented mini-project before External Committee for viva-voce.

B.TECH.-VIII-SEMESTER SYLLABUS

GROUND IMPROVEMENT TECHNIQUES
(Professional Elective – IV)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	20-CE-PE-421	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO12	PSO1
CO1	explain various methods of dewatering	3	3	3
CO2	identify suitable densification methods for various soils	3	3	3
CO3	improve the soil strength using grouting and stabilization methods	3	3	3
CO4	propose suitable techniques to strengthen the expansive soil	3	3	3
CO5	classify geo-synthetics and their field applications	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Dewatering: Methods of de-watering-sumps and interceptor ditches - single, multi stage well points-vacuum well points - Horizontal wells-foundation drains-blanket drains-criteria for selection of fill material around drains – Electro - osmosis.		
II		9
In-Situ Densification Methods in Cohesion less and Cohesive Soils: Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth. Preloading or dewatering, Vertical drains - Sand Drains, Sand wick geo-drains - Stone and lime columns - thermal methods		
III		5+5=10
Part-A: Grouting: Objectives of grouting- grouts and their properties- grouting methods - ascending, descending and stage grouting- hydraulic fracturing in soils and rocks- post grout test.		
Part-B: Stabilization: Methods of stabilization mechanical cement lime bituminous - chemical stabilization with calcium chloride sodium silicate and gypsum.		
IV		10
Expansive Soils: Problems of expansive soils - tests for identification - methods of determination of swell pressure - Improvement of expansive soils. Foundation techniques in expansive soils - under reamed piles.		
V		9
Geosynthetics and Reinforced Earth: Geo-textiles - Types, Functions and applications – geo-grids and geo-membranes - functions and applications. Reinforced Earth: Principles - Components of reinforced earth - factors governing design of reinforced earth walls - design principles of reinforced earth walls.		
Textbooks:		
1. Engineering Principles of Ground Modification, Hausmann M.R. , MGH, International Edn. 2. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.		

PRESTRESSED CONCRETE
(Professional Elective – V)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	20-CE-PE-423	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO8	PO12	PSO2
CO1	illustrate concepts of pre-stressed concrete	3	3	3	3	3
CO2	determine losses of pre-stressed concrete	3	3	2	3	3
CO3	analyze PSC members for flexure and shear	3	3	3	3	3
CO4	analyze pre-stress transfer in pre and post tensioned members	3	3	3	3	3
CO5	analyze composite members and calculate the deflection	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Introduction: Historic development- General principles of pre-stressing pre-tensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of pre-stressing Materials- high strength concrete and high tensile steel their characteristics. **Methods and Systems of pre-stressing:** Pre-tensioning and Post-tensioning methods and systems of pre-stressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.		
II		9
Losses of Pre-stress: Loss of pre-stress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.		
III		5+5=10
Part-A: Flexure: Analysis of sections for flexure- beams pre-stressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC beams of rectangular and I Sections-Kern line - Cable profile and cable layout.		
Part-B: Shear: General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical pre-stressing and by using inclined or parabolic cables- Analysis of rectangular and I beam for shear - Design of shear reinforcements- Bureau of Indian Standards (BIS) Code provisions.		
IV		9
Transfer of Pre-stress in Pre-Tensioned Members: Transmission of pre-stressing force by bond- Transmission length - Flexural bond stresses - IS code provisions- Anchorage zone stresses in post tensioned members - stress distribution in End block-Analysis by Guyon, Magnel, Zielinski and Rowe's methods -Anchorage zone reinforcement- BIS Provisions.		
V		10
Composite Beams: Different Types- Propped and Unpropped - stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations. **Deflections:** Importance of control of deflections- Factors influencing deflections - short term deflections of uncracked beams- prediction of long time deflections- BIS code requirements.		
Textbooks:		
1. Pre-stressed concrete by N. Krishna Raju, 5th Edition, Tata McGraw Hill Book Education P. Ltd. 2. Prestressed concrete by S. Ramarnrutham, Dhanpat Rai & Sons, Delhi.		
References:		
1. Design of pre-stress concrete structures by T.Y. Lin and Burn, John Wiley, New York1 2. Prestressed Concrete by N. Rajagopalan, Narosa Publishing House		

TRAFFIC ENGINEERING
(Professional Elective – V)

Course	B.Tech.-III-Sem.	L	T	P	C
Subject Code	20-CE-PE-425	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO5	PO6	PO12	PSO2
CO1	identify traffic stream characteristics and studies	2	3	3	3	3
CO2	explain traffic capacity and level of service	2	3	3	3	3
CO3	analyze parking problems and provide traffic safety	3	3	3	3	3
CO4	design traffic signal cycle and traffic island capacity	3	3	3	3	3
CO5	classify various traffic-environment problems	2	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		9
Traffic Characteristics Measurement and Analysis: Basic traffic Characteristics - Speed, Volume and Concentration. Relationship between Flow, Speed and Concentration. Traffic Measurement and Analysis - Volume Studies - Objectives, Methods; Speed studies – Objectives, Definition of Spot Speed, time mean speed and space mean speed; Methods of conducting speed studies; Presentation of speed study data; Head ways and Gaps; Critical Gap; Gap acceptance studies.		
II		6
Highway Capacity and Level of Service: Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways, Multilane highways and freeways.		
III		9+5=14
Part-A: Parking Analysis: Types of parking facilities – On-street parking and Off-street Parking facilities; Parking studies and analysis- Parking Inventory Study, Parking Usage Study By Patrolling, Questionnaire Survey, Cordon Surveys; Evaluation of parking parameters; Parking accumulation, Parking Load, Parking Turnover, Parking Index, Parking Volume.		
Part-B: Traffic Safety: Traffic Safety - Accident studies and analysis; Causes of accidents - The Road, The vehicle, the road user and the Environment, Engineering, Enforcement and Education measures for the prevention of accidents.		
IV		10
Traffic Signals: Traffic Signals –Types of Signals; Principles of Phasing; Timing Diagram; Design of Isolated Traffic Signal by Webster method, Warrants for signalization. Signal Coordination, Signal Coordination methods, Simultaneous, Alternate, Simple progression and Flexible progression Systems.		
V		9
Traffic and Environment: Detrimental effects of Traffic on Environment, Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic. Sustainable Transportation: Sustainable modes, Transit Oriented Development, ITS based benefits for Environment.		
Textbooks:		
1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers. 2. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.		
References:		
1. Transportation Engineering - An Introduction - C. Jotin Khisty, Prentice Hall Publication. 2. Highway Capacity Manual -2000.		

EARTHEN DAMS AND SLOPES STABILITY
(Professional Elective – VI)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	20-CE-PE-422	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO6	PO7	PO8	PO12	PSO1
CO1	outline the behaviour and design criteria of earthen dams	3	3	3	3	3	3
CO2	illustrate failures in dams and their control measures	3	3	3	3	3	3
CO3	analyze slope stability of earthen dams	3	3	3	3	2	3
CO4	explain various methods of slope stability	3	3	3	3	3	3
CO5	adapt suitable techniques for slope stabilization	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Earthen Dams: General features, Selection of site; Merits and demerits of the earthen dams, Classification of earth dams, Causes of failure, Safe design criteria. Instrumentation in earth dams: Pore pressure measurements, Settlement gauges, Inclinometers, Stress measurements, Seismic measurements.		
II		9
Failures, Damages and Protection of Earth Dams: Nature and importance of failure, Piping through embankment and foundations, Methods of seepage control through embankments and foundations, Design Criteria for filters, Treatment of upstream and downstream of slopes, Drainage control, Filter design.		
III		5+5=10
Part-A: Slope Stability Analysis: Types of Failure: Failure surfaces - Planar surfaces, Circular surfaces, Non-circular surfaces, Limit equilibrium methods.		
Part-B: Total stress analysis versus effective Stress analysis, Use of Bishop's pore pressure parameters, Short term and Long term stability in slopes. Taylor Charts.		
IV		10
Methods of Slope Stability: Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Janbu Analysis, Sliding Block Analysis, Seismic stability.		
V		9
Stabilization of slopes: Soil reinforcement (geo-synthetics / soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete).		
Textbooks:		
1. Bharat Singh and Sharma, H. D. – Earth and Rockfill Dams.		
References:		
1. Sherard, Woodward, Gizienski and Clevenger. Earth & Earth-Rock Dams. John Wiley & Sons. 2. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilization methods–John Wiley & sons.		

REPAIR AND REHABILITATION OF STRUCTURES
(Professional Elective – VI)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	20-CE-PE-424	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO4	PO7	PO12	PSO2
CO1	identify the preventive measures against damages of structures	3	3	3	3	3
CO2	assess steel-reinforcement behaviour subject to corrosion & fire	3	3	3	3	3
CO3	predict damages and distress using NDT techniques	3	3	3	3	3
CO4	use repairing and strengthening techniques for structures	3	3	3	3	3
CO5	adapt health monitoring techniques for various structures	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Introduction - Deterioration of Structures - Distress in Structures - Causes and Prevention. Mechanism of Damage - Types of Damage.		
II		9
Corrosion of Steel Reinforcement - Causes - Mechanism and Prevention. Damage of Structures due to Fire - Fire Rating of Structures - Phenomena of Desiccation.		
III		5+5=10
Part-A: Inspection and Testing - Symptoms and Diagnosis of Distress.		
Part-B: Damage assessment – NDT.		
IV		9
Repair of Structure - Common Types of Repairs - Repair in Concrete Structures - Repairs in Under Water Structures - Guniting - Shot Create Underpinning. Strengthening of Structures - Strengthening Methods Retrofitting - Jacketing.		
V		10
Health Monitoring of Structures - Definition & motivation for SHM, SHM - a way for smart materials and structures, SHM and bio mimetic - analog between the nervous system of a man and a structure with SHM, SHM as a part of system management, Passive and Active SHM, NDE, SHM and NDECS, basic components of SHM, materials for sensor design.		
Textbooks:		
1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications. 2. Concrete Technology by A.R. Santakumar, Oxford University press. 3. Maintenance Repair and Rehabilitation and Minor Works of Buildings, P.C. Varghese, PHI.		
References:		
1. Defects and Deterioration in Buildings, EF & N Spon, London. 2. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press.		

URBAN PUBLIC TRANSPORTATION SYSTEM
(Professional Elective - VI)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	20-CE-PE-426	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO6	PO12	PSO1
CO1	explain various modes of UPTS	3	3	3	3
CO2	analyze and plan for UPTS	3	3	3	3
CO3	plan flexible transit system	3	3	3	3
CO4	evaluate transit system	3	3	3	3
CO5	develop prototype for city traffic	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		9
System and Technologies: Urban passenger transportation modes, transit classifications and definitions, theory of urban passenger transport modes, rail transit, bus transit, Para transit and ride sharing, designing for pedestrians, trends in transit rider ship and use of different modes.		
II		10
Comparing Alternatives: Comparing costs, comparative analysis, operational and technological characteristics of different rapid transit modes, evaluating rapid transit. **Planning:** Transportation system management, system and service planning, financing public transportation, management of public transportation, public transportation marketing.		
III		5+5=10
Part-A: Planning-Flexible Transit: Ways of delivering flexibility, Individual Public Transportation.		
Part-B: Planning-Flexible Transit Collective Transportation, Taxis, Dial-a-Ride (DAR), Public Car-Sharing.		
IV		9
Transit System Evaluation: Definition of quantitative performance attributes, transit lane capacity, way capacity, station capacity, theoretical and practical capacities of major transit modes, quantification of performance.		
V		10
City Traffic: Classification of transportation systems, conventional transportation systems, unconventional transportation systems, prototypes and tomorrow's solutions, analysis and interpretation of information on transportation systems, perspectives of future transportation.		

Textbooks:

1. George E. Gray and Lester A. Hoel. “Public Transportation”, PHI, New Jersey.
2. John W. Dickey,' Metropolitan Transportation Planning', TMH, New Delhi.
3. Public Transportation Systems:Basic Principles of System Design,Operations Planning and Real-Time Control, Carlos F. Daganzo.

References:

1. Vukan R Vuchic, “Urban Public Transportation Systems and Technology”, PHI, New Jersey
2. Horst R. Weigelt, Rainer E. Gotz, Helmut H. Weiss,' City Traffic - A Systems Digest', Van Nostrand Reinhold Company, New York.

INTELLECTUAL PROPERTY RIGHTS
(Open Elective-III)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	20-OEC-421	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO6	PO8	PO12
CO1	outline basics of intellectual property law	3	3	3	3
CO2	identify the various trademarks	3	3	3	3
CO3	analyze patent and copy rights law	3	3	3	3
CO4	differentiate trade secret and unfair practice	3	2	3	2
CO5	summarize new developments in Intellectual Property Rights	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Intellectual property**	10
Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights. ***Task:*** *Draw a flow chart for filing IPR.*		
II	**Trade Marks**	9
Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes. ***Task:*** *Perform a case study on grant of trade mark.*		
III	**Law of copy rights and patents**	5+4=9
Part-A: Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues. ***Task:*** *Draw a flow chart for a copy right.*		
Part-B: Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. ***Task:*** *Draw a flow chart for filing a patent.*		
IV	**Trade Secrets and Unfair competition**	10
Trade Secrets: Trade secretes law; determination of trade secretes status and litigation. **Unfair competition:** Misappropriation right of publicity, false advertising. ***Task:*** *Perform a case study on geographical indications.*		
V	**New development of intellectual property**	10
Recent Trends in copy right law, patent law, intellectual property audits at national and international level. ***Task:*** *Perform a case study intellectual property audits.*		
Textbooks:		
1. Intellectual property right, Deborah, E. Bouchoux, Cengage Learning. 2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, TMH.		

PRINCIPLES OF ENTREPRENEURSHIP
(Open Elective – III)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	20-OEC-422	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO7	PO8	PO9	PO11	PO12
CO1	illustrate concept & types of entrepreneurship	3	3	2	3	2
CO2	distinguish individual and corporate entrepreneurship	3	3	3	3	2
CO3	identify the process of launching new ventures	3	3	3	3	3
CO4	assess legal challenges of entrepreneurship	3	3	3	3	3
CO5	build entrepreneurial strategies	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Entrepreneurship**	10
The revolution impact of entrepreneurship- The evolution of entrepreneurship - Approaches to entrepreneurship - Process approach - Twenty first centaury trends in entrepreneurship. ***Task:*** *Perform a case study on a successful women entrepreneur.*		
II	**Individual and corporate entrepreneurship**	9
The entrepreneurial journey - Stress and the entrepreneur- the entrepreneurial ego- Entrepreneurial motivations - Corporate Entrepreneurial Mindset the nature of corporate entrepreneur. ***Task:*** *Prepare a report on Mindset of the corporate entrepreneur.*		
III	**Launching Entrepreneurial Ventures**	5+5=10
Part-A: Opportunities identification - entrepreneurial Imagination and Creativity - the nature of the creativity Process - Innovation and Entrepreneurship - Methods to initiate Ventures. ***Task:*** *Prepare a report on initiation of a venture.*		
Part-B: Creating New Ventures - Acquiring an established entrepreneurial venture – Franchising - hybrid disadvantage of Franchising. ***Task:*** *Develop a startup plan.*		
IV	**Legal challenges of Entrepreneurship**	9
Intellectual Property Protection-Patents, Copyrights, Trademarks and Trade Secrets-Avoiding Pitfalls- Formulation of the entrepreneurial Plan- The challenges of new venture start-ups. ***Task:*** *Prepare a report on statutory compliances for IPR protection.*		
V	**Strategic perspectives in entrepreneurship**	10
Strategic Planning-Strategic actions-strategic positioning-Business stabilization-Building the adaptive firms-understanding the growth stage-unique managerial concern of growing ventures. ***Task:*** *Prepare a strategic plan for positioning and stabilization of an enterprise.*		
References:		
1. Arya Kumar "Entrepreneurship- creating and leading an entrepreneurial org" Pearson 2012. 2. 'Entrepreneurship: New Venture Creation' David H Holt PHI, 2013. 3. Entrepreneurship: Text and Cases P. Narayana Reddy, Cengage, 2010.		

PRECISION AGRICULTURE
(Open Elective – III)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	20-OEC-423	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PSO2
CO1	explain the concepts of precision agriculture	3	3	3	3	3	3
CO2	outline the components of precision agriculture	3	3	3	3	3	3
CO3	illustrate about tools technologies and sampling	3	3	3	3	3	3
CO4	adapt recent advances in precision agriculture	3	3	3	3	3	3
CO5	make use of feasibility and evaluation of precision farming	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Accuracy and precision, Comparison chart, Target comparison, Number of measurements, Quality, Bias, Degree of accuracy, A brief history of precision agriculture, Defining precision agriculture, Variability and the production system, Need for precision agriculture. ***Task:*** *Write a program on finding the precision in agricultural dataset.*		
II	**Components of Precision Agriculture**	9
Components of Precision Agriculture, Spatial Data Management, Geographical Positioning, Geographical Information System, Remote Sensing, Soil Sampling and Mapping, Yield Monitoring and Mapping, Components of a Yield Monitor. ***Task:*** *Perform a case study on Yield Monitoring.*		
III	**Tool, Technologies and Sampling**	6+6=12
Part-A: Tool and Technologies in Precision Agriculture: Global Positioning System (GPS), Sensor Technologies, Geographic Information System (GIS), Grid Soil Sampling and Variable Rate Fertilizer (VRT), Online Resources for Precision Agriculture. ***Task:*** *Perform a case study on Tool and Technologies in Precision Agriculture.*		
Part-B: Precision Soil Sampling: Introduction, Soil Sampling, Sampling Procedures – Depth, Pattern, Soil Sampling Instructions and Pattern Options, Grid Soil Sampling - Advantages and Disadvantages, Zone Sampling - Method, Advantages and Disadvantages, Prescription Maps. ***Task:*** *Perform a comparative analysis on soil sampling procedures.*		
IV	**Recent Advances in Precision Agriculture**	9
Internet of Things in Precision Agriculture, Prerequisites of IoT Applications in Agriculture, Structure of IOT for Agriculture, Drones or Unmanned Aerial Vehicles (UAVs). ***Task:*** *Perform a case study on design concept of UAVs.*		
V	**Feasibility and Evaluation of Precision Farming in India**	9
Present Scenario, Economic Feasibility of Precision Farming, Constraints in the Adoption of Precision Agriculture, Capital Expenditures in Precision Agriculture, Farm Size and Technology Adoption, Profitability, Environmental Benefits. ***Task:*** *Perform the profitability analysis in Precision Agriculture.*		
Textbooks:		
1. Latief Ahmad and Syed Sheraz Mahdi, "Satellite Farming - An Information and Technology Based Agriculture" Springer, 2018. 2. Pedersen, Søren Marcus, "Precision Agriculture: Technology and Economic Perspectives" Springer, 2018.		
References:		
1. Ryan Nagelhout, "The Modern Nerd's Guide to Drone Racing", Gareth Stevens, 2018. 2. Oerke, E.C et.al., "Precision Crop Protection - the Challenge and Use of Heterogeneity" Springer, 2010.		

WEB TECHNOLOGIES
(Open Elective – III)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	20-OEC-424	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12
CO1	design web pages using HTML and JavaScript	3	3	3	3	3
CO2	develop web applications using PHP	3	3	3	2	3
CO3	make use of XML and DTD for web design	3	3	3	2	2
CO4	build web applications using servlets and session tracking	3	3	3	2	2
CO5	establish database connectivity using JSP and JDBC	3	3	3	2	2

Syllabus

Unit	Title/Topics	Hours
I	**Web, HTML and Java Script**	10
Web: Introduction, Internet and web, web browsers, web servers, protocols. **HTML:** Basics, elements, attributes, tags- list, tables, images, forms, frames, cascading style sheets. **Java Script**: Introduction to scripting, control structures, conditional statements, arrays, functions, objects. ***Task:*** *Develop static pages (using Only HTML) of an online Book store.*		
II	**PHP**	10
Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls, handling file uploads, connecting to database, executing simple queries. ***Task:*** *A web application that takes name and age from an HTML page using PHP.*		
III	**XML, Parsing and Introduction to DTD**	4+4=8
Part-A: XML: Basics of XML, Elements, Attributes, Name space, **Parsing:** DOM and SAX Parsers. ***Task:*** *Create XML document to display student details.*		
Part-B: Introduction to DTD: internal and external DTD, Elements of DTD, DTD Limitations, XML Schema, Schema structure, XHTML. ***Task:*** *Write a program to demonstrate DTD.*		
IV	**Servlets and Session Tracking**	10
Servlets: Introduction, Lifecycle, Generic and HTTP servlet, passing parameters to servlet, HTTP servlet Request & Response interfaces, Deploying web Applications, **Session Tracking:** Hidden form fields, cookies, URL- Rewriting, session. ***Task:*** *Write a servlet program with an example.*		
V	**JSP and JDBC**	10
JSP: Introduction, Difference Between servlets & JSP, Anatomy of JSP page, JSP elements: Directives, comments, Expressions, scriptlets, Declaration, Implicit JSP objects using Action elements. **JDBC:** Introduction, JDBC Drivers, Loading Driver, establishing connection, Executing SQL statement in JSP pages, MVC architecture. ***Task:*** *Write a JSP program for user validation.*		
Textbooks:		
1. Web Technologies, Uttam K Roy, Oxford University Press. 2. The Complete Reference PHP- Steven Hozner, TMH.		
References:		
1. Java Server Pages-Hans Bergsten, SPD O'Reilly. 2. JavaScript, D. Flanagan O'Reilly, SPD.		

MAJOR PROJECT

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	20-CE-PR-421	-	-	20	10

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PSO2
CO1	identify the problem statement, assess the scope and develop a prototype	3
CO2	execute the project using modern tools and prepare the report	3
CO3	demonstrate leadership, management skills for project development with ethics	3
CO4	function effectively as individual / member / leader in project teams	3
CO5	make use of engineering knowledge for societal sustenance	3

Guidelines

S. No.	Title
The objective of the project work is to imbibe students with technical, analytical and innovative ideas to facilitate with theoretical and practical learning pertaining to relevant domain of interest. An individual or a peer of 2-5 students work under the guidance / mentorship of a departmental faculty with the aim of addressing solution to real world / societal problems using various R & D techniques. The team work fosters the communication and leadership skills among peers to survive and exercise during their career.	
1	Survey and study of published literature on the approved / assigned topic.
2	Conduct preliminary Analysis / Modeling / Simulation / Experiment / Design / Feasibility / ethnographical study.
3	Prepare an abstract/synopsis on the opted topic and present before Departmental Review Committee (DRC).
4	Prepare an Action Plan for conducting the investigation, including team work.
5	Apply suitable methodology for Designing / Modeling / Simulation / Experimentation as needed.
6	Develop an end product or process along with conclusions, recommendations and future scope.
7	Present and execute the project before DRC for CIE.
8	Prepare and publish a paper in Conference / Journal, if possible.
9	Prepare and submit the final dissertation in the prescribed format to the Department.
10	Present and execute the project before External Committee for viva-voce.