ACADEMIC REGULATIONS (R18)

COURSE STRUCTURE AND DETAILED SYLLABUS

(CHOICE BASED CREDIT SYSTEM (CBCS))

CIVIL ENGINEERING

For

B. Tech. - Regular Four Year Degree Course

(Applicable for the batches admitted from 2018 - 2019)

&

B. Tech. - Lateral Entry Scheme

(Applicable for the batches admitted from 2019 - 2020)

CMR INSTITUTE OF TECHNOLOGY

(UGC - Autonomous)

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

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

Landline: 08418-200720; Fax: 08418-200240

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, twice 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.

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 (R18)
B.Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2018 - 19)
&
B.Tech. - Lateral Entry Scheme
(For batches admitted from the academic year 2019 - 20)

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 2018-19 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:

1) B.Tech. - Civil Engineering
2) B.Tech. - Mechanical Engineering
3) B.Tech. - Electronics and Communication Engineering
4) B.Tech. - Computer Science and Engineering

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 ($\geq$ 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 general 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)	Breakup of Credits (CMRIT)
1	Humanities and Social Sciences including Management courses (HSMC)	12*	09.0
2	Basic Science Courses (BSC)	25*	22.0
3	Engineering Science courses including workshop, drawing, basics of Electrical / Mechanical / Computer etc. (ESC)	24*	25.5
4	Professional core courses (PCC)	48*	65.5
5	Professional Elective courses relevant to chosen specialization / branch (PEC)	18*	15.0
6	Open subjects – Electives from other technical and /or emerging subjects (OEC)	18*	09.0
7	Project work, seminar and internship in industry or appropriate work place / academic and research institutions in India / abroad (PRJ)	15*	14.0
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**: Students have to choose professional elective wherever offered from the list of professional electives given. However, students may opt for professional elective subjects offered in the related area.

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

7.3.1 Four year B.Tech. (Regular):

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

		(ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	**(i)** Regular course of study of third year second semester. **(ii)** Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

7.3.2 Four year B.Tech. (LES):

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	**(i)** Regular course of study of second year second semester. **(ii)** Must have secured at least 21 credits out of 42 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	**(i)** Regular course of study of third year second semester. **(ii)** Must have secured at least 49 credits out of 82 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

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 I & II (4 - 6 weeks each) registered by the students in consultation with course coordinator and carried out in Industries and/or R&D Organizations immediately after their IV and VI semester course work respectively, the completion report will be assessed in subsequent semester(s) as 'Satisfactory' or 'Unsatisfactory' by a committee consisting of Head of the Department, supervisor and a senior faculty member of the department.

8.5 Evaluation of Project work: Student(s) shall start the Project Work during the VII Semester as per the instructions of the Project Guide / Supervisor assigned by the Head of the Department. The topics for Summer Internship and Project Stage – I shall be different from one another.

a) The Project Work shall be carried out in two stages: Project-I (Stage – I) during VII Semester and Project-II (Stage – II) during VIII Semester. The student has to prepare two independent Project Work Reports – *one each during each stage*. First Report shall include the Project Work carried out under Stage – I, and the Second Report (Final Report) shall include the Project Work carried out under Stage – I and Stage – II put together. Stage – I and Stage – II of the Project Work shall be evaluated for 100 marks each.

b) Out of the total 100 marks allotted for each stage of the Project Work, 30 marks shall be for the Continuous Internal Evaluation(CIE), and 70 marks shall be for the End Semester Viva-voce Examination (SEE). The marks earned under CIE for both the stages of the Project shall be awarded by the Project Guide / Supervisor (based on the continuous evaluation of student's performance during the two Project Work stages); and the marks earned under SEE shall be awarded by the Project Viva-voce Committee (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

c) For the Project Stage - I, the Viva-voce shall be conducted at the end of the VII Semester by the Department Evaluation Committee comprising of the Head of the Department , One Senior Faculty member and Supervisor. The Project Stage – II Viva-voce shall be conducted by the Committee comprising of an External Examiner appointed by the Head of the Institution, Head of the Department and Project Supervisor at the end of the VIII Semester.

d) If a student does not appear (or fails) for any of the two Viva-voce examinations at the scheduled times as specified above, he may be permitted to reappear for Project Stage - I and/or Project Stage - II Viva-voce examinations, as and when they are scheduled again in that semester; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester(s), as and when they are scheduled, as supplementary candidate.

8.6 **Evaluation of Mandatory Non-Credit Courses:** There shall be only CIE for all mandatory (non credit) courses, instead of marks or letter grade '**Satisfactory'** or "**Unsatisfactory'** shall be indicated and this will not be counted for the computation of SGPA / CGPA. The student has to maintain a minimum of 65% attendance and secure not less than 40% in the CIE and then only the student is declared as **pass** and will be qualified for the award of the degree.

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 – I & Summer Internship – II and Project-I & Project-II 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 (above Average)	6
Below 50% but not less than 40% (≥ 40% , < 50%)	C (Average)	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

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

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:

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

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.

10 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 R18 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 R18 Regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R18 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 R18 regulations for the corresponding semester/year, the promotion rules of R18 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 R18 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	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has

	paper during the examination or answer book or additional sheet, during or after the examination.	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 Chairman 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.

———

COURSE STRUCTURE

B.Tech. – R-18 COURSE STRUCTURE

(Applicable from the batch admitted during 2018-19 and onwards)

I – Semester (I – B.Tech. – I - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	BSC-101	Engineering Mathematics – I (Linear Algebra & Calculus)	1,2,12	3	1	-	4
2	BSC-107	Engineering Chemistry	1,2,12	3	-	-	3
3	ESC-101	Basic Electrical & Electronics Engineering	1,2,3,12	3	-	-	3
4	ESC-107	Engineering Mechanics	1,2,12	3	-	-	3
5	BSC-108	Engineering Chemistry Lab	4	-	-	3	1.5
6	ESC-102	Basic Electrical & Electronics Engineering Lab	4	-	-	3	1.5
7	ESC-108	Engineering Mechanics Lab	3	-	-	3	1.5
8	ESC-110	IT & Engineering Workshop	1,5,9,10	-	-	3	1.5
TOTAL				**12**	**01**	**12**	**19**
Mandatory Course (Non-Credit)							
9	MC-101	Technology Exploration for Social Innovation Lab - I	1 to 14	-	-	2	-

II – Semester (I – B.Tech. – II - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	BSC-102	Engineering Mathematics – II (Advanced Calculus)	1,2,12	3	1	-	4
2	BSC-105	Engineering Physics	1,2,12	3	-	-	3
3	HSMC-101	English	10,12	2	-	-	2
4	ESC-103	Programming for Problem Solving	1,2,3,12	3	-	-	3
5	ESC-109	Engineering Graphics	1,5,10	1	-	4	3
6	BSC-106	Engineering Physics Lab	4	-	-	3	1.5
7	HSMC-102	English Language and communication Skills Lab	5,10	-	-	2	1
8	ESC-104	Programming for Problem Solving Lab	4	-	-	3	1.5
TOTAL				**12**	**01**	**12**	**19**
Mandatory Course (Non-Credit)							
9	MC-102	Technology Exploration for Social Innovation Lab – II	1 to 14	-	-	2	-

Note: **Students need to carry out virtual lab experiments by registering on to the AICTE referred portal https://vlabs.ac.in**

III – Semester (II – B.Tech. – I - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	ESC-201	Engineering Geology	1,2,12	3	-	-	3
2	ESC-202	Building Materials, Construction & Planning	1,6,12,13	3	-	-	3
3	CE-PCC-211	Strength of Materials – I	1,2,12,13	3	1	-	4
4	CE-PCC-212	Fluid Mechanics	1,2,12,13	3	-	-	3
5	CE-PCC-213	Surveying	1,2,12,13	3	-	-	3
6	ESC-203	Engineering Geology Lab	4	-	-	3	1.5
7	CE-PCC-214	Fluid Mechanics Lab	4,14	-	-	2	1
8	CE-PCC-215	Surveying Lab – I	4,5,10,14	-	-	3	1.5
9	CE-PCC-216	Computer Aided Civil Engineering Drawing Lab	4,5,10,14	-	-	2	1
TOTAL				**15**	**01**	**10**	**21**
Mandatory Course (Non-Credit)							
10	MC-202	Environmental Sciences	1,6,7,12	2	-	-	-

IV – Semester (II – B.Tech. – II - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	BSC-201	Numerical and Statistical Methods	1,2,12	3	1	-	4
2	CE-PCC-221	Strength of Materials – II	2,12,13	3	-	-	3
3	CE-PCC-222	Hydraulics & Hydraulic Machinery	2,12,13	3	-	-	3
4	CE-PCC-223	Soil Mechanics – I	1,2,12,13	3	-	-	3
5	CE-PCC-224	Structural Analysis	2,12,13	3	-	-	3
6	CE-PCC-225	Strength of Materials Lab	4,14	-	-	2	1
7	CE-PCC-226	Hydraulics & Hydraulic Machinery Lab	4,14	-	-	3	1.5
8	CE-PCC-227	Surveying Lab – II	4,5,10,14	-	-	3	1.5
9	BSC-203	Computational Mathematics Lab using Sci Lab	3,4,5,14	-	-	2	1
TOTAL				**15**	**01**	**10**	**21**
Mandatory Course (Non-Credit)							
10	MC-201	Gender Sensitization Lab	9,12	-	-	2	-

Note: Summer Internship – I (Mandatory Course) carried out during Summer Vacation between IV semester & V semester and evaluated in V semester.

V – Semester (III – B.Tech. – I - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	CE-PCC-311	Concrete Technology	3,8,12,13	3		-	3
2	CE-PCC-312	Soil Mechanics - II	2,3,8,12,14	3	-	-	3
3	CE-PCC-313	Environmental Engineering	3,6,7,12,13	3	-	-	3
4	CE-PCC-314	Design of Reinforced Concrete Structures	3,8,10,12,14	3	-	-	3
5	CE-PCC-315	Water Resources Engineering	2,3,12,13	3	-	-	3
6	CE-PCC-316	Concrete Technology Lab	4,6,14	-	-	2	1
7	CE-PCC-317	Soil Mechanics Lab	4,6,14	-	-	2	1
8	CE-PCC-318	Environmental Engineering Lab	4,14	-	-	2	1
9	HSMC-301	Advanced English Communication Skills Lab	5,10	1	-	2	2
TOTAL				**16**	**-**	**08**	**20**
Mandatory Course (Non-Credit)							
10	MC-311	Employability Skills – I	9,10	3	-	-	-
11	MC-312	Summer Internship – I	1 to 14	-	-	-	-

VI – Semester (III – B.Tech. – II - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	CE-PCC-321	Artificial Intelligence and Robotics	1,2,12,13	3	-	-	3
2	CE-PCC-322	Transportation Engineering	2,3,12,13	3	-	-	3
3	CE-PCC-323	Design of Steel Structures	3,8,10,12,14	3	-	-	3
4	**Professional Elective – I**			3	-	-	3
	CE-PEC-301	G: Rock Mechanics	2,7,12,13				
	CE-PEC-302	S: Construction Technology & Project Management	11,12,14				
	CE-PEC-303	T: Urban Public Transportation System	2,6,12,13				
	CE-PEC-304	W: Irrigation Engineering	3,4,7,12,13				
5	**Open Elective – I**			3	-	-	3
	OEC-301	CE: Disaster Management	2,7,8,12				
	OEC-302	ME: Fundamentals of Operation Research	1,2,12				
	OEC-303	ECE: Electronic Measurements and Instrumentation	1,2,12				
	OEC-304	CSE: Java Programming	1,2,3,5,12				
	OEC-305	HSMC: Indian Culture and Constitution	8,12				
6	CE-PCC-324	Artificial Intelligence and Robotics Lab	4,5,14	-	-	2	1
7	CE-PCC-325	Transportation Engineering Lab	4,7,14	-	-	2	1
8	CE-PCC-326	Computer Aided Civil Engineering Design Lab	4,5,10,14	-	-	3	1.5
9	CE-PCC-327	Advanced Concrete Technology Lab	4,6,14	-	-	3	1.5
TOTAL				**15**	**-**	**10**	**20**
Mandatory Course (Non-Credit)							
10	MC-321	Employability Skills – II	9,10	3	-	-	-

Note: Summer Internship – II carried out during Summer Vacation between VI semester & VII semester and evaluated in VII semester.

VII – Semester (IV – B.Tech. – I - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	CE-PCC-411	Estimation & Costing	11,12,13	3	-	-	3
2	**Professional Elective – II**			3	-	-	3
	CE-PEC-401	G: Geosynthetics and Soil Reinforcement	2,7,12,13				
	CE-PEC-405	S: Finite Element Analysis	2,3,4,12,14				
	CE-PEC-409	T: Pavement Design	3,6,8,12,14				
	CE-PEC-413	W: Watershed Management	6,7,12,13				
3	**Professional Elective – III**			3	-	-	3
	CE-PEC-402	G: Municipal and Hazardous Waste Management	2,3,6,7,12,13				
	CE-PEC-406	S: Advanced Structural Analysis	2,12,13				
	CE-PEC-410	T: Remote Sensing and GIS	2,5,7,12,14				
	CE-PEC-414	W: Stochastic Hydrology	3,4,7,12,13				
4	**Professional Elective – IV**			3	-	-	3
	CE-PEC-403	G: Ground Improvement Techniques	2,12,13				
	CE-PEC-407	S: Prestressed Concrete	2,3,8,12,14				
	CE-PEC-411	T: Traffic Engineering	3,5,6,12,14				
	CE-PEC-415	W: Urban Hydrology and Hydraulics	2,3,4,12,13				
5	**Open Elective – II**			3	-	-	3
	OEC-401	CE: Environmental Impact Assessment	6,7,10,12				
	OEC-403	ME: Non-Conventional Energy Sources	6,7,12				
	OEC-405	ECE: Principles of Communication Systems	1,2,3,12				
	OEC-407	CSE: Database Management Systems	1,2,3,5,12				
	OEC-409	HSMC: Intellectual Property Rights	1,6,8,10,12				
6	HSMC-402	Technical Writing Skills Lab	5,10	-	-	2	1
7	CE-PCC-412	Estimation & Costing Lab	4,5,14	-	-	2	1
8	CE-PRJ-413	Project – I	1 to 14	-	-	6	3
TOTAL				**15**	**-**	**10**	**20**
Mandatory Course (Non-Credit)							
9	MC-411	Summer Internship – II	1 to 14	-	-	-	-

VIII – Semester (IV – B.Tech. – II - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	HSMC-401	Management, Economics and Accountancy	11,12	3	-	-	3
2	**Professional Elective – V**			3	-	-	3
	CE-PEC-404	G: Earthen Dams and Slopes Stability	3,5,12,13				
	CE-PEC-408	S: Repair and Rehabilitation of Structures	2,4,7,12,14				
	CE-PEC-412	T: Modern Transportation Engineering	2,4,7,12,13				
	CE-PEC-416	W: Water Resources Systems Analysis	2,3,5,6,12,13				
3	**Open Elective – III**			3	-	-	3
	OEC-402	CE: Green Building Technologies	1,2,7,12				
	OEC-404	ME: Fundamentals of Robotics	1,2,5,12				
	OEC-406	ECE: Fundamentals of Embedded Systems	1,2,3,12				
	OEC-408	CSE: Web Technologies	2,3,5,6,12				
	OEC-410	HSMC: Principles of Entrepreneurship	7,8,9,11,12				
4	CE-PRJ-421	Project-II	1 to 14	-	-	22	11
TOTAL				**9**	**-**	**22**	**20**

I-B.TECH.-I-SEMESTER SYLLABUS

ENGINEERING MATHEMATICS – I
(Linear Algebra and Calculus)

I-B.Tech-I-Sem. **L T P C**
Subject Code 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

Unit-I: Matrices **9 hours**

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.

Unit-II: Eigen values and Eigen vectors **11 hours**

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.

Unit-III: Sequences &Series **(4 + 6) 10 hours**

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.

Unit-IV: Calculus **9 hours**

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem.
Definition of Improper Integral: Beta and Gamma functions and their applications.

Unit-V: Multivariable calculus (Partial Differentiation and applications) **9 hours**

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, 9thEdn, Pearson, Reprint, 2002.

References:

1. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Pub., Reprint, 2008.
2. Higher Engineering Mathematics, Ramana B.V., TMH, 11th Reprint.

ENGINEERING CHEMISTRY

I-B.Tech.-I-Sem. **L T P C**
Subject Code: BSC-107 **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

Unit-I: Water and its treatment **9 hours**

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. Boiler troubles: Sludge's, scales and Caustic embrittlement. 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 - Disinfection of potable water by chlorination and Ozonization Desalination of water – Reverse osmosis. Deflouridation - Nalgonda technique.

Unit-II: Electrochemistry and Corrosion **10 hours**

Electrochemistry: Introduction, conductance - specific, equivalent and molar conductance, Electrode-Types of electrodes – Construction and functioning of Standard hydrogen electrode, calomel electrode, Determination of p^H of a solution by using glass electrode. Nernst equation – electrochemical series and its applications. Electrochemical cells: Daniel cell – cell notation, cell reaction and cell EMF – Numerical problems 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. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods-protective coatings-metallic coatings-hot dipping and cementation.

Unit-III: Spectroscopic techniques and applications **(5 + 4) 9 hours**

Part A: Principles of spectroscopy and applications of electronic spectroscopy. Vibrational and rotational spectroscopy.

Part B: Basic concepts of nuclear magnetic resonance Spectroscopy- chemical shift. Introduction to Magnetic resonance imaging.

Unit-IV: Reaction Mechanism and synthesis of drug molecules **11 hours**

Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN1, SN2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydrohalogenation of alkyl halides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and chromic acid. Reduction reactions: reduction of carbonyl compounds using $LiAlH_4$& $NaBH_4$. Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Unit-V: Engineering Materials **9 hours**

Cement: Portland cement, its composition, setting and hardening of Portland cement. Special cements-white cement, waterproof cement, high alumina cement, acid resistant cement.
Refractories: Classification and characteristics of refractories, properties and applications of Refractories.

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

Nanomaterials: Introduction to nanomaterials, preparation of CNT'S by CVD method, properties and applications 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, Venkata Ramana Reddy and Rath, Cengage learning, New Delhi. 2016.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell.
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E. Schore, 5th Edition.

References:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, New Delhi 2015.
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd., New Delhi 2011.

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

I- B.Tech. I-Sem. **L T P C**
Subject Code: 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	explain the concepts of single phase and three phase AC circuits	3	3	2	1
CO3	elaborate the working principles and construction of AC and DC machines	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

Unit-I: Introduction to Electrical Circuits **11 hours**

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, Superposition ,Reciprocity, Thevenin's, Norton's and Maximum power transformer Theorems for dc excitation. Simple problems

Unit-II: Single phase & 3-phase AC circuits: **8 hours**

1-phase AC circuits: Introduction, Sinusoidal alternating quantities, RMS values, Average values, form factor and peak factor, AC through RL, RC & RLC circuits.
3-phase AC circuits: Introduction, line voltage, line current relations power equation in star and delta connections of power equation in star & delta connections of 3-phase systems, Advantages of 3-phase systems.

Unit-III: Electrical Machines & P-N Junction Diode **(5 + 5) 10 hours**

Part-A: Electrical Machines: Construction, Working principle and applications of electric dc generator & DC motor, single phase transformer & 3-ph induction motor.

Part-B: P-N Junction Diode: PN Junction diode- V-I Characteristics, Ideal versus Practical, Temperature dependence, Diode as a Switch.

Unit-IV: Rectifiers & Special Purpose Devices **9 hours**

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 simple regulator, Principle of operation and Characteristics of SCR.

Unit-V: Bipolar Junction Transistor (BJT) **10 hours**

Construction, Principle of Operation, Symbol, Amplifying Action, CB, CE, 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.

ENGINEERING MECHANICS

I- B.Tech.- I-Sem. **L T P C**
Course Code: ESC-107 **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

Unit-I **10 hours**

Introduction to Engineering Mechanics: 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.

Unit-II **09 hours**

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.

Unit-III **(5 + 4) 09 hours**

Part A: Simple Lifting Machines: Basic definitions: effort, Load, mechanical advantage, velocity ratio, efficiency. Simple screw jack, Differential Screw jack.
Centroid: Centroid of simple figures from first principles – Centroid of Composite Figures- Centroid of L, T, I, Z and channel Sections.

Part B: Center of Gravity: Centre of gravity of simple solids (from basic principles), centre of gravity of composite solids.

Unit-IV **10 hours**

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.

Unit-V **10 hours**

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.

ENGINEERING CHEMISTRY LAB

I-B.Tech.-I-Sem. **L T P C**
Subject Code: BSC-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	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)

Volumetric Analysis:

1. Determination of total hardness of water by complexo metric 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

Preparations:

8. Synthesis of Aspirin and paracetamol.

Physical properties:

9. Determination of viscosity of a liquid by using Ostwald's viscometer.
10. Determination of surface tension of a given liquid using stalagmometer.
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.

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. Determination of ferrous ion in cement.
9. Determination of P^H values of various soft drinks.
10. Studies on the effect of metal coupling on corrosion.

References:

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

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

I -B.Tech.- I-Sem. **L T P C**
Subject Code: 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 and network theorems	3
CO2	find the efficiency of AC and DC machines	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

Note: Minimum of 6 experiments to be conducted from each part.

Part-A: Electrical lab

1. Verification of KVL & KCL.
2. Verification of Superposition theorem & reciprocity theorem.
3. Verification of maximum power transfer theorem. Verification on DC.
4. Experimental determination of Thevenin's Theorem equivalent circuits.
5. Experimental determination of Norton's Theorem equivalent circuits
6. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
7. Brake Test on DC Shunt Motor. (To draw the performance curves).
8. Performance characteristics of a 3-phase induction motor.

Part-B: Electronics Lab

9. Forward and reverse bias characteristics of PN-Junction Diode.
10. Zener diode V-I characteristics and Zener diode as voltage regulator.
11. Efficiency of Half wave rectifier.
12. Efficiency of Full wave rectifier.
13. Input & output characteristics of Transistor in CB configuration.
14. Input & output characteristics of Transistor in CE configuration.
15. SCR Characteristics.
16. Design and verification of self-bias circuit.

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.

Reference:

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

ENGINEERING MECHANICS LAB

I -B.Tech.- I-Sem. **L T P C**
Subject Code: 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	PO3
CO1	determine the resultant of a given system of forces	3
CO2	determine the moment of inertia of a body and support reactions of a given beam	3
CO3	apply the principle of moments to calculate unknown forces	3
CO4	compare frictional forces between two surfaces	3
CO5	estimate the mechanical advantage and velocity ratio for simple machines	3

List of Experiments (Perform any 10 Experiments)

1. Verify the polygon law of forces using universal force table
2. Verify the principle of moments using bell crank lever
3. Verify the force in the members of a jib crane
4. Verify the law of moments by rotating disc apparatus
5. Determine the moment of inertia of a fly wheel
6. Determine the mechanical advantage, velocity ratio and efficiency of square threads screw jack
7. Determination of coefficient of friction by the inclined plane apparatus
8. Verify the polygon law of forces using gravesand apparatus
9. Verify the principle of forces in beam of parallel forces apparatus
10. Determine the mechanical advantage, velocity ratio and efficiency of worm and worm wheel
11. Determine the performance of differential axle and wheel and find its velocity ratio and law of machine
12. Determine the radius of gyration and mass moment of inertia of the given specimen using compound pendulum

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

1. Design and Fabrication of Pneumatic Vice.
2. Fabrication of Reduction Gears.
3. Fabrication of Intelligent Reverse Braking System.
4. Fabrication of Pneumatic Jack for Car.
5. Fabrication of Simple 4-Bar Mechanism.
6. Fabrication of Simple Pendulum for Different Oscillating Positions.
7. Fabrication of Mechanism of a Flywheel for Automobile Vehicles.
8. Fabrication of Parallelogram Law of Force Set Up for Different Loads.
9. Fabrication of Mini Crank to Lever Mechanism.
10. Fabrication of Motorized Screw Jack.

Reference:

1. Engineering Mechanics Lab manual, FED, CMRIT, Hyd.

IT & ENGINEERING WORKSHOP

I-B.Tech.-I-Sem. **L T P C**
Subject Code: ESC-110 **- - 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	install and make use of operating systems and MS office tools	3	3	2	2
CO2	configure fire walls and trouble shoot network connections	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

PART-A: IT Workshop

Week-1: WINDOWS OPERATING SYSTEM & DRIVERS INSTALLATION

Windows 7, Windows 8 and Windows 10. LAN, graphics, audio, video and command prompt, commands.

Week-2: NETWORK CONNECTIONS & TROUBLESHOOTING

IP configurations, connecting devices in LAN through bridge, hub, switch; Wi-Fi, Li-Fi and Bluetooth settings; Crimping: Crossover, strait over. Hardware and software troubleshooting.

Week-3: Cyber Hygiene

Introduction to Virus, worms, threats. Threats on internet, Configure the Systems to be internet safe, Install antivirus, personal firewall, block pop-ups, block active x downloads

Week-4: MS Word

Prepare the project document and resume.

Week-5: MS Excel

Spreadsheet basics, modifying worksheets, formatting cells, formulas and functions, sorting and filtering, charts.

Week-6: MS Power Point

Power point screen, working with slides, add content, work with text, working with tables, graphics, slide animation, reordering slides, adding sound to a presentation.

PART-B: Engineering Workshop

Week-7: House Wiring

Power point, light fitting and switches.

Week-8 & 9: Carpentry

Study of tools and joints; Practice in planning, chiseling, marking and sawing; Joints: Cross joint, T joint, Dove tail joint.

Week-10 &11: Fitting

Study of tools, practice in filing, cutting, drilling and tapping; Male and female joints, stepped joints.

Week-12 & 13: Tin Smithy & Black Smithy

Tin smithy:-Preparation of Open scoop, Cylinder, square/rectangular tray, **Black Smithy**:-S-Hook, Square /Hexagonal headed bolt.

Week 14: Demonstration of Power Tools

Bench drilling machine, hand drilling machine, power hacksaw, grinding machine and wood cutting machine.

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

1. Design monthly budget planner using Ms Excel.
2. Design a Photo album using Ms Power Point.
3. Design of various certificates / brochure using Ms Word.
4. Design a video presentation using open source tools.
5. Preparation of truncated prism.
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.

Reference:

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

TECHNOLOGY EXPLORATION FOR SOCIAL INNOVATION LAB - I
MANDATORY COURSE (NON-CREDIT)

I-B.Tech.-I-Sem. **L T P C**
Subject Code: 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	PO1 to PO14
CO1	identify the problems	3
CO2	illustrate social innovation	3
CO3	choose suitable processes	3
CO4	design suitable prototype	3
CO5	develop feasibility report	3

Week 1 & 2: Introduction to Engineering: what is engineering, difference between science, engineering and technology. Requirement of a scientist and engineer. Misconceptions about engineering, Expectation for the 21st century engineer.

Week 3 & 4: Introduction to Social Innovation: Core definitions, Core elements and common features of social innovation, a topology of social innovations, Fields for social innovation, History of social innovation

Week 5: social and economic change: The shape of the economy to come, Understanding social change-individuals, Movements and organizations.

Week 6: Process of Social Innovation: Prompts – identifying needs, Proposals – generating ideas, Prototyping – testing the idea in practice, Sustaining-developing a business model, Scaling and diffusion-growing social innovations

Week 7: Systematic change: Different sectors for social innovation and stages of social innovation.

Week 8: Engineering Design: Engineering Design Process, Multidisciplinary facet of design.

Week 9 & 10: Charts: Pair wise comparison chart, Introduction to Mechatronics system, generation of multiple solutions, Pugh Chart.

Week 11: PCB Design: Motor and battery sizing concepts, introduction to PCB design .

Week 12: Social Innovation: Designing the social innovations and Examples.

Week 13 &14: Case Studies: Report writing and documentation, Presentation of the case studies with a focus on impact and vision on society.

Reference:

1. A Hand Book on Technology Exploration for Social Innovation - I, FED, CMRIT, Hyd.

I-B.TECH.-II-SEMESTER SYLLABUS

ENGINEERING MATHEMATICS – II
(Advanced Calculus)

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 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

Unit-I: Differential Equations **11 hours**

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.

Unit-II: Partial Differential Equations **8 hours**

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.

Unit-III: Multiple Integration **(5 + 5) 10 hours**

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).

Unit-IV: Vector Differentiation **9 hours**

Vector Differentiation: Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Scalar potential functions. Solenoidal and Irrational vectors, Vector Identities.

Unit-V: Vector Integration **10 hours**

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 Edn., Pearson, Reprint, 2002.

References:

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes.
2. S. L. Ross, Differential Equations, 3rd Edition, Wiley.

ENGINEERING PHYSICS

I-B.Tech. - II –Sem. **L T P C**
Subject Code: 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	compare simple and damped harmonic oscillations	3	2	1
CO2	illustrate the interference and diffraction phenomena of light	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

Unit - I: Simple & Damped harmonic motion **10 hours**

Introduction, Simple Harmonic Oscillator, Characteristics of Simple Harmonic oscillator, Energy of Simple Harmonic Oscillator, Frequency of Vibration of a String, Principle of Superposition of Waves: Linear Superposition of Two Waves of Same Frequency.
Damped harmonic motion – over, critical and under – damped oscillators; Energy decay in damped harmonic oscillator, Resonance and Quality factor.

Unit - II: Wave Optics **10 hours**

Interference: Huygen's principle, Superposition of waves, interference of light by Division of wavefront and amplitude, Young's double slit experiment, Newton's rings.
Diffraction: Differences between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction from a single slit, double slit; Diffraction grating: Grating spectrum and resolving power.

Unit-III: Lasers **(4 + 4) 8 hours**

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.
-

Unit - IV: Fiber Optics **10 hours**

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.

Unit - V: Nano Science & Technology **10 hours**

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.

Text Books:

1. A Textbook of Engineering Physics, Dr. M.N. Avadhanulu, Dr. P.G Kshirsagar – S.Chand.
2. Haliday and Resnick, Physics – wiley.

References:

1. Classical Mechanics by J.C. Upadyaya, Himalaya Publishing House, 2005.
2. Introduction to Solid State Physics by Charles kittel, wiley student edition.

ENGLISH

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 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

Reading Skills:

Objectives:

To develop an awareness in students about the significance of silent reading and comprehension.
To develop students' ability to guess meanings of words from the context and grasp the overall message of the text, draw inferences, etc., by way of:

- Skimming and Scanning the text
- Intensive and Extensive Reading
- Reading for Pleasure
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Recognizing Coherence/Sequencing of Sentences

NOTE: The students will be trained in reading skills using the prescribed texts for detailed study. They will be tested in reading comprehension of different 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

Writing Skills:

Objectives:

1. To develop an awareness in the students about writing as an exact and formal skill
2. To create an awareness in students about the components of different forms of writing, beginning with the lower order ones through;
   - Writing of sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness
   - Narration / description
   - Note Making
   - Formal and informal letter writing
   - Describing graphs using expressions of comparison

Unit –I **7 hours**

('The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

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.

Unit –II **6 hours**

('Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

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.

Unit –III **(3 + 3) 6 hours**

('Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

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

Unit-IV **7 hours**

('What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

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 - Essay Writing-Précis Writing.

Unit-V **6 hours**

('How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

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.

Textbook:

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. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

PROGRAMMING FOR PROBLEM SOLVING

I-B.Tech.- II- Sem. **L T P C**
Subject Code: 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

Unit-I: Introduction to Programming **11 hours**

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.

Unit-II: Arrays and Functions **8 hours**

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.

Unit-III: Pointers and Strings **(5 + 5) 10 hours**

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.

Unit-IV: Structures and Unions **10 hours**

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.

Unit-V: File handling in C **9 hours**

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 GRAPHICS

I-B.Tech-II-Sem. **L T P C**
Subject Code: ESC-109 **1 - 4 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	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 1: Introduction to engineering drawing and AutoCAD software, Lettering, dimensioning practice and Geometrical Constructions.

Week 2: Conic sections: General method, Construction of Ellipse, Parabola.

Week 3: Construction of Hyperbola, Epicycloid.

Week 4: Construction of hypocycloid, involutes.

Week 5: Orthographic Projections: Principles of Orthographic projections, Projections of Points.

Week 6: Projections of lines simple position, inclined to one plane.

Week 7: Projections of Lines inclined to both the planes.

Week 8: Projections of planes inclined to one plane and both the planes.

Week 9: Projections of Solids simple position.

Week 10: Projections of Solids inclined to one plane.

Week 11: Projections of Solids inclined to both the planes.

Week 12: Development of surfaces: Development of Prisms and Cylinders, Pyramids and Cones.

Week 13: Isometric projections: isometric views of lines, planes and solid figures; Conversion of Isometric to Orthographic views (3D to 2D).

Week 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.

ENGINEERING PHYSICS LAB

	L	T	P	C
I -B.Tech.-II-Sem.				
Subject Code: 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	evaluate the physical constants and frequency by using simple harmonic vibrations	3
CO2	compare practical results with theoretical calculations in electromagnetic theory and 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	demonstrate the interference and dispersion phenomena of light	3

List of Experiments: (Any 08 experiments compulsory)

1. Torsional pendulum - Calculate the rigidity modulus of a given wire.
2. Melde's Exp - Determination of frequency of an Electronic Vibrator.
3. Coupled Oscillator - Determination frequency of a material.
4. Time constant of an R-C Circuit.
5. Bending Losses of Fibers & Evaluation of numerical aperture of given fiber.
6. Diffraction Grating - Determination of wavelengths of a LASER source.
7. Energy gap of material of a semiconductor.
8. Stewart and Gee's method - Magnetic field along the axis of current carrying coil.
9. Newton's Rings-Radius of curvature of Plano convex lens.
10. Identifying the Dispersive power a material.

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 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.

Reference:

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

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

I-B.Tech-II-Sem. **L T P C**
Subject Code: HSMC-102 **- - 2 1**

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

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

COMPUTER ASSISTED LANGUAGE LEARNING (CALL) LAB

Exercise – I (Week 1 & 2): Introduction to Phonetics -Speech Sounds -Vowels and Consonants

Exercise – II (Week 5): Pronunciation I: Syllable Division, Accent & Stress

Exercise – III (Week 8): Pronunciation II: Intonation and Rhythm

Exercise – IV (Week 11): Errors in pronunciation – the Influence of Mother Tongue (MTI)

Exercise – V (Week 14): Listening Comprehension (Specific & General)

INTERACTIVE COMMUNICATION SKILLS (ICS) LAB

Exercise – I (Week 3 & 4): JAMs

Exercise – II (Week 6 & 7): Role Play: Situational Dialogues

Exercise – III (Week 9 & 10): Descriptions & Formal Presentations

Exercise – IV (Week 12 & 13): Communication at Workplace and Interviews Skills

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

Reference:

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

PROGRAMMING FOR PROBLEM SOLVING LAB

I-B.Tech-II-Sem. **L T P C**
Subject Code: 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 1: 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.

Week 2: 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)

Week 3: 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.

Week 4: 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).

Week 5: 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          1          *
1 2        * *      2 3        2 2        * *
1 2 3      * * *    4 5 6      3 3 3      * * *
                               4 4 4 4    * *
                                          *
```

Week 6: 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.

Week 7: 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.

Week 8: 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.

Week 9: 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 ${}^nC_r$

Week 10: 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.

.

Week 11: 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.

Week 12: 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.

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.

Reference:

1. Programming for Problem Solving Lab Manual, FED, CMRIT, Hyd.

TECHNOLOGY EXPLORATION FOR SOCIAL INNOVATION LAB - II
MANDATORY COURSE (NON-CREDIT)

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 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 to PO14
CO1	deploy suitable mechanisms	3
CO2	develop platform based innovations	3
CO3	demonstrate data acquisition and analytical skills	3
CO4	execute projects using suitable management techniques	3
CO5	adapt ethics and code of conduct	3

Week 1: Mechanisms: Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism.

Week 2 & 3: Mechanisms & Examples: 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism. Example: Simple Robotic Arm building.

Week 4: Platform based development: Introduction to various platform based development (arduino) programming and its essentials.

Week 5 & 6: Introduction to Arduino: Introduction to sensors, transducers and actuators and its interfacing with arduino.

Week 7: Data Acquisition and Analysis: Types of Data, Descriptive Statistics techniques as applicable to different types of data.

Week 8 & 9: Analysis: Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition(Temperature and humidity) using Sensors. Exporting acquired data to Microsoft Excel and analysis using visual representation.

Week 10: Project Management: Introduction to Agile practices, Significance of team work, Importance of communication in engineering profession.

Week 11: Tools: Checklist, Timeline, Gantt chart, Significance of documentation.

Week 12: Engineering Ethics: Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers.

Week13 & 14: Ethical Dilemmas: Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas.

Reference:

1. A Hand Book on Technology Exploration for Social Innovation - II, FED, CMRIT, Hyd.

II-B.TECH.-I-SEMESTER SYLLABUS

ENGINEERING GEOLOGY

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 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	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

Unit – I **10 hours**

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, Brief study of case histories of failure of some civil engineering constructions due to geological draw backs, Internal structure of the Earth and its composition.
Physical Geology: Weathering, Effect of weathering over the properties of rocks like 'granite', Importance of weathering with reference to civil engineering constructions like dams, reservoirs and tunnels; Soil formation, Geological work of Rivers, Geological work of wind.

Unit – II **6 hours**

Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of rock forming and economics minerals.
Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

Unit – III **(3 + 3) 6 hours**

Part A: Structural Geology: 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.

Unit - IV **10 hours**

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

Unit – V **10 hours**

Geology of Dams, Reservoirs and Tunnels: Types of dams and bearing of Geology of site in their selection, geological considerations in the selection of a dam site, analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water tightness and

life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Lithological, structural and ground water) 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 & Distribution.
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.

BUILDING MATERIALS, CONSTRUCTION AND PLANNING

II-B.Tech.-I-Sem. **L T P C**
Subject Code: ESC-202 **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	PO13
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

Unit–I **10 hours**

Stones and Bricks: Building stones–classifications and quarrying–properties–structural requirements – dressing; Bricks – Composition of Brick earth – manufacture and structural requirements.
Cement, Wood and Glass : Cement - Ingredients of cement – manufacture – Chemical composition – Hydration.Wood - structure – types and properties – seasoning – defects; alternate materials for wood – GI / fibre reinforced glass bricks, steel & aluminum.

Unit-II **10 hours**

Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed ; foundations – types; Damp Proof Course; Joinery – doors – windows – materials – types.
Building Services: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Hazards – Classification of fire resistant materials and constructions.

Unit-III **(4 + 4) 8 hours**

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.

Unit –IV **12 hours**

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

Unit –V **8 hours**

Building Planning: Principles of Building Planning, classification of buildings and Building by laws.

Text Books:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications
2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Pub.

References:

1. Building Materials by Duggal, New Age International.
2. Concrete Technology by M.S. Shetty, S. Chand & Company Ltd.

STRENGTH OF MATERIALS - I

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-211 **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	PO13
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

Unit – I **10 hours**

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

Unit – II **9 hours**

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.

Unit – III **(5 + 5) 10 hours**

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.

Unit–IV **9 hours**

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

Unit – V **10 hours**

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

Text Books:

1. Strength of Materials by R.K.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

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-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	PO13
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

Unit-I **10 hours**

Fluid Properties & Statics: Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motionpressure 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; Buouancy and floation.

Unit-II **9 hours**

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, nonuniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions.

Unit-III **(5 + 5) 10 hours**

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

Unit-IV **9 hours**

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.

Unit-V **10 hours**

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.

Text Books:

1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K.Som & G.Biswas (Tata Mc.Grawhill publishers Pvt. Ltd.)

References:

1. Fluid Mehanics 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

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-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	PO13
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

Unit-I **9 hours**

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.

Unit-II **9 hours**

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.

Unit-III **(6 + 2) 8 hours**

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.

Unit-IV **10 hours**

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.

Unit-V **12 hours**

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.

Text Books:

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.

ENGINEERING GEOLOGY LAB

II-B.Tech.-I-Sem. **L T P C**
Subject Code: ESC-203 **- - 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

Lab Experiments

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.

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.

Reference:

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

FLUID MECHANICS LAB

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-214 **- - 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	PO14
CO1	determine the coefficient of discharge for venturimeter, orifice meter and mouth piece	3	3
CO2	perform the calibration of rectangular, triangular and trapezoidal notches	3	3
CO3	assess the major and minor losses in a flow through pipes	3	3
CO4	verify the Bernoulli's equation	3	3
CO5	analyze the effect of water hammer	3	3

List of Experiments:

1. Determination of Coefficient of discharge for a small orifice.
2. Determination of Coefficient of discharge for a mouthpiece by constant head method.
3. Calibration of contracted Rectangular Notch / Triangular Notch/Trapezoidal Notch.
4. Determination of friction factor of a pipe
5. Calibration of venturimeter
6. Calibration of Orifice meter
7. Determination of Coefficient for minor losses - Sudden Expansion
8. Determination of Coefficient for minor losses - Sudden Contraction
9. Verification of Bernoulli's equation.
10. Study of Water Hammer due to sudden Closure of valve.

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. Study the difference between Chezy's and Darcy's friction factor.
6. Study the difference between orifice meter and venturimeter coefficient of discharge.
7. Calibration of Rotameter.
8. Determine the metacentric height of a floating body.
9. Study the characteristics of stream line, streak line and stream tube types of flows.
10. Calibration of simple U-tube and inverted U-tube manometer.

Reference:

1. Fluid Mechanics Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

SURVEYING LAB – I

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-215 **- - 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	PO14
CO1	find the distances and directions using the concepts of surveying	3	3	3	3
CO2	compare plotted work with the actual features of the area using plane table	3	3	3	3
CO3	identify reduced levels for L.S and C.S of road profiles using dumpy or auto level	3	3	3	3
CO4	measure horizontal and vertical angles by using theodolite	3	3	3	3
CO5	determine the heights and distances using trigonometric and tacheometric surveying	3	3	3	3

List of Experiments

1. Surveying of an area by chain survey (closed traverse) & plotting.
2. Chaining across obstacles
3. Determine of distance between two inaccessible points with compass
4. Survey of a given area by prismatic compass (closed traverse) and plotting after adjustment.
5. Radiation method, intersection methods by plane table survey.
6. Two point and three point problems in plane table survey.
7. Levelling – Longitudinal and cross-section and plotting.
8. Measurement of Horizontal angle & vertical angle by using theodolite.
9. Trigonometric leveling using theodolite
10. Height and distances using principles of tacheometric surveying

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 to a scale on the chart for chain surveying.
2. Determination of horizontal distance between two inaccessible points using compass.
3. Plot the given area to a scale on the chart by plane table survey.
4. Three point problem using plane table survey.
5. Determine the vertical profile of road surface.
6. Determine the height of the given object by using tacheometry.
7. Prepare a contour map by using auto level.
8. Draw the layout plan of the CMRIT campus.
9. Draw road alignment by using compass.
10. Determine the height of High Tension Tower using Trigonometric surveying.

Reference:

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

COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB

II-B.Tech.-I-Sem. **L T P C**

Subject Code: CE-PCC-216 **- - 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	PO14
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

1. Introduction to computer aided drafting
2. Software for CAD – Introduction to different softwares
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

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.

Reference:

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

ENVIRONMENTAL SCIENCES
MANDATORY COURSE (NON-CREDIT)

II-B.Tech.-I-Sem. **L T P C**
Subject Code: MC-202 **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

Unit I: Ecosystem **6 hours**

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.

Unit II: Natural Resources **7 hours**

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.

Unit III: Biodiversity **(3 + 2) 5 hours**

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.

Unit IV: Environmental Pollution & Control Technologies **8 hours**

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.

Unit V: Environmental Acts, EIA & Sustainable Development **6 hours**

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), 4thedition, New age International Publications

II-B.TECH.-II-SEMESTER SYLLABUS

NUMERICAL AND STATISTICAL METHODS

II-B.Tech.-II-Sem. **L T P C**
Subject Code: BSC-201 **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 using numerical methods	3	2	1
CO2	find the numerical solutions for first order initial value problems and integrals	3	2	1
CO3	differentiate among random variables involved in the probability model	3	2	1
CO4	test hypothesis for small and large samples	3	2	1
CO5	identify the correlation coefficients, strength, direction and significance level	3	2	1

Unit-I: Algebraic and transcendental Equations and Curve Fitting **9 hours**

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.

Unit-II: Numerical Integration and Solution of Ordinary Differential equations **9 hours**

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)

Unit- III: Probability, Random variables and Distributions **(6 + 4) 10 hours**

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.

Unit – IV: Sampling Theory and Test of Hypothesis for Large Samples **12 hours**

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.

Unit – V: Test of Hypothesis for Small Samples **8 hours**

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.

Text Books:

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.

STRENGTH OF MATERIALS – II

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO2	PO12	PO13
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

Unit – I **10 hours**

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.

Unit – II **9 hours**

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.

Unit – III **(5 + 4) 9 hours**

Part A: Direct and Bending Stresses: Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of chimneys.

Part B: Direct and Bending Stresses: 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.

Unit – IV **10 hours**

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.

Unit – V **10 hours**

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.

Text Books:

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

II-B.Tech-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO13
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

Unit – I **11 hours**

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.

Unit - II **8 hours**

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.

Unit – III **(5 + 5) 10 hours**

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.

Unit - IV **9 hours**

Hydraulic Turbines: Layout of a typical Hydropower installation – Heads and efficiencies classification of turbines- pelton wheel-Francis turbine-Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and function efficiency. Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitation and preventive measures.

Unit – V **10 hours**

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.

SOIL MECHANICS - I

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO1	PO2	PO12	PO13
CO1	explain engineering properties of soil and their applications	3	2	3	3
CO2	describe permeability and seepage of soils	3	3	2	3
CO3	analyze various theories of stress distribution and compaction mechanism in soils	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	3	3

Unit – I **10 hours**

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.

Unit –II **9 hours**

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.

Unit –III **(5 + 5) 10 hours**

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.

Unit – IV **9 hours**

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

Unit – V **10 hours**

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.

Text books:

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.

STRUCTURAL ANALYSIS

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO13
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

Unit – I **11 hours**

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.

Unit – II **9 hours**

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 – Comparision between Three hinged and two hinged Arches. Linear Arch. Eddy's theorem. Analysis of Three hinged arches. Normal Thrust and radial shear in an arch. Geometrical properties of parabolic and circular arch. Three hinged circular arch at different levels. Absolute maximum bending moment diagram for a three hinged arch.

Unit-III **(4 + 5) 9 hours**

Part A: Propped Cantilever and Fixed Beams: Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads

Part B: Propped Cantilever and Fixed Beams (contd.): Shear force and Bending moment diagrams for Propped Cantilever and Fixed Beams-effect of sinking of support, effect of rotation of a support.

Unit – IV **9 hours**

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 indeterminaciesfor frames. Analysis of Single Bay – Single storey Portal Frames by Slope Deflection Method Including Side Sway. Shear force and bending moment diagrams and Elastic curve.

Unit – V **10 hours**

Moving Loads and Influence Lines: 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.

Text Books:

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

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO14
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

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.

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.

Reference:

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

HYDRAULICS & HYDRAULIC MACHINERY LAB

II B.Tech.-II-Sem. **L T P C**
Course Code: CE-PCC-226 **- - 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	PO14
CO1	calculate impact of force of Jet on different types of Vanes	3	3
CO2	analyze the performance of various turbines	3	3
CO3	determine the performance of various pumps	3	3
CO4	find energy loss in hydraulic jump and study of open channel flow	3	3
CO5	evaluate the coefficient of discharge for a weir	3	3

List of Experiments:

1. Impact of jet on vanes
2. Study of Hydraulic jump in Open Channel
3. Performance test on Pelton wheel turbine
4. Performance test on Francis turbine
5. Performance test on Kaplan turbine
6. Performance characteristics of a single stage centrifugal pump
7. Performance characteristics of a multi-stage centrifugal pump
8. Performance characteristics of a reciprocating pump
9. Study of Flow in Open Channel (Applying Chezy's and Manning's equations)
10. Determination of Coefficient of discharge for the given Weir (Sharp crested / Broad crested / Cippoletti weir)

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

1. Determine the co-efficient of discharge for Pitot tube.
2. Determine the study of hydraulic jump in Open channel.
3. Conduct performance test on Reciprocating pump.
4. Fabricate a Pelton wheel prototype model
5. Fabricate a Centrifugal pump prototype model.
6. Fabricate a Francis turbine prototype model.
7. Draw the hydraulic gradient line and total energy line for an inclined pipe.
8. Fabrication of Orifice meter suitable for a given pipe to determine the discharge.
9. Apply chezy's formula for study flow in open channel.
10. Fabricate a Kaplan turbine prototype model**.**

Reference:

1. Fluid Mechanics & Hydraulic Machinery Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

SURVEYING LAB –II

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO5	PO10	PO14
CO1	calculate the area, traverse and contour using total station	3	3	3	3
CO2	determine the elevation and stakeout using total station	3	3	3	3
CO3	measure distance, gradient and height between two inaccessible points using total station	3	3	3	3
CO4	develop curve and resection for various item of work	3	3	3	3
CO5	find the position of stations using GPS	3	3	3	3

LAB EXPERIMENTS

1. Determine of area using total station.
2. Traversing using total station.
3. Contouring using total station.
4. Determination of remote height using total station.
5. Stake out using total station.
6. Distance, gradient, differential height between two inaccessible points using total station.
7. Curve setting using total station.
8. Resection using total station.
9. Setting out works for buildings and pipe lines.
10. Finding position of stations using G.P.S.

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.

References:

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

COMPUTATIONAL MATHEMATICS LAB USING Sci LAB

II-B.Tech.-II-Sem. **L T P C**
Subject Code: BSC-203 **- - 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	PO3	PO4	PO5	PO14
CO1	solve problems on Linear Algebra and plotting of Graphs	3	3	3	3
CO2	find roots of an equation using various Methods	3	3	3	3
CO3	fit a curve for straight line, parabola, exponential and power curves	3	3	3	3
CO4	solve ordinary differential equations using Numerical techniques	3	3	3	3
CO5	solve ordinary integral equations using Numerical techniques	3	3	3	3

LIST OF EXPERIMENTS

Week-01: Introduction to Sci Lab, History, Features and Local Environment.
Week-02: Basic operations on Matrices (Characteristic Equations, Eigen values and Eigen vectors).
Week-03: Plotting of Graphs and finding Roots of Polynomials.
Week-04: Find the root of equation by Bisection and Regula-Falsi Methods.
Week-05: Find the root of equation by Iteration and Newton Raphson Methods
Week-06: Fit a straight line and second degree polynomial curves using method of least square.
Week-07: Fit a power curve using method of least square.
Week-08: Fit a exponential curve using method of least square.
Week-09: Basic operations on Differential Equations / Integrations and find the area by using Trapezoidal rule.
Week-10: Find the area by using Simpsons 1/3rd rule and 3/8th rule.
Week-11: Find the solution of a given Differential Equation by using Euler‘s method.
Week-12: Find the solution of a given Differential Equation by using Runge-Kutta method (2^{nd} and 4^{th} Order).

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

1. Demonstrate the battery discharge function graphically by adopting a mathematical model.
2. Apply inverse Laplace transforms in image processing for getting the better image.
3. Evaluate the trigonometric functions using Laplace transforms.
4. Illustrate the laminar flow of heat through partial differential equations.
5. Design a mathematical model to explain the functioning of Global positioning system (GPS)
6. Design a mathematical model for the construction of flyover
7. Model any art craft using mathematical calculations (electrical / non-electrical)
8. Prepare a detailed report on usage of mathematical concepts in overcoming “risk vs reward” situations in day to day life.
9. 2-D plotting using SCI-lab.
10. 3-D plotting using SCI-lab.

Reference:

1. Computational Mathematics Lab using Sci Lab Manual, FED, CMRIT, Hyd.

GENDER SENSITIZATION LAB
(MANDATORY COURSE- NON- CREDIT)

II-B.Tech.-II-Sem. **L T P C**
Subject Code: 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

Unit-I: Understanding Gender **6 hours**

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

Unit-II: Gender Roles And Relations **6 hours**

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

Unit-III: Gender And Labour **(4 + 4) 8 hours**

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.

Unit-IV: Gender - Based Violence **6 hours**

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 OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life".

Unit-V: Gender And Culture **6 hours**

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.

Text Book:

1. 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".

ASSESSMENT AND GRADING: (1) Discussion & Classroom Participation: 20%
(2) Project/Assignment: 30% (3) End Term Exam: 50%

III-B.TECH.-I-SEMESTER SYLLABUS

CONCRETE TECHNOLOGY

III-B.Tech.–I-Sem. **L T P C**
Subject Code: CE-PCC-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	PO13
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

Unit-I **9 hours**

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.

Unit-II **10 hours**

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.

Unit-III **(5 + 5) 10 hours**

Part-A: Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests- setting times of concrete- Effect of time and temperature on workability – Segregation and bleeding of concrete.

Part-B: Fresh Concrete (Contd.): Steps in manufacture of concrete – Quality of Mixing water.

Unit-IV **10 hours**

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.

Unit-V **9 hours**

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.

SOIL MECHANICS – II

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-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	PO3	PO8	PO12	PO14
CO1	explain the various processes of soil exploration and its bearing capacity	3	3	2	3	3
CO2	determine the slope failures using various methods	3	3	3	2	3
CO3	analyze earth retaining structures using various theories	3	3	3	2	3
CO4	illustrate various types foundations	3	3	3	2	3
CO5	make use of well foundation based on site requirements	3	3	3	3	3

Unit–I **9 hours**

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.

Unit–II **10 hours**

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.

Unit–III **(5 + 5) 10 hours**

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.

Unit-IV **11 hours**

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.

Unit-V **8 hours**

Well Foundations: Types – Different shapes – Components of wells – functions and Design Criteria – Sinking of wells – Tilts and shifts.

Text Books:

1. Basic and Applied Soil Mechanics by GopalRanjan & 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.

ENVIRONMENTAL ENGINEERING

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO6	PO7	PO12	PO13
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

Unit-I **9 hours**

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

Unit-II **10 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **10 hours**

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.

Unit-V **9 hours**

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

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-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	PO3	PO8	PO10	PO12	PO14
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

Unit-I **5 hours**

Concepts of RC Design: Limit state method – Material Stress–Strain curves – Safety factors – Characteristic values– Stress block parameters – IS-456:2000 – Working stress method.

Unit-II **14 hours**

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.

Unit-III **(5 + 5) 10 hours**

Part-A: Slabs: Design of one-way slabs and Two-way Slabs, Continuous slabs using I.S. coefficients

Part- B: Slabs (Contd.): Design of Cantilever slab, Canopy slab.

Unit-IV **10 hours**

Short And Long Columns: Axial loads, uni-axial and bi-axial bending I.S. Code provisions.

Unit-V **9 hours**

Design of Footings: 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.

WATER RESOURCES ENGINEERING

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-315 **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	PO13
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

Unit-I **10 hours**

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.

Unit-II **9 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **10 hours**

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.

Unit-V **9 hours**

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

CONCRETE TECHNOLOGY LAB

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-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	PO14
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

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

IV. 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)

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.

Reference:

1. Concrete Technology Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

SOIL MECHANICS LAB

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-317 **- - 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	PO14
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**)**

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

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.

Reference:

1. Soil Mechanics Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

ENVIRONMENTAL ENGINEERING LAB

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-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	PO14
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 (At least 8 of the above experiments are to be conducted)

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

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.

Reference:

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

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

III-B.Tech.-I-Sem. **L T P C**
Subject Code: HSMC-301 **1 - 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	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 1 & 2: Importance of Non-Verbal Communication – Synonyms and Antonyms, One-word substitutes, Prefixes and Suffixes, Idioms, Phrases and Collocations.

Week 3: Conversations, Self introduction, Role Play.

Week 4: General Vs Local Comprehension, Reading for Facts, Guessing Meaning from context, Skimming, Scanning, Inferring Meaning.

Week 5: Unseen Passages on various topics.

Week 6 & 7: Structure and Presentation of different types of Writing – e-correspondence / Technical Report Writing.

Week 8: Letter Writing, Resume Writing, CV, E-mail Writing, Memo Writing.

Week 9 & 10: Oral Presentations (individual or group) and Written Presentation through Posters/ Projects / Reports / e-mails / Assignments, etc.

Week 11: JAMs, Seminars, PPTs, Debate Sessions

Week 12 & 13: Dynamics of Group Discussion, Organization of Ideas and Rubrics of Evaluation – Concept and Process, Interview Preparation Techniques.

Week 14: Group Discussion and Mock Interviews.

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

Reference:

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

EMPLOYABILITY SKILLS – I
MANDATORY COURSE (NON-CREDIT)

III-B.Tech.-I-Sem. **L T P C**
Subject Code: MC-311 **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	PO9	PO10
CO1	demonstrate verbal and written skills effectively	3	3
CO2	develop professional correspondence skills	3	3
CO3	build proficiency in quantitative reasoning	3	3
CO4	improve critical thinking skills	3	3
CO5	exhibit confidence in facing the interview process	3	3

Unit–I **10 Hours**

Verbal Ability: Fundamentals of Grammar Fundamentals - Sentence Structure - Parts of Speech.
Analytical Skills: Averages - Basic Concepts, combined mean, average principles, wrong values taken, number added or deleted, average speed.
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.
Data Interpretation - Introduction to Data Interpretation, quantitative and qualitative data, Tabular Data, Line Graphs, Bar Chart, Pie Charts, X-Y Charts.

Unit–II **10 Hours**

Verbal Ability: Synonyms and Antonyms, Homonyms and Homophones, Word Formation, Idioms and Phrases, Analogy, One-word Substitutes.
Analytical Skills: Reasoning - Number Series, Letter Series, Series completion and correction, Coding and Decoding.

Unit–III **(4 + 4) 8 Hours**

Part-A: Verbal Ability: Exercises on Common Errors in Grammar.
Analytical Skills: Word analogy-Applied analogy.

Part-B: Verbal Ability: Vocabulary Enhancement, Study skills and using a Dictionary.
Analytical Skills: Classifications, verbal classification.

Unit–IV **10 Hours**

Verbal Ability: Paragraph writing, Picture description, Text Completion, Essay writing.
Analytical Skills: Reasoning Logical Diagrams - Simple diagrammatic relationship, Multi diagrammatic relationship, Venn-diagrams, Analytical reasoning.

Unit–V **10 Hours**

Verbal Ability: Sentence Equivalence, Comparison and Parallelism, Letter writing and e-mail writing.
Analytical Skills: Reasoning Ability - Blood Relations, Seating arrangements, Directions, Decision making.

Activities List:

1. Regular cumulative practice tests.
2. Quiz, Crossword, Word-search and related activities.
3. Picture Description including Description of Photos/Images/Posters/Advertisement Analysis etc.,

Reference:

1. Employability Skills – I Manual, FED, CMRIT, Hyd.

SUMMER INTERNSHIP - I
MANDATORY COURSE (NON-CREDIT)

III-B.Tech.-I-Sem. **L T P C**
Subject Code: MC-312 - - - -

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 PO14
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:

1. The student has to complete the internship for a period of 4 to 6 weeks during summer vacation between IV Semester & 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.

III-B.TECH.-II-SEMESTER SYLLABUS

ARTIFICIAL INTELLIGENCE AND ROBOTICS

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO1	PO2	PO12	PO13
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

Unit-I **10 hours**

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.

Unit-II **9 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **10 hours**

Robot Kinematics: transformation matrices and their arithmetic, link and joint description, denavit-hartenberg parameters, frame assignment to links, direct kinematics.

Unit-V **9 hours**

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.

TRANSPORTATION ENGINEERING

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO2	PO3	PO12	PO13
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

Unit-I **9 hours**

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.

Unit-II **10 hours**

Highway Geometric Design: Importance of Geometric Design, Design controls and Criteria, Highway Cross Section Elements, Sight Distance Elements, Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance, Design of Horizontal Alignment, Design of Super elevation and Extra widening, Design of Transition Curves-Design of Vertical Alignment, Gradients, vertical curves.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **9 hours**

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.

Unit-V **10 hours**

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.

Text books:

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.

DESIGN OF STEEL STRUCTURES

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO8	PO10	PO12	PO14
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

Unit-I **10 hours**

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.

Unit-II **9 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **9 hours**

Eccentric connections: Design of eccentric connections with brackets, beam end connections, web angle, Un-stiffened and stiffened seated connections bolted and welded types.

Unit-V **10 hours**

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

ROCK MECHANICS
(Professional Elective – I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PEC-301 **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	PO12	PO13
CO1	illustrate properties of different rocks	3	3	3	3
CO2	explain testing methods of rocks strength	3	3	3	3
CO3	determine the stress-strain relationship in rocks	3	3	3	3
CO4	estimate the stability of rock slopes, foundations and remedial measures	3	3	3	3
CO5	identify different types of excavation and controlled blasting techniques	3	3	3	3

Unit-I **10 hours**

Engineering Classification of Rocks: Classification of intact rocks, Rock mass classifications, Rock Quality Designation (RQD), Rock Structure Rating (RSR), Rock Mass Rating (RMR), Norwegian Geotechnical Classification (Q-system), Strength and modulus from classifications, Classification based on strength & modulus and strength and fracture strain, Geo-engineering classification.

Unit-II **9 hours**

Methods of Testing of Rocks: Physical properties, Compressive strength, Tensile strength, Direct shear test, Tri-axial shear test, Slake durability test, Schmidt rebound hardness test, Sound velocity test, In-Situ Tests: Seismic methods, Electrical resistivity method, in-situ stresses, Plate loading test, Goodman jack test, Plate jacking test, In-situ shear test, Field permeability test.

Unit-III **(5 + 5) 10 hours**

Part-A: Strength, Modulus and Stresses-Strain Responses of Rocks: Factors influencing rock response, Strength criteria for isotropic intact rocks, Modulus of intact rocks, effect of confining pressure, Uniaxial Compressive strength, Strength criteria for intact rocks, Strength due to induced anisotropy in rocks.

Part-B: Stress Strain Models: Constitutive relationships, Elastic, Elasto-plastic, Visco-elastic, Elasto-viscoplastic stress-strain models.

Unit-IV **10 hours**

Stability of Rock Slopes and Foundations on Rocks: Rock slopes, Modes of failure, Rotational failure, Plane failure, Design charts, Wedge method of analysis, Buckling failure, Toppling failure, Improvement of slope stability and protection. Foundations on Rock: Introduction, Estimation of bearing capacity, Stress distribution, Sliding stability of dam foundations, strengthening measures, Settlements in rocks, Bearing capacity of pile/pier in rock, Remedial measures, Foundations located on edge of jointed slope.

Unit-V **9 hours**

Underground and Open Excavations: Blasting operational planning, Explosive products, Blast Design, Underground blast design, Controlled blasting techniques, blasting damage and control, Safe practice with explosives and shots.

Textbooks:

1. Goodman – Introduction to Rock mechanics, Willey International.
2. Ramamurthy, T. - Engineering in Rocks for slopes, foundations and tunnels, PHI.

References:

1. Jaeger, J.C. and Cook, N.G.W. – Fundamentals of Rock Mechanics, Chapman and Hall, London.
2. Brady, B. H. G. and Brown, E. T. - Rock Mechanics for Underground Mining, Chapman & Hall.

CONSTRUCTION TECHNOLOGY & PROJECT MANAGEMENT
(Professional Elective – I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PEC-302 **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	PO14
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

Unit-I **9 hours**

Management -Fundamentals of construction project management: Introduction, Project Initiation and Planning.

Unit-II **10 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **9 hours**

Introduction to Building Information Modelling (BIM), Lean construction, and Integrated Project Delivery in construction, Invoicing, Preparation of RA bill, Safety in construction, Estimation.

Unit-V **10 hours**

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.

Reference:

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.

URBAN PUBLIC TRANSPORTATION SYSTEM
(Professional Elective - I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PEC-303 **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	PO13
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

Unit-I **9 hours**

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.

Unit-II **10 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **9 hours**

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.

Unit-V **10 hours**

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.

IRRIGATION ENGINEERING
(Professional Elective - I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PEC-304 **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	PO13
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

Unit-I **10 hours**

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.

Unit-II **9 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **10 hours**

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.

Unit-V **9 hours**

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)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-301 **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

Unit-I **10 hours**

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 assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards.

Unit–II **9 hours**

Disaster Management Mechanism: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief.

Unit-III **(5 + 5)10 hours**

Capacity Building: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels.

Unit- IV **9 hours**

Coping with Disaster: Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.

Unit-V **10 hours**

Planning for disaster management: 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.

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).

FUNDAMENTALS OF OPERATIONS RESEARCH
(Open Elective-I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-302 **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	formulate and solve linear programming problem using various methods	3	2	3
CO2	solve transportation and assignment problems	3	3	3
CO3	compute sequencing and inventory model problems	2	2	3
CO4	analyze waiting lines and game theory problems	3	3	3
CO5	evaluate replacement and dynamic programming problems	2	3	3

Unit-I **10 hours**

Introduction to Operations Research: Basics definition, scope, objectives, phases, models, applications and limitations of Operations Research.
Linear Programming Problem Formulation, Graphical solution, Simplex method, Artificial variables techniques: Two-phase method, Big M method.

Unit-II **9 hours**

Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.
Assignment model: Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem.

Unit-III **(5 + 5) 10 hours**

Part-A: Sequencing: Introduction, Flow-Shop sequencing, n jobs through two machines, n jobs through three machines, Job shop sequencing, two jobs through m machines.

Part-B: Inventory: Introduction, Single item, Deterministic models - Purchase inventory models with one price break and multiple price breaks -Stochastic models - demand may be discrete variable or continuous variable - Single Period model and no setup cost.

Unit-IV **10 hours**

Theory of Games: Introduction, Terminology- Solution of games with saddle points and without saddle points- 2 x 2 games, dominance principle, m x 2 & 2 x n games -graphical method.
Waiting Lines: Introduction, Terminology-Single Channel-Poisson arrivals and Exponential Service times-with infinite population and finite population models-Multichannel-Poisson arrivals and exponential service times with infinite population.

Unit-V **9 hours**

Dynamic Programming: Introduction, Terminology - Bellman's Principle of Optimality - Applications of dynamic programming- Project network - CPM and PERT networks - Critical path scheduling.

Text Books:

1. Operations Research, J.K.Sharma 4th Edition, Mac Milan.
2. Introduction to O. RIHilIier & Libermannf, TMH.

References:

1. Introduction to O.R, Hamdy A. Taha, PHl.
2. Operations Research, A.M.Natarajan, P. Balasubramaniam, A.Tamilarasi, Pearson Education.
3. Operations Research I Wagner, PHI Publications.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Open Elective-I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-303 **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

Unit-I **10 hours**

Block Schematics of Measurement: 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.

Unit-II **9 hours**

Signal Analyzers: 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.

Unit-III **(5 + 5) 10 hours**

Part-A: Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, CRO Probes. Applications-measurement of Time period and frequency specifications.

Part-B: Special Purpose Oscilloscopes: introduction to dual trace, dual beam CROs, sampling oscilloscopes, storage oscilloscopes, digital storage CROs.

Unit-IV **10 hours**

Transducers: 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.

Unit-V **9 hours**

Bridges: 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.

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)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-304 **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

Unit-I **10 hours**

Java Basics: 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, access control, this keyword, garbage collection, parameter passing, recursion, exploring String class.

Unit-II **9 hours**

Inheritance and Polymorphism: 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.

Unit-III **(5 + 5) 10 hours**

Part-A: Packages and Inner classes: Defining, creating and accessing a package, CLASSPATH, importing packages, inner classes – local, anonymous and static.

Part-B: Interfaces: Defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces, differences between classes and interfaces.

Unit-IV **9 hours**

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.

Unit-V **10 hours**

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Textbooks:

1. Java the complete reference, 8th Edition, Herbert Schildt, TMH.

References:

1. Java How to Program, H. M. Dietel and P. J. Dietel, Sixth Edition, Pearson Education, PHI.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.

INDIAN CULTURE AND CONSTITUTION
(Open Elective-I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-305 **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	PO8	PO12
CO1	identify paradigm shift in indian culture	3	1
CO2	explain features of languages, religions and holy books	3	2
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	2

Unit –I **10 hours**

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.

Unit-II **9 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **10 hours**

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.

Unit-V **9 hours**

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.

ARTIFICIAL INTELLIGENCE AND ROBOTICS LAB

III-B.Tech.- II-Sem. **L T P C**
Subject Code: CE-PCC-324 **- - 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	PO14
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

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

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

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

Reference:

1. Artificial Intelligence And Robotics Lab Manual, Department of CE, CMRIT, Hyd.

TRANSPORTATION ENGINEERING LAB

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO7	PO14
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

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.

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.

Reference:

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

COMPUTER AIDED CIVIL ENGINEERING DESIGN LAB

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PCC-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	PO14
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:

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

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.

Reference:

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

ADVANCED CONCRETE TECHNOLOGY LAB

III-B.Tech.-II-Sem. **L T P C**

Subject Code: CE-PCC-327 **- - 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	PO14
CO1	test the suitability of super plasticizer with cement	3	3	3
CO2	assess the properties of fresh concrete	3	3	3
CO3	examine the properties of self compacting 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

I. TEST ON CEMENT

1. Determination of optimum super plasticizer dosage with cement

II. TEST ON FRESH CONCRETE

1. Determination of air content in fresh concrete.
2. Influence of w/c ratio on strength of concrete.
3. Influence of Aggregate/cement ratio on strength of concrete
4. Influence of chemical admixtures on concrete

III. TESTS ON SELF COMPACTING CONCRETE

1. Flow Test
2. V funnel
3. L Box
4. J Ring

IV. TESTS ON HARDENED CONCRETE

1. Modulus of Elasticity
2. Accelarated curing of concrete.

V. NON DESTRUCTIVE TEST OF CONCRETE

1. Rebound hammer
2. Ultrasound pulse Velocity (UPV)

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

1. Determine the optimum dosage of different admixtures
2. Find the air content in lean and rich concrete mixes.
3. Prepare concrete with different water cement ratios and compare results.
4. Prepare concrete with different aggregate cement ratios and compare results.
5. Use plasticizer and super plasticizer and compare the slump at 0, 30 and 60Min.
6. Prepare self compacting concrete and check passing, filling abilities.
7. Determine the Modulus of elasticity of given concrete specimen.
8. Prepare concrete of different grades and determine its strength using Accelerated curing test
9. Prepare concrete of different grades using curing admixtures and test the results.
10. Conduct NDT tests on different concrete elements and suggest its acceptability.

Reference:

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

EMPLOYABILITY SKILLS – II
MANDATORY COURSE (NON-CREDIT)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: MC-321 **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	PO9	PO10
CO1	make use of soft skills to become a professional team member	3	3
CO2	develop professional correspondence skills	3	3
CO3	apply knowledge of decision making, leadership, motivation	3	3
CO4	adapt principles of quantitative aptitude to achieve qualitative results	3	3
CO5	exhibit confidence in facing the interview process	3	3

Unit–I **10 Hours**

Soft Skills:

Introduction to Soft Skills: Self awareness and Self esteem, Discipline, Integrity, Attitude, Change and Adaptability.

Quantitative Aptitude:

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

Progressions & Inequalities: Basic Concepts, Types: arithmetic, geometric, harmonic progression and applications.

Unit-II **9 Hours**

Soft Skills:

People Skills: Relationships - Personal & Professional Relationships – Rapport Building – Personal Space; Definition of Motivation –Motivation – Self-motivation; Time Management – Stephen Covey's time management.

Quantitative Aptitude:

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.

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.

Unit–III **(5 + 5) 10 Hours**

Part-A:

Soft Skills:

Teamwork: Definition of Team, Team Dynamics – Specialization and Teamwork – Rewards of Teamwork.

Quantitative Aptitude:

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.

Part-B:

Soft Skills:

Leadership: Definition of Leadership, Leading a Team, Leadership Qualities – Leader vs Manager – Leadership Styles.

Quantitative Aptitude:

Time and Work: Basic Concepts, comparative work, mixed work, alternative work, middle leave and middle join, ratio efficiency.

Unit IV **10 Hours**

Soft Skills:

Problem Solving and Decision Making: Definitions –Problem Solving and Decision Making – Hurdles in Decision Making - Case studies.

Quantitative Aptitude:

Permutations and combinations: Basic Concepts, differences between permutations and combinations, always together-never together, alternative arrangement, fixed positions, 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.

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.

Unit – V **9 Hours**

Soft Skills:

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.

Quantitative Aptitude:

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.

Activities List:

1. Regular cumulative practice tests
2. Quiz, Crossword, Word-search and related activities
3. 5-minute presentations about concepts learnt
4. JAM and Picture Narration.
5. Mock Interviews.

Reference:

1. Employability Skills – II Manual, FED, CMRIT, Hyd.

IV-B.TECH.-I-SEMESTER SYLLABUS

ESTIMATION AND COSTING

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-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	PO13
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

Unit-I **10 Hours**

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.

Unit-II **9 Hours**

Earthwork for roads and canals.

Unit-III **(5+5) 10 Hours**

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.

Unit –IV **10 Hours**

Reinforcement bar bending and bar requirement schedules. Contracts – Types of contracts –Contract Documents – Conditions of contract.

Unit-V **9 Hours**

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.

GEOSYNTHETICS AND SOIL REINFORCEMENT
(Professional Elective – II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-401 **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	PO12	PO13
CO1	explain the functions and applications of geosynthetics	3	3	3	3
CO2	make use of soil reinforcement mechanism	3	3	3	3
CO3	apply geosynthetics for highways and landfills	3	3	3	3
CO4	find stability of walls and embankments using soil reinforcement	3	3	3	3
CO5	adapt dewatering systems using vertical drains	3	3	3	3

Unit-I **10 hours**

An Overview of Geosynthetics: Classification of Geosynthetics, Functions and applications, Properties of geotextiles, Geogrids and Geomembranes.

Unit-II **9 hours**

Soil Reinforcement: Mechanism, improvement of bearing capacity, Embankments on soft ground, Soil Nailing.

Unit-III **(5 + 5) 10 hours**

Part-A: Geosynthetics for Highways: Roadway Reinforcement, applications for Separation, Filtration, Drainage, Reinforcement, Moisture Barrier, Membrane encapsulation.
Part-B: Landfills: Geosynthetic applications for land fill liners, covers and other components.

Unit-IV **9 hours**

Reinforced Embankments and Reinforced soil walls – Internal and External Stability

Unit-V **10 hours**

Dewatering Systems: Sand drains, Prefabricated Vertical drains (PVD), French Drains.

Textbooks:

1. An Introduction to Soil Reinforcement and Geosynthetics, G.L. Sivakumar Babu, Universities Press.
2. Engineering Principles of Ground Modifications, Hausmann, M. R., McGraw Hill Pub Co.
3. Designing with Geosynthetics, Robert M. Koerner, Kindle Edition.

References:

1. Engineering with Geosynthetics, Rao, G. V. & Raju G. V. S. S. TMH, New Delhi.
2. Ground Control and Improvement, Xianthakos, Abreimson and Bruce, John Wiley & Sons.
3. Ground Improvement, M. P. Moseley, K. Krisch, Taylor and Francis.

FINITE ELEMENT ANALYSIS
(Professional Elective – II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-405 **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	PO14
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

Unit-I **10 Hours**

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.

Unit-II **9 Hours**

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.

Unit-III **(5+5) 10 Hours**

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.

Unit-IV **10 Hours**

Introduction to Finite Element Analysis of Plates: Basic theory of plate bending - thin plate theory - stress resultants - Mindlin's approximations - formulation of 4-noded isoperimetric quadrilateral plate element – Shell Element.

Unit-V **9 Hours**

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.

PAVEMENT DESIGN
(Professional Elective – II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-409 **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	PO14
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

Unit-I **10 Hours**

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

Unit-II **9 Hours**

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

Unit-III **(5+5) 10 Hours**

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.

Unit-IV **10 Hours**

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

Unit-V **9 Hours**

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.

WATERSHED MANAGEMENT
(Professional Elective – II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-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	PO6	PO7	PO12	PO13
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

Unit-I **10 Hours**

Introduction, concept of watershed, need for watershed management, concept of sustainable development. Hydrology of small watersheds.

Unit-II **9 Hours**

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.

Unit-III **(5+5) 10 Hours**

Part A: Principles of water harvesting, methods of rainwater harvesting
Part B:design of rainwater harvesting structures.

Unit-IV **10 Hours**

Artificial recharge of groundwater in small watersheds-, methods of artificial recharge.

Unit-V **9 Hours**

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.

MUNCIPAL AND HAZARDOUS WASTE MANAGEMENT
(Professional Elective - III)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-402 **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	PO13
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

Unit-I **7 hours**

Solid Waste: Definition of solid wastes, types of solid wastes, sources, Industrial, mining, agricultural and domestic, characteristics, solid waste problems, impact on environmental health.

Unit-II **12 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **10 hours**

Biomedical Waste Management: Classification, collection, segregation treatment and disposal. radioactive waste: definition, low level and high level radioactive wastes and their management, radiation standards.

Unit-V **9 hours**

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.

ADVANCED STRUCTURAL ANALYSIS
(Professional Elective - III)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-406 **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	PO13
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

Unit-I **10 hours**

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.

Unit-II **9 hours**

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.

Unit-III **(5 + 5) 10 hours**

Part-A: Approximate Methods of Analysis: Introduction - Analysis of multi-storey frames for lateral loads: Portal Method. Cantilever method.
Part-A: Analysis of multi-storey frames for gravity (vertical) loads. Substitute Frame method.

Unit-IV **10 hours**

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.

Unit-V **9 hours**

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.

REMOTE SENSING AND GIS
(Professional Elective – III)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-410 **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	PO14
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

Unit-I **9 hours**

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

Unit-II **10 hours**

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

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **9 hours**

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

Unit-V **10 hours**

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.

STOCHASTIC HYDROLOGY
(Professional Elective – III)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-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	PO3	PO4	PO7	PO12	PO13
CO1	explain the concepts of stochastic hydrology	3	3	3	2	3
CO2	apply probability concepts to hydrology	3	3	3	2	3
CO3	test hypothesis and fit regression equation	3	3	3	2	3
CO4	apply time series data for autoregressive processes	3	3	3	2	3
CO5	develop model for operational hydrology	3	3	3	3	3

Unit-I **10 hours**

Deterministic and Stochastic Hydrology, Need for statistical methods in hydrology, Continuous, and Discrete distributions.

Unit-II **9 hours**

Moments and expectations, Parameter estimation, Probability plotting, Regional flood frequency analysis.

Unit-III **(5+5) 10 hours**

Hypothesis Testing, linear regression, Hydrologic Time Series Analysis - Modeling of Hydrology.

Unit-IV **9 hours**

Time Series - Data generation techniques, Autoregressive processes.

Unit-V **10 hours**

Models for operational hydrology.

Textbooks:

1. Stochastic Hydrology, Jaya Rami Reddy, Laxmi Publications.
2. Stochastic Process in Hydrology, N.T Kottegoda, PHI

Reference:

1. Statistical Methods in Hydrology, Charles T. Haan, East West Publishers

GROUND IMPROVEMENT TECHNIQUES
(Professional Elective – IV)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-403 **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	PO13
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

Unit-I **10 Hours**

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.

Unit-II **9 Hours**

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

Unit-III **(5+5) 10 Hours**

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

Unit-IV **10 Hours**

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.

Unit-V **9 Hours**

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 – IV)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-407 **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	PO14
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

Unit-I **10 hours**

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.

Unit-II **9 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **9 hours**

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.

Unit-V **10 hours**

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 – IV)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PEC-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	PO3	PO5	PO6	PO12	PO14
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

Unit-I **9 hours**

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

Unit-II **6 hours**

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.

Unit-III **(9 + 5) 14 hours**

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.

Unit-IV **10 hours**

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.

Unit-V **9 hours**

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.

URBAN HYDROLOGY AND HYDRAULICS
(Professional Elective – IV)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PEC-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	PO4	PO12	PO13
CO1	explain the concepts of urban hydrologic process	2	3	3	3	3
CO2	apply statistical approaches for storm water modelling	2	3	3	3	3
CO3	develop a model urban drainage system	3	3	3	3	3
CO4	asses and mitigate risks due to storm water	3	3	3	3	3
CO5	identify an effective urban drainage maintenance systems	2	3	3	3	3

Unit-I **10 hours**

Urban Hydrologic Process: Process of urbanization – Water in Urban ecosystem – Urban water subsystems – Urban hydrologic cycle. Impact of urbanization on urban runoff and stream flow quantity – Impact of urbanization on quality of runoff and stream flow – Erosion due to urban runoff

Unit-II **9 hours**

Storm water Modelling: Analysis of hydrologic changes due to urbanization- Approaches to study – Data collection and analysis – Probabilistic and statistical approaches.

Unit-III **(5 + 5) 10 hours**

Urban Drainage Systems: Sanitary and combined sewer systems – components – Design considerations for fixing sewer capacity – Infiltration into and exfiltration from sewers -causes – Infiltration inflow analysis – Field investigations –Control measures.

Unit-IV **9 hours**

Storm Water Management: Urban storm runoff quantity and quality management – Mitigation of damaging effects of urban storm runoff

Unit-V **10 hours**

Urban Drainage Systems Maintenance: Maintenance management of UDS and its subsystems – Drainage system – Storm drain conveyance system – Pump stations – Open channel – Illicit connections and discharges – Spill response – Other considerations, limitations and regulations.

Textbooks:

1. Stephenson. D, “Storm Water Hydrology and Drainage”, Elsevier Publications, 2nd Edition, 1981.
2. Hall. J.M, “Urban Hydrology”, Elsevier Applied Science Publishing Company, 1st Edition, 1984.

References:

1. Overtens D.E., and Medows M.E., “Storm water Modeling” Academic Press, 2nd Edition. 1976.
2. Grigg, N.S, “Urban Water Infrastructure Planning, Management, and Operations”, John Wiley & Sons, 2nd Edition, 1986.

ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-401 **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	PO10	PO12
CO1	identify the attributes to be considered for EIA	3	3	3	3
CO2	assess impact of deforestation	3	3	3	3
CO3	interpret impact prediction, significance of soil quality and mitigation	3	3	2	3
CO4	conduct environmental audit and prepare reports	3	3	2	3
CO5	illustrate environmental policies and provisions	3	3	3	3

Unit-I **10 hours**

Basic concept of EIA: Initial environmental Examination, Elements of EIA, factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

Unit-II **9 hours**

Assessment of impact of development activities on vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

Unit-III **(5 + 4) 9 hours**

Part A: Procurement of relevant soil quality, impact prediction, assessment of impact significance.

Part B: Identification and incorporation of mitigation measures for enhancement of soil quality.

Unit-IV **10 hours**

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

Unit-V **10 hours**

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Textbooks:

1. Environmental Pollution by R.K. Khitoliya S. Chand.
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications.

References:

1. Larry Canter – Environmental Impact Assessment, TMH.
2. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication.
3. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication, Pvt., Ltd., Delhi.

NON-CONVENTIONAL ENERGY SOURCES
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-403 **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
CO1	analyze global and national energy scenarios	3	3	3
CO2	illustrate the various solar energy systems	3	3	3
CO3	demonstrate the aspects related to wind energy power plants	3	3	3
CO4	build the power plants using bio gas	3	3	3
CO5	estimate the power generation in hydroelectric plants	3	3	3

Unit-I **10 hours**

Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO_2 reduction potential of renewable energy- concept of Hybrid systems.

Unit-II **9 hours**

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

Unit-III **(5 + 5) 10 hours**

Part-A: Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy.

Part-B: Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

Unit-IV **10 hours**

Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications.

Unit-V **9 hours**

Hydel Energy: Small hydro Power Plant - Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.

Textbooks:

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

PRINCIPLES OF COMMUNICATION SYSTEMS
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-405 **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	outline the fundamentals of communication systems	3	2	2	2
CO2	analyze various analog modulation and demodulation schemes	3	3	3	2
CO3	explain sampling theorem, pulse modulation and multiplexing techniques	3	3	3	2
CO4	illustrate digital modulation schemes	3	3	2	2
CO5	develop source and channel coding techniques	3	3	3	2

Unit-I **9 hours**

Fundamentals of communication systems: Block diagram of communication system; types of communications-analog and digital; Noise–types of noise, sources of noise, calculation of noise in linear systems, and noise figure.

Unit-II **10 hours**

Methods of Modulation: Need for modulation; Types of modulation, generation and detection of AM, DSB-SC, SSB-SC. Angle modulation: frequency & phase modulations, Narrow band and Wide band FM, comparison of AM, FM & PM.

Unit-III **(5 + 5) 10 hours**

Part-A: Pulse Modulations: Sampling theorem, Nyquist criteria, introduction to PAM, PWM and PPM.

Part-B: Multiplexing techniques: TDM, FDM, asynchronous multiplexing.

Unit-IV **10 hours**

Digital Communication: Advantages; Working principle of PCM; comparison of PCM, DM, ADM, ADPCM; introduction to digital modulation techniques-ASK, FSK, PSK, DPSK, QPSK.

Unit-V **9 hours**

Information Theory: Concept of information; rate of information and entropy; Coding efficiency-Shanon-Fano and Huffman coding; introduction to error detection and correction codes.

Textbooks:

1. Communication Systems Analog and Digital – R.P. Singh & SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

References:

1. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
2. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2nd Ed. 2004.

DATABASE MANAGEMENT SYSTEMS
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-407 **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

Unit-I **11 hours**

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.

Unit-II **9 hours**

Relational Model: 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.

Unit-III **(5 + 4) 9 hours**

Part-A: SQL Basics: DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, in operator.

Part-B: Functions: Aggregate functions, Built-in functions - numeric, date, string functions, set operations.

Unit-IV **10 hours**

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.

Unit-V **10 hours**

Normalization: Introduction, Normal forms - 1NF, 2NF, 3NF, BCNF, 4NF and 5NF, concept of De-normalization and practical problems based on these forms.

Textbooks:

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, TMH.
2. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 6th Edn, TMH.

INTELLECTUAL PROPERTY RIGHTS
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-409 **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	PO10	PO12
CO1	outline basics of intellectual property law	3	3	2	3	3
CO2	identify the various trademarks	3	3	2	3	3
CO3	analyze patent and copy rights law	3	3	3	3	3
CO4	differentiate trade secret and unfair practice	3	3	3	3	3
CO5	summarize new developments in Intellectual Property Rights	3	3	3	3	3

Unit-I **10 hours**

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

Unit-II **9 hours**

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

Unit-III **(5 + 4) 9 hours**

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, copy right registration, notice of copy right, international copy right law.

Part-B: Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Unit-IV **10 hours**

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

Unit-V **10 hours**

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.
International overview on intellectual property, international - trade mark law, copy right law, international patent law, international development in trade secrets law.

Textbooks:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddha ganguli, TMH.

TECHNICAL WRITING SKILLS LAB

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: HSMC-402 **- - 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	PO5	PO10
CO1	make use of language for understanding discourse and make notes	3	3
CO2	demonstrate command over using library resources for academic and other pursuits	3	3
CO3	apply knowledge of English language for creative and academic purposes	3	3
CO4	adapt principles in conveying good professional ethics	3	3
CO5	exhibit thorough awareness on research-oriented activities and career development	3	3

List of Experiments

1. Definition of Writing – difference between General and Academic writing process - gathering ideas for academic writing - organizing ideas into sentences –language of writing - analysis of material.
   Assignment: exercises on creative, academic and other written formats.

2. Note making and Note taking techniques - collecting notes - writing outlines – precis writing - writing rough drafts.
   Assignment: exercises on precise writing and note making & taking techniques.

3. Description of mechanisms and processes – Information transfer process – technical vocabulary.
   Assignment: information transfer exercises such as flow charts, pai charts, and discussion on technical vocabulary.

4. Library and Digital Resources - Internet as a Tool for research - reference and research techniques - Proposal writing.
   Assignment: exercises on information gathering techniques using various online and manual resources on the topic assigned; samples on abstracts and research proposals.

5. Technical writing – types – process of technical writing – style and language – editing strategies to achieve appropriate technical style.
   Assignment: dealing with samples of technical reports and writing reports.

6. Technical communication - audience analysis, and persuasion – understanding graphic aids in technical reports.
   Assignment: showing various graphs of sample reports.

7. Elements of the Formal Research Report – Thesis Writing - Title - Abstract – Synopsis – Conclusions – Suggestions - References.
   Assignment: samples of project reports and written exercises on elements mentioned.

8. Job hunt - Resume - Cover Letter - Networking and Professional Success - Sources of networking - Research about Job Profile, Company, Competitors & Industry - Body Language and Grooming.
   Assignment: exercises on cover letter, job application, emails, resume writing, etc. discussion on personality development techniques.

9. Plagiarism and Professional Ethics - understanding Plagiarism and Tools to check plagiarism - Ethics of Research - Engineering ethics - Awareness of Professional Ethics.
   Assignment: exploration of plagiarism checks mechanisms and discussion on professional ethics.

10. Presentation styles - Inforgraphics - types & tools for presentation - audience-centered presentations - cross-cultural communication.
    Assignment: exercises on Oral Presentation.

Text/Reference Books:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004.
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York,2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London,2004.
5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN:07828357-4)
6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi2002.
7. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN0402213)

ESTIMATION & COSTING LAB

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CE-PCC-413 **- - 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	PO14
CO1	find the quantities of building items using various methods	3	3	3
CO2	estimate quantity of 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	3	3	3
CO5	prepare the cost estimation for various structures	3	3	3

LIST OF EXPERIMENTS:

1. Estimation of building (long wall and short wall method).
2. Estimation of building (center line method).
3. Estimate the earth work quantity of a given road and canal work.
4. Analysis of rate for concrete work.
5. Analysis of rate for brick work.
6. Analysis of rate for plastering work.
7. Estimate quantity of reinforcement.
8. Preparation for approximate estimate for earthen road.
9. Preparation for approximate estimate for bitumen road.
10. Estimating cost of building on plinth area method.

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

1. Estimation of Building (Long Wall And Short Wall Method)
2. Estimation of Building (Center Line Method)
3. Estimate the Earth Work Quantity of A Given Canal Work
4. Analysis of Rate For Concrete Work
5. Analysis of Rate For Brick Work
6. Analysis of Rate For Plastering Work
7. Estimate Quantity Of Reinforcement
8. Preparation For Approximate Estimate For Earthen Road
9. Preparation For Approximate Estimate For Bitumen Road
10. Estimating Cost Of Building On Plinth Area Method

Reference:

1. Estimation and Costing Lab Manual, Department of Civil Engineering, CMRIT, Hyd.

PROJECT - I

IV-B.Tech.-I-Sem.	L	T	P	C
Subject Code: CE-PRJ-413	-	-	6	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 PO14
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:

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.

The project work normally includes:

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 / Modelling / 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.

SUMMER INTERNSHIP - II
MANDATORY COURSE (NON-CREDIT)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: MC-411 - - - -

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 PO14
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:

1. The student has to complete the internship for a period of 4 to 6 weeks during summer vacation between VI Semester & VII 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:
   e) Students have to approach respective course coordinator with name of proposed company / organization in which they wish to carry out internship.
   f) The Department shall nominate guide to supervise the interns.
   g) Student has to obtain a no objection certificate (NOC) in the prescribed format from the department and submit the same to the respective organization.
   h) 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 VII-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 VII-Semester result will not be declared till completion.

IV-B.TECH.-II-SEMESTER SYLLABUS

MANAGEMENT, ECONOMICS AND ACCOUNTANCY

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: HSMC-401 **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	apply principles of management in professional career	3	2
CO2	make use of principles of economics for decision making	3	2
CO3	solve problems in the areas of production, cost and price	3	2
CO4	prepare balance sheet and maintain books of accounts	2	3
CO5	analyze financial performance of an enterprise	3	3

Unit-I: Management concepts **10 hours**

Introduction to Management and organization, Scientific management, Modern management – Functions, objectives and scope of functional areas of management, Levels of management.

Unit-II: Introduction to Managerial Economics **10 hours**

Fundamental concepts of Managerial Economics, Concept of Law of Demand, Factors influencing and limitations, Concept of Elasticity of Demand, types and methods, Demand forecasting methods and limitations.

Unit-III: Theory of Production, Cost and Market Structure **(4 + 4) 8 hours**

Part-A: Types of Production function, input output relationship and types of costs, cost output relationship.

Part-B: CVP Analysis-BEP analysis assumptions, limitations and uses. Different market structures-Perfect & Monopoly Competition.

Unit-IV: Introduction to Accounts **14 hours**

Accounting Objectives, Functions, GAAP – Basics of Accounting - Rules for preparation of Journal and Ledger. Process of Journalisation and Subsidiary books. Preparation of Trading, Profit & Loss Accounts and Balance Sheet (Simple Problems).

Unit- V: Financial Statement Analysis **6 hours**

Concept of Financial Statement Analysis uses and limitations – Liquidity, Leverage, Activity, Turnover, Profitability Ratios (Simple problems).

References:

1. L.M. Prasad, Principles and Practices of Management, Revised Edition, S. Chand Publishing.
2. IM Pandey, Financial Management, 12th Edition, Vikas, 2017.
3. Philip Kotler, Kevin Lane Keller, Abraham Koshy and Mithleshwar Jha: Marketing Management, 15/e, Pearson Education, 2012.
4. K. Aswathappa, “Human Resource Management, Text and Cases”, TMH, 2016.
5. Panneerselvam “Production and Operations Management” PHI, 2017.

EARTHEN DAMS AND SLOPES STABILITY
(Professional Elective – V)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PEC-404 **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	PO13
CO1	outline the behaviour and design criteria of earthen dams	3	3	3	3
CO2	illustrate failures in dams and their control measures	3	3	3	3
CO3	analyze slope stability of earthen dams	3	3	2	3
CO4	explain various methods of slope stability	3	3	3	3
CO5	adapt suitable techniques for slope stabilization	3	3	3	3

Unit-I **10 Hours**

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.

Unit-II **9 Hours**

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.

Unit-III **(5+5) 10 Hours**

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.

Unit-IV **10 Hours**

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.

Unit-V **9 Hours**

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 – V)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PEC-408 **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	PO14
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

Unit-I **10 hours**

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

Unit-II **9 hours**

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

Unit-III **(5 + 5) 10 hours**

Part-A: Inspection and Testing - Symptoms and Diagnosis of Distress.
Part-B: Damage assessment – NDT.

Unit-IV **9 hours**

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

Unit-V **10 hours**

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.

MODERN TRANSPORTATION ENGINEERING
(Professional Elective – V)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PEC-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	PO7	PO12	PO13
CO1	illustrate classification of highway system	3	3	3	2	3
CO2	outline the features of port and harbour engineering	3	3	3	2	3
CO3	make use of GIS applications in transportation engineering	3	3	3	2	3
CO4	develop an effective railway transportation system	3	3	3	2	3
CO5	adapt airport engineering techniques	3	3	3	2	3

Unit-I **10 hours**

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.

Unit-II **9 hours**

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.

Unit-III **(5 + 5) 10 hours**

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.

Unit-IV **10 hours**

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.

Unit-V **9 hours**

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.

WATER RESOURCES SYSTEMS ANALYSIS
(Professional Elective – V)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PEC-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	PO3	PO5	PO6	PO12	PO13
CO1	apply optimization techniques to water resource systems	3	3	3	3	3	3
CO2	solve linear programming problems	3	3	3	3	3	3
CO3	adapt non-linear programming techniques	3	3	3	3	2	3
CO4	develop dynamic programming model	3	3	3	3	3	3
CO5	make use of concepts of water resources economics	3	3	3	3	3	3

Unit-I **10 hours**

Introduction: Definition of system, Types of systems, System approach, System analysis and types of systems, Techniques of water resources system analysis. Systems Techniques in Water Resources: Objective function and constraints, optimization using calculus, Optimization of a function of single variable, Optimization of a function of multiple variables, Constrained optimization, Kuhn – Tucker conditions.

Unit-II **7 hours**

Linear programming-I: Formulation of linear programming models, graphical method, simplex method, application of linear programming in water resources.

Unit-III **(7 + 7) 14 hours**

Part-A: Linear programming-II: Revised simplex method, duality in linear programming, sensitivity and post optimality analysis.

Part-B: Non-Linear programming: Classical optimization techniques, Lagrange methods, Kuhn-Tucker conditions, Search techniques, Overview of Genetic Algorithm.

Unit-IV **8 hours**

Dynamics programming: Belman's principles of optimality forward and backward recursive dynamic programming, curse of dimensionality, application of dynamic programming for resource allocation.

Unit-V **9 hours**

Water Resources Economics: Basics of Engineering economics, Discount factors, Uniform annual series, Amortization, Comparison of alternate plans. Principles of Economics analysis, Conditions of project optimality, benefit cost analysis socio economic intuitional and pricing of water resources.

Textbooks:

1. Water Resources System Analysis, Vedula.S and P. P Mujumdar, MGH Company.
2. Water Resources Economics, James D and R. Lee, Oxford Publishers.

References:

1. Water Resources Systems Planning and Management – An Introduction to Methods, Models and Applications, Loucks D P and E V Bee, UNESCO Publications.
2. Optimal design of water distribution networks, Bhave, P. R, Narosa,, Publishing house.

GREEN BUILDING TECHNOLOGIES
(Open Elective-III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-402 **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

Unit-I **10 hours**

Overview of the significance of energy use and energy processes in building: 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.

Unit-II **9 hours**

Indoor environmental requirement and management: Thermal comfort - Ventilation and air quality - Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

Unit-III **(5 + 5) 10 hours**

Part-A: Climate, solar radiation and their influences: Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation.

Part-B: Temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

Unit-IV **10 hours**

End-use, energy utilization and requirements: 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 - Evaluation of the overall thermal transfer.

Unit-V **9 hours**

Energy management options: Energy audit and energy targeting - Technological options for 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.
3. James Kachadorian, The Passive Solar House: Using Solar Design to Heat and Cool Your Home‖, Chelsea Green Publishing Co., USA.

FUNDAMENTALS OF ROBOTICS
(Open Elective-III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-404 **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 mechanical and electrical hardware for robot with feedback control	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

Unit-I **10 hours**

Introduction to Robotics: 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.

Unit-II **9 hours**

Robot Kinematics: Kinematics systems, Definition of mechanisms and manipulators, Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, Homogeneous Coordinate representation, DH parameters.

Unit-III **(5 + 4) 9 hours**

Part-A: Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc., Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean / Similarity / Affine / Projective transformations Vision applications in robotics.

Part-B: Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Unit –IV **10 hours**

Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID, Non-linear and advanced controls.

Unit-V **9 hours**

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

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.

FUNDAMENTALS OF EMBEDDED SYSTEMS
(Open Elective – III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-406 **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	outline the basic concepts of embedded computing	3	3	2	2
CO2	illustrate the architecture of 8051 microcontroller	3	3	3	2
CO3	develop embedded programs using 8051 microcontroller	3	3	3	2
CO4	demonstrate 8051 microcontroller interface with peripherals	3	3	3	2
CO5	explain real time operating system concepts	3	3	3	3

Unit-I **9 hours**

Embedded computing: Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples.

Unit-II **10 hours**

The 8051 architecture: Introduction, 8051 micro controller hardware, input / output ports and circuits, external memory, counter and timers, serial data input / output, interrupts.

Unit-III **(5 + 5) = 10 hours**

Part-A: Basic assembly language programming concepts: The assembly language programming process, programming tools and techniques, programming the 8051.

Part-B: Instructions set: Data transfer and logical instructions, arithmetic operations, decimal arithmetic. Jump and call instructions.

Unit – IV **9 hours**

Applications: Interfacing with keyboards, displays, D/A and A/D conversions, multiple interrupts, serial data communication.

Unit – V **10 hours**

Introduction to real - time operating systems: Tasks and task states, tasks and data, semaphores, and shared data; message queues, mailboxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment.

Textbooks:

1. Computers as Components - Principles of Embedded Computer System Design, Wayne Wolf, Elseveir.
2. The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.

References:

1. Microcontrollers, Raj kamal, Pearson Education.
2. An Embedded Software Primer, David E. Simon, Pearson Education.

WEB TECHNOLOGIES
(Open Elective – III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-408 **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

Unit-I **10 Hours**

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.

Unit-II **10 Hours**

PHP: 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, handling sessions and cookies, file handling.

Unit-III **(4 + 4) 8 Hours**

Part-A: XML: Basics of XML, Elements, Attributes, Name space, **Parsing:** DOM and SAX Parsers.
Part-B: Introduction to DTD: internal and external DTD, Elements of DTD, DTD Limitations, XML Schema, Schema structure, XHTML.

Unit-IV **10 Hours**

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.

Unit-V **10 Hours**

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

Text Books:

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.
3. Beginning Web Programming-Jon Dckett WROX.

PRINCIPLES OF ENTREPRENEURSHIP
(Open Elective – III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-410 **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

Unit-I: Entrepreneurship **10 hours**

The revolution impact of entrepreneurship- The evolution of entrepreneurship - Approaches to entrepreneurship- Process approach- Twenty first centaury trends in entrepreneurship.
Case: From candle seller to CEO (Arya Kumar P.No. 48).

Unit-II: Individual and corporate entrepreneurship **9 hours**

The entrepreneurial journey - Stress and the entrepreneur- the entrepreneurial ego- Entrepreneurial motivations- Corporate Entrepreneurial Mindset the nature of corporate entrepreneur.
Case: Globalizing Local Talent, (B. Janakiram, M. Rizwana, page 228).

Unit-III: Launching Entrepreneurial Ventures **(5 + 5) 10 hours**

Part-A: Opportunities identification - entrepreneurial Imagination and Creativity - the nature of the creativity Process - Innovation and Entrepreneurship - Methods to initiate Ventures.

Part-B: Creating New Ventures - Acquiring an established entrepreneurial venture – Franchising - hybrid disadvantage of Franchising.
Case: creativity in start-ups (Arya Kumar Page 166).

Unit-IV: Legal challenges of Entrepreneurship **9 hours**

Intellectual Property Protection-Patents, Copyrights, Trademarks and Trade Secrets-Avoiding Pitfalls- Formulation of the entrepreneurial Plan- The challenges of new venture start-ups.
Case: Tata Motors – Nano (Arya Kumar P.No. 279).

Unit-V: Strategic perspectives in entrepreneurship **10 hours**

Strategic Planning-Strategic actions-strategic positioning-Business stabilization-Building the adaptive firms-understanding the growth stage-unique managerial concern of growing ventures.
Case: To Lease or Not: A Cash flow Question (David H.Holt, Page 452).

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.

PROJECT - II

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CE-PRJ-421 **- - 22 11**

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 PO14
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:

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.

The project work normally includes:

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 / Modelling / 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.