**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

# Scheme of Teaching and Examination for V Semester B.E. CBCS, Academic Year: 2024-25

# 2022 Scheme: CIVIL ENGINEERING

**V SEMESTER**

| Sl. No | Course Category and Course Code | | Course Title | Teaching Dept. | Teaching Hours /Week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical | Self - Study | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | HSMS | 22CVT501 | Construction Project and Management | Civil | 3 | 0 | 0 | - | 03 | 50 | 50 | 100 | 3 |
| 2 | IPCC | 22CVU502 | Geotechnical Engineering | Civil | 3 | 0 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 3 | PCC | 22CVT503 | Design of RC Structural Elements | Civil | 3 | 0 | 0 | - | 03 | 50 | 50 | 100 | 4 |
| 4 | PCCL | 22CVL504 | Advanced Surveying Laboratory | Civil | 0 | 0 | 2 | - | 03 | 50 | 50 | 100 | 1 |
| 5 | PEC | 22CVT505X | Professional Elective Course | Civil | 3 | 0 | 0 | - | 03 | 50 | 50 | 100 | 3 |
| 6 | PROJ | 22CVM506 | Extensive Survey Project | Civil | 0 | 0 | 4 | - | 03 | 50 | 50 | 100 | 2 |
| 7 | AEC | 22RMT507 | Research Methodology and IPR | TD: CV PSB: EEE | 3 | 0 | 0 | - | 03 | 50 | 50 | 100 | 3 |
| 8 | MC | 22CVT508 | Environmental Studies | Civil | 2 | 0 | 0 | - | 02 | 50 | 50 | 100 | 2 |
| 9 | HS | 22CDN509 | Aptitude and Verbal Ability Skills | Placement | 2 | 0 | 0 | - | - | 50 | - | 50 | PP/NP |
| 10 | MC | 22NSN510 | National Service Scheme (NSS) | NSS | 0 | 0 | 2 | - | - | 100 | - | 100 | PP/NP |
| | | 22PEN510 | Physical Education (PE) (Sports and Athletics) | Physical Education | | | | | | | | | |
| | | 22YON510 | Yoga | Yoga Teacher | | | | | | | | | |
| | | | | | | | | | **Total** | **550** | **400** | **950** | **22** |

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, S= Self-Study CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K: The letter in the course code indicates common to all the stream of Engineering. PROJ: Project /Mini Project. PEC: Professional Elective Course

**Professional Elective Course 22CVT505X**

| | | | |
|---|---|---|---|
| 22CVT505A | Solid Waste Management | 22CVT505C | Pavement Design |
| 22CVT505B | Advanced Concrete Technology | 22CVT505D | Masonry Structures |

**Professional Core Course (IPCC):**

Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

**National Service Scheme /Physical Education/Yoga:**

All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

**Mini-project work:**

Mini Project is a laboratory-oriented/hands-on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

**CIE procedure for Mini-project:**

**(i) Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

**(ii) Interdisciplinary:** Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

**No SEE component for Mini-Project.**

**Professional Elective Courses (PEC):**

A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of Engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

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**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **CONSTRUCTION PROJECT AND MANAGEMENT** | | | | | | |
| Course Code | **22CVT501** | | | | | | |
| Category | **(HSMS)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objectives:** The course will enable students to understand the concept of planning, scheduling, cost and quality control, safety during construction, organization & use of project information necessary for construction project and inculcate Human values to grow as responsible human beings with proper personality, keeping up ethical conduct and discharge professional duties.

**UNIT – I** **8 Hours**

**MANAGEMENT**:

Characteristics of management; Functions of management; Importance and purpose of planning process; Types of plans.

**CONSTRUCTION PROJECT FORMULATION**:

Introduction to construction management; Project organization; Management functions; Management styles; Project communication protocol.

**UNIT – II** **8 Hours**

**CONSTRUCTION PLANNING AND SCHEDULING**:

Introduction; Types of project plans; Stakeholders in management, Work breakdown structure; Gaant Chart, Concept of activity on arrow and activity on node; Preparation of network diagram- event and activity based and its critical path; Critical path method; PERT method; Crashing of activities.

**UNIT – III** **8 Hours**

**RESOURCE MANAGEMENT**:

Basic concepts of resource management, class of labour; Wages and statutory requirement; Labour Production rate or Productivity; Factors affecting labour output or productivity.

**CONSTRUCTION QUALITY AND SAFETY**:

Construction quality process; Inspection; Quality control and quality assurance; Cost of quality; ISO standards. Introduction to concept of Total Quality Management.

**UNIT – IV** **8 Hours**

**HEALTH SAFETY AND ENVIRONMENT (HSE)**:

Introduction to concepts of HSE as applicable to Construction; Importance of safety in construction; Safety measures to be taken during- Excavation; Explosives, Drilling and blasting, Hot bituminous works, Scaffolds / platforms / ladder, Form work and equipment operation, Storage of materials.

Safety through legislation; Safety campaign; Insurances.

**MATERIALS**:

Introduction to material management; Material management functions; Inventory management.

**UNIT – V** **8 Hours**

**ETHICS & HUMAN VALUES**:

Morals; Values; Ethics; Integrity; Trustworthiness; Work ethics; Need of engineering ethics; Professional Duties; Professional and Individual Rights; Confidential and Proprietary Information; Conflict of Interest Confidentiality; Gifts and Bribes; Price Fixing; Whistle Blowing.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Prepare a project plan as per requirements, prepare schedule of a project by understanding the activities and their sequence. |
| CO2 | Understand labour output and resource allocation required for an activity/project to achieve desired quality and safety. |
| CO3 | Establish as an ethical entrepreneur and establish an enterprise utilizing the provisions offered by the federal agencies. |

| **Teaching & Learning Process:** |
|---|
| Chalk and talk, Power point presentations. |

| **Text Books:** | |
|---|---|
| 1 | Tripathi, P. C., and P. N. Reddy. "Principles of Management", 6th edition, 2017. |
| 2 | Chitkara, K. K. "Construction Project Management" Tata McGraw-Hill Education, 2010. |
| 3 | Seetharaman, S. "Construction Engineering and Management" Umesh Publications, 2014. |
| **Reference Books:** | |
| 1 | U.K. Shrivastava "Construction Planning and Management", Galgotia Publications, New Delhi, 2000. |
| 2 | Choudhury, Sadhan. "Project Management" Mc Graw Hill Education, 2019. |
| 3 | Charantimath, Poornima M. "Entrepreneurship Development and Small business enterprises" Pearson Education India, 2018. |
| 4 | Clough, Richard H., Glenn A. Sears, and S. Keoki Sears. "Construction project management" John Wiley & Sons, 2021. |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5$^{th}$ week of the semester and Second test at the end of the 10$^{th}$ week of the semester.
- ✓ The makeup test at the end of the 15$^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4$^{th}$ week and Second assignment at the end of 9$^{th}$ week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13$^{th}$ week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.

• The students will have to answer five full questions, selecting one full question from each unit.

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | ✓ | | | | | | | | | | ✓ | ✓ |
| CO2 | ✓ | | ✓ | | | | | | | | | ✓ |
| CO3 | | | | | | | | ✓ | ✓ | | ✓ | ✓ |

| Course Title | **GEOTECHNICAL ENGINEERING** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **22CVU502** | | | | | | |
| Category | **Integrated Professional Core Course (IPCC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **2** | **0** | **5** | **50** | **04** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objective:** To understand the importance of soil and its properties in Civil Engineering applications. To demonstrate the index properties and engineering properties of different soils. To interpret the various factors influencing the soil behavior. To summarize the significance of soils and its behavior in various applications of Civil Engineering.

**UNIT – I** **8 Hours**

**SOIL IN ENGINEERING PRACTICE:**

Phase representation diagram, Basic definitions of terms - Voids ratio, Porosity, Air content, Degree of saturation, Percentage Air Voids, Water content, Specific Gravity of soil solids and soil mass, Unit weights - Dry, Bulk, Saturated and Submerged and their inter relationships.

**INDEX PROPERTIES OF SOIL AND THEIR DETERMINATION:**

Water content, Specific gravity of soil solids, Particle size distribution, In-situ density, Relative Density, Consistency limits.

**UNIT – II** **8 Hours**

**SOIL CLASSIFICATION SYSTEM:**

Field identification of soils, IS classification, IS Plasticity chart.

**PERMEABILITY:**

Darcy's law - assumption and validity, Seepage velocity, Discharge velocity and coefficient of percolation. Factors affecting permeability, Coefficient of permeability and its determination - laboratory and field.

**UNIT – III** **8 Hours**

**GEO-STATIC STRESSES:**

Concept of effective stress under different conditions of soils (Submerged soil mass, Partially submerged, Surcharge and soil mass with Capillary rise), Stresses affected by direction of flow of water (Upward and downward) and Quick sand phenomena.

**SEEPAGE ANALYSIS:**

Flow nets – characteristics and applications, Flow nets for sheet piles and below dam. Phreatic line – A. Casagrande's method – with and without filter, Pipe failure, Heave failure, Design of dam filters.

**UNIT – IV** **8 Hours**

**COMPACTION OF SOIL:**

Standard Proctor's compaction test, Factors affecting compaction, Effect of compaction on different properties of soil, Field compaction control, Proctor's needle, Compacting equipments and their suitability.

**CONSOLIDATION OF SOIL:**

Terzaghi's Mass - Spring analogy, Terzaghi's 1-D consolidation theory, Pre-consolidation pressure and its estimation by A. Casagrande's method. Laboratory 1-D consolidation test, Determination of consolidation characteristics of soils - Compression index and Coefficient of consolidation.

**UNIT – V** **8 Hours**

**SHEAR STRENGTH OF SOIL:**

Concept of shear strength, Mohr's Circle construction, Mohr's - Coulomb's theory, Terzaghi's total and effective stress principle, Classification of shear tests based on drainage conditions and simulate their field conditions, Measurement of shear strength parameters: Direct shear box test, Tri-axial compression test, Unconfined compression test and Vane shear test, Skempton's pore pressrue coefficients.

| Expt. No | LABORATORY EXPERIMENTS: | No. of sessions |
|---|---|---|
| 1 | Tests for determination of Specific gravity and Water content. | **10** |
| 2 | Wet Sieve analysis and Hydrometer analysis. | |
| 3 | Relative density of sand. | |
| 4 | Consistency Limits. | |
| 5 | Compaction Test and Proctor needle. | |
| 6 | Constant head and variable head permeability Test. | |
| 7 | Direct Shear Box Test. | |
| 8 | Unconfined Compression Strength Test. | |
| 9 | Consolidation Test. | |
| | Demonstrations:<br>✓ Vane shear test.<br>✓ Tri-axial Compression Test. | |

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

| **Course Outcomes:** At the end of the course the student will be able to: | |
|---|---|
| CO1 | Understand the index properties of soils and analyse the data to identify and classify the soils. |
| CO2 | Discuss the permeability, effective stresses and seepage in soils. |
| CO3 | Explain the concepts and evaluate compressible characteristics and shear strength parameters of soil. |

| **Text Books:** | |
|---|---|
| 1 | "Soil Mechanics and Foundation Engineering", Punmia B. C. and Jain A. K. (2005), 17th Edition Laxmi Publications Co., New Delhi. |
| 2 | "Soil Mechanics and Foundation Engineering (Geotechnical Engineering): In SI Units", Arora, K. R. (2008), 7th Edition, Standard publishers. New Delhi. |
| 3 | "Basic and Applied Soil Mechanics", Ranjan G. and Rao A.S.R. (2011), New Age International (P) Ltd., New Delhi. |
| 4 | "Geotechnical Engineering", Braja, M. Das (2002), 5th Edition, Thomson Business Information India (P) Ltd., India |

| **Reference Books:** | |
|---|---|
| 1 | "Principles of Soil Mechanics and Foundation Engineering", Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi. |
| 2 | "Foundation analysis and design", Bowles J. E. (1988), 5th Edition, McGraw- Hill Publications. New Delhi. |
| 3 | "Manual of Soil Laboratory Testing", Head K.H., (2006), 3rd Edition, Vol. I, II, III, Princeton Press, London. |
| 4 | BIS Codes of Practice: IS: 2720(Part-3/Sec. 1) – 1987; IS: 2720 (Part – 2)- 1973; IS: 2720 (Part – 4) – 1985; IS: 2720 (Part – 5) – 1985; IS: 2720 (Part – 6) – 1972; IS: 2720 (Part – 7) – 1980; IS: 2720 (Part – 8) – 1983; IS: 2720 (Part – 17) – 1986; IS: 2720 (Part - 10) – 1973; IS: 2720 (Part – 13) – 1986; IS: 2720 (Part 11) – 1971; IS: 2720 (Part 15) – 1986; IS: 2720 (Part 30) – 1987; IS: 2720 (Part 14) – 1977; IS: 2720 (Part – 14) – 1983; IS: 2720 (Part – 28) – 1974; IS: 2720 (Part – 29) – 1966, IS: 2720 (Part-60) 1965. |

**Process of Ascertaining (both CIE and SEE):**

**Continuous Internal Evaluation (CIE):**

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

**(i) Assessment of CIE theory component: (30 Marks)**

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

**(ii) Assessment of CIE theory component: (20 Marks)**

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

**(iii)Calculation of Final CIE marks for IPCC course:**

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

$$CIE\ score = (Test\ 1 + Test\ 2) \times 0.6 + Laboratory\ Component$$

**Passing standard in CIE:**

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

**Passing Standards in SEE:**

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

**Weightage of CIE and SEE:**

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

**Question paper pattern:**

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | | | | | | | | | | ✓ |
| CO2 | ✓ | ✓ | | ✓ | | | | | | | | ✓ |
| CO3 | ✓ | ✓ | | ✓ | | | | | | | | ✓ |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **DESIGN OF RCC STRUCTURAL ELEMENTS** | | | | | | |
| Course Code | **22CVT503** | | | | | | |
| Category | **Professional Core Course (PCC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **4** | **0** | **0** | **0** | **4** | **50** | **4** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objectives:** Understand the concepts of limiting, short-term, and long-term deflections in structural elements. It includes practical design examples for simply supported and cantilever beams with rectangular and flanged sections, the design of slabs under various boundary conditions, and the design of stairs. Additionally, it addresses the design of columns subjected to uniaxial and biaxial moments.

**UNIT – I** **10 Hours**

**INTRODUCTION**

Introduction to Limit State Design and Serviceability: Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety.

Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section.

Limiting deflection, short-term deflection, long-term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slender limits of beams for stability.

**UNIT – II** **10 Hours**

**ANALYSIS AND DESIGN OF BEAMS:**

Analysis of singly reinforced, doubly reinforced, flanged sections, shear strength and development length. General Specification for flexure design of beams. Practical requirements, size of beam, cover to reinforcements pacing of bars. General aspects of serviceability and deflection limits as in IS code.

Design procedures for critical sections for moment and Design for shear. Anchorages of bars, check for development length. Reinforcement requirements, Slenderness limits for beams to ensure lateral stability. Design examples for Simply supported and Cantilever beams for Rectangular and Flanged sections.

**UNIT – III** **10 Hours**

**DESIGN OF SLABS**

Introduction to one-way and two-way slabs, Design of cantilever, simply supported and one-way continuous slab. Design of two-way slabs for different boundary conditions.

**UNIT – IV** **10 Hours**

**DESIGN OF STAIRS:**

Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.

**UNIT – V** **10 Hours**

**DESIGN OF COLUMNS AND FOOTINGS:**

Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments. Design concepts of the footings. Design of Rectangular and square column footings with axial load and uniaxial moment

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Differentiate between the Working Stress Method and the Limit State Method, comprehending key concepts such as Modular Ratio, Factor of Safety, Partial Safety Factors, and Stress Block Parameters. |
| CO2 | Calculate deflections and crack widths in singly reinforced beams, understanding the factors affecting stability and serviceability in reinforced concrete structures. |
| CO3 | Design critical sections for moment and shear in beams and slabs, including considerations for anchorages, development length, reinforcement requirements, and slenderness limits. |

| | |
|---|---|
| CO4 | Analyse and design short axially loaded RC columns, columns with uniaxial and biaxial moments, and footings, ensuring structural integrity under various loading conditions. |

**Teaching & Learning Process:** Chalk and talk, Power point presentations, Animations and Videos.

| | |
|---|---|
| **Text Books:** | |
| 1 | Design of Reinforced Concrete Structures- Unnikrishnan and Devadas Menon, 4th Edition, 2021, McGraw Hill, New Delhi, ISBN 978-9354601026 |
| 2 | Design of RCC Structural Elements – S. S. Bhavikatti, Vol-I, 4th Edition, 2022, New Age International Publications, New Delhi. |
| **Reference Books:** | |
| 1 | Design of Reinforced Concrete Structures- Krishnaraju N, 4th Edition, CBS Publishers and Distributors, New Delhi, 2017, eISBN 978-93-890-1701-4 |
| 2 | Limit State Design of Reinforced Concrete- Varghese P.C, 2nd Edition, Eastern Economy Edition, Prentice –Hall of India Pvt Ltd, New Delhi, 2004, ISBN 9788120320390. |
| 3 | Fundamentals of Reinforced concrete Design-by M.L. Gambhir, PHI Learning Private Limited 2008-2009. |
| 4 | IS 456:2000, SP 16 Table, SP 34, IS 875 Part (I & II). |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

• The question paper will have ten full questions carrying equal marks.

- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | ✓ | ✓ | | | | | | | | | | ✓ |
| CO2 | ✓ | ✓ | ✓ | | | | | | | | | ✓ |
| CO3 | ✓ | ✓ | ✓ | | | | | | | | | ✓ |
| CO4 | ✓ | ✓ | ✓ | | | | | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **ADVANCED SURVEYING LABORATORY** | | | | | | |
| Course Code | **22CVL504** | | | | | | |
| Category | **Professional Core Course Laboratory (PCCL)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **0** | **0** | **2** | **0** | **2** | **24** | **01** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objective:** To provide basic knowledge of levelling using total station and can be applied in construction of civil engineering projects which helps in developing skills for using modern surveying instruments and methods such as Total station and to familiarize in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works which are used for abstracting the information of earth surface.

| Sl. No. | Syllabus Contents | No. Sessions |
|---|---|---|
| 1 | Determination of height and remote elevation of an object using total station. | 10 |
| 2 | Determination of distance and gradient between inaccessible points using total station. | |
| 3 | Setting out the section in the field using total station (T, L, C & U sections). | |
| 4 | Setting out of pentagon using total station. | |
| 5 | Determination of area using total station and drawing map. | |
| 6 | Perform the longitudinal and cross sectional levelling. | |
| 7 | Traversing using total station for drawing contour map. | |
| 8 | Setting out simple curve using total station. | |
| 9 | Setting out work for a given plan of a building. | |
| 10 | Setting out work for marking the column position using total station. | |

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Understand how to find distance, height, difference in elevation and area using total station. |
| CO2 | Develop the profile of the ground and curve setting in the transportation network system. |
| CO3 | Applying the stake out operation in marking the position of the column and other in the construction work. |

| **Text Books:** | |
|---|---|
| 1 | Surveying Vol. 1, 2 & 3. B. C. Punmia, Ashok Kumar Jain, Arun Kuma Jain, Lakshmi publication, 17th edition, (2015) |
| 2 | Surveying and leveling, T P Kanetkar, Pune Vidyarthi Griha Prakashan, Pune Vidyarthi Griha Prakashan publisher, 3rd edition, (2019). |
| **Reference Books:** | |
| 1 | Surveying and Leveling, 2nd edition – R Subramanian. Oxford University Press (2007) Publisher. |
| 2 | Fundamentals of Surveying, Milton O. Schimidt – Wong, Thomson, CengageLearning Publishing, 3rd edition (2013). |

| **Question paper pattern:** |
|---|
| The candidate has to conduct one experiment which carries 70 % of the total marks and viva-voce for 30 % of the total marks. |

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | ✓ | | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO2 | ✓ | | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO3 | | ✓ | ✓ | | ✓ | | | | | | ✓ | |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **ENVIRONMENTAL STUDIES** | | | | | | |
| Course Code | **22CVT508** | | | | | | |
| Category | **Mandatory Course (MC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **1** | **0** | **0** | **0** | **1** | **15** | **01** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 02 hours** | | |

**Course Learning Objective:**

Understand the interdisciplinary nature of environmental studies and its importance in addressing global and local environmental challenges. Comprehend the basic ecological principles, components of ecosystems, and the impacts of human activities on ecosystems and biodiversity. Recognize the classification and sustainable management of natural resources, along with the sources and consequences of environmental pollution. Gain knowledge of climate change, renewable energy sources, and their role in mitigating climate change, as well as understand the importance of environmental conservation and sustainable practices for a more sustainable future.

| | |
|---|---|
| **UNIT-1** | **3 Hours** |
| **INTRODUCTION TO ENVIRONMENTAL STUDIES:** Definition and scope of environmental studies. Interdisciplinary nature of environmental studies. Environmental issues and challenges at the global and local levels. Importance of sustainable development and environmental conservation. | |
| **UNIT-2** | **3 Hours** |
| **ECOLOGICAL CONCEPTS AND ECOSYSTEMS:** Basic ecological principles and concepts. Components of an ecosystem: biotic and abiotic factors. Ecological relationships and interactions**.** Human impacts on ecosystems and biodiversity loss | |
| **UNIT-3** | **3 Hours** |
| **NATURAL RESOURCES AND ENVIRONMENTAL POLLUTION:** Classification and importance of natural resources (water, air, soil, minerals, forests, agricultural land, marine resources). Sustainable use and management of natural resources. Types and sources of environmental pollution (water, air, soil, noise). Impact of pollution on human health and the environment | |
| **UNIT-4** | **3 Hours** |
| **CLIMATE CHANGE AND RENEWABLE ENERGY:** Causes and consequences of climate change. Mitigation and adaptation strategies for climate change. Introduction to renewable energy sources (solar, wind, hydro, geothermal, biomass, hydrogen fuel). Role of renewable energy in combating climate change | |
| **UNIT-5** | **3 Hours** |
| **ENVIRONMENTAL CONSERVATION AND SUSTAINABLE PRACTICES:** Biodiversity conservation and endangered species protection**.** Waste management and recycling practices**.** Sustainable agriculture and food systems. Environmental policies, regulations, and international agreements | |
| | |
| **Teaching & Learning Process:** Chalk and talk, Power point presentations, Animations and Videos. | |

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Develop a comprehensive understanding of the interdisciplinary nature of environmental studies and its significance in addressing global and local environmental challenges. |
| CO2 | Apply ecological principles and concepts to analyse and evaluate the components of ecosystems, as well as assess the impacts of human activities on ecosystems and biodiversity. |
| CO3 | Demonstrate knowledge of the classification and sustainable management of natural resources, and evaluate the sources and consequences of environmental pollution. |
| CO4 | Recognize the causes and consequences of climate change, identify renewable energy sources, and evaluate their role in mitigating climate change. Additionally, demonstrate an understanding of the |

| | |
|---|---|
| | importance of environmental conservation and sustainable practices for creating a more sustainable future. |

| **Text Books:** | |
|---|---|
| 1 | R. Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005. |
| 2 | Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", Universities Press (India) Private Limited, 2019. |
| 3 | Singh, J.S., Singh, S.P., and Gupta, S.R.). "Ecology, Environmental Science and Conservation". S. Chand Publishing, New Delhi, 2017. |
| 4 | D K Asthana, "Text Book of Environmental Studies", S Chand Publishing, 2010 |

| **Reference Books** | |
|---|---|
| 1 | Dr. J. P Sharma, "Environmental Studies", Laxmi Publications Pvt Ltd, 2017. |
| 2 | Benny Joseph, "Environmental Studies", Tata McGraw-Hill Publishing company Limited, 2008. |
| 3 | G.T.Miller Jr., "Environmental Science", 11th Edition, Cenage Learning Pvt. Ltd., 2008. |
| 4 | Singh, J.S., Singh, S.P., and Gupta, S.R.). "Ecology, Environmental Science and Conservation". S. Chand Publishing, New Delhi, 2017. |

**Process of Assessment (both CIE and SEE):**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% ( 18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

**Continuous internal Examination (CIE)**

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5$^{th}$ week of the semester
2. Second test at the end of the 10$^{th}$ week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4$^{th}$ week of the semester
2. Second assignment at the end of 9$^{th}$ week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for50 marks and shall be scaled for the same.

**Semester End Examinations (SEE)**

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | ✓ | ✓ | | | | | ✓ |
| CO2 | ✓ | | | | | ✓ | ✓ | | | | | ✓ |
| CO3 | ✓ | | | | | ✓ | ✓ | | | | | ✓ |
| CO4 | ✓ | | | | | ✓ | ✓ | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **SOLID WASTE MANAGEMENT** | | | | | | |
| Course Code | **22CVT505A** | | | | | | |
| Category | **Professional Elective Course (PEC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objective:**

Understand the key principles and concepts of integrated solid waste management (ISWM), including waste generation, collection, treatment, and disposal. Analyze and evaluate different waste management strategies and technologies, considering their environmental, health impacts. Apply practical knowledge of waste reduction, recycling, composting, and energy recovery techniques to develop sustainable waste management plans. Demonstrate the ability to develop and implement comprehensive ISWM plans that align with regulatory requirements, community needs, and sustainability goals.

**UNIT – I** **8 Hours**

**INTRODUCTION AND WASTE GENERATION ASPECTS**:

Sources, types, functional elements of solid waste management, factors affecting solid waste generation and management, waste characteristics, health and environmental effects. Numerical on moisture content, density and energy content.

**UNIT – II** **8 Hours**

**WASTE PROCESSING TECHNIQUES:**

Purpose of processing, volume and size reduction, component separation, significance of source reduction, product recovery and recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and processes.

**COLLECTION, STORAGE, TRANSPORT OF WASTES:**

Collection components, storage-containers/collection vehicles, collection operation and route optimization, need and types of transfer stations, location of transfer station. Estimation of solid waste quantities.

**UNIT – III** **8 Hours**

**BIOLOGICAL CONVERSION TECHNOLOGIES:**

Definition of compost, classification of composting, key process variables of composting, different types of composting- aerobic composting, windrow composting, in-vessel composting, aerated static pile composting, vermicomposting, anaerobic composting. Site selection and design of composting. Specifications for composting as per Solid Waste Management Rules-2016.

**THERMAL CONVERSION TECHNOLOGIES:**

Definition of thermal process, categories of thermal conversion, Combustion Systems-Mass fired combustion systems, RDF-Fired combustion system, Fluidized bed combustion. Pyrolysis Systems, Gasification Systems. Environmental and air pollution control systems. Air Quality standards as per Solid Waste Management Rules-2016.

**UNIT – IV** **8 Hours**

**DISPOSAL OF SOLID WASTES:**

Sanitary landfills- Definition, environmental impact and its minimization, Landfilling methods-trench method, area method and canyon method. Essential components, site selection, landfill planning and design. Generation, movement and control of landfill gases. Formation, movement and control of leachate. Different types of Liner systems. Landfill closure and post closure care. Numerical on landfill area estimation. Specifications for Sanitary Landfills as per Solid Waste Management Rules-2016.

**UNIT – V** **8 Hours**

**SPECIAL WASTE MANAGEMENT:**

Definition, importance of special waste Management, Automotive Wastes, Construction and Demolition Wastes, Electronic Wastes, Industrial Solid Wastes, Medical Wastes, Plastic Wastes, Lead Battery

| |
|---|
| Wastes (environmental significance, recovery, recycle and current management systems). Waste Management Laws in India. |

| |
|---|
| **Teaching & Learning Process:**<br>Chalk and talk, Power point presentations, Animations and Videos and waste collection and disposal site visit. |

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Narrate the basics of solid waste management towards sustainable development. |
| CO2 | Apply technologies to process waste for product and energy recovery options. |
| CO3 | Comprehend the principles and practices involved in the safe and environmentally sound disposal Technique. |
| CO4 | Analyze the need for special wastes management for safe and sustainable disposal. |

| **Text Books:** | |
|---|---|
| 1 | Integrated Solid Waste Management: Tchobanoglous: M/c Graw Hill. 2012 |
| 2 | Solid Waste Management in developing countries. Bhide and Sunderashan. 2017 |
| 3 | Environmental Engineering – Vol II.: S.K. Garg. 2015 |

| **Reference Books:** | |
|---|---|
| 1 | Ramesha Chandrappa and Diganta Bhusan Das "Solid Waste Management: Principles and Practice", Springer Berlin Heidelberg, 2012. |
| 3 | William A. Worrell and P. Aarne Vesilind, "Solid Waste Engineering", Cengage Learning Inc, 2012. |
| 4 | Dr. R.Saravanan, "Municipal Solid Waste Management", Suchitra Publications, 2017. |
| 5 | P. White, M. Franke, P. Hindle "Integrated Solid Waste Management: A Lifecycle Inventory", 1995. |
| 6 | Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, "Environmental Engineering", McGraw Hill International Editions, 1985. |
| 7 | Sunil Kumar, "Municipal Solid Waste Management in Developing Countries", CRC Press, 2016. |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5$^{th}$ week of the semester and Second test at the end of the 10$^{th}$ week of the semester.
- ✓ The makeup test at the end of the 15$^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4$^{th}$ week and Second assignment at the end of 9$^{th}$ week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13$^{th}$ week of the semester the sum of two tests, two assignments and Group

discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.

- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | | ✓ | | | | | ✓ |
| CO2 | ✓ | ✓ | | | | | ✓ | | | | | ✓ |
| CO3 | ✓ | | | ✓ | | | ✓ | | | | | ✓ |
| CO4 | ✓ | | | | | | ✓ | | | | | ✓ |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **ADVANCED CONCRETE TECHNOLOGY** | | | | | | |
| Course Code | **22CVT505B** | | | | | | |
| Category | **Professional Elective Course (PEC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objectives:** The course will provide a broad background of concrete construction with modern concrete construction materials with emphasis on performance and sustainability. This course will focus on design and control of concrete proportions to achieve desired properties and performance, particularly those of specialized concrete mixtures such as Light weight concrete, Ferro cement, Fiber-Reinforced Concrete, Self-Compacting Concrete and also to know the properties and applications of other special concrete like HPC, Geopolymer concrete, Bacterial concrete and Nano concrete.

**UNIT – I** **8 Hours**

**CONSTITUENTS OF MODERN CONCRETE:**

Role of constituents, Development in cements and cement replacement materials, pozzolona, fly ash, silica fume, rice husk ash, recycled aggregates, chemical admixtures. Mix proportioning of Concrete: Principles and methods.

**UNIT – II** **8 Hours**

**LIGHT WEIGHT CONCRETE:**

Introduction, classification, properties, strength and durability, mix proportioning and design problems.

**HIGH DENSITY CONCRETE:**

Radiation shielding ability of concrete, materials for high density concrete, properties in fresh and hardened state, placement methods.

**UNIT – III** **8 Hours**

**FERRO CEMENT:**

Ferro cement materials, mechanical and durability properties, cracking of ferro cement, strength and behaviour in tension, compression and flexure, ferro cement constructions and applications.

**UNIT – IV** **8 Hours**

**FIBRE REINFORCED CONCRETE*:***

Fiber materials, distribution and orientation, properties in fresh state, strength and behavior in tension, compression and flexure of steel fiber reinforced concrete, mechanical properties, crack arrest and toughening mechanism, applications.

**UNIT – V** **8 Hours**

**SELF COMPACTING CONCRETE:**

Constituents, mix proportioning, properties in fresh and hardened states, design, applications and limitations.

**SPECIAL CONCRETE:**

High performance concrete, Geopolymer Concrete, Nano concrete and Bacterial concrete.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Understand the range of material types, their properties and how these materials impact the performance of concrete mixtures. |
| CO2 | Summarise the concepts of conventional concrete and its differences with other concretes like ferro cement, light weight concrete, high density concrete, fibre reinforced concrete etc. |
| CO3 | Design and develop a concrete mix design as per codal provisions. |
| CO4 | Discuss the application and use of various special concrete. |

**Teaching & Learning Process:**

| |
|---|
| Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory. |

| **Text Books:** | |
|---|---|
| 1 | M.S.Shetty, "Concrete Technology" - Theory and Practice, S.Chand and Company, New Delhi, 2002. |
| 2 | "Concrete Technology (Trade, Technology & Industry)", George White, Delmar Cengage Learning, 1991. |
| 3 | "Concrete: Microstructure, Properties, and Materials", P. Kumar Mehta, Paulo J. M. Monteiro, McGraw-Hill Education, 2017. |
| 4 | Neville, A.M., "Properties of Concrete", ELBS, London, Pearson Education India, 2012. |
| 5 | A.R.Santakumar, "Concrete Technology" –. Oxford University Press (2007)' |
| 6 | "Advanced Concrete Technology", Zongjin Li, Wiley; 1 edition |

| **Reference Books:** | |
|---|---|
| 1 | Gambhir Dhanpat Rai & Sons , "Concrete Manual" -, New Delhi |
| 2 | Rudnai.G. "Light Wiehgt concrete"- Akademiaikiado, Budapest, 1963. |
| 3 | Rixom.R. and Mailvaganam.N., "Chemical admixtures in concrete"- E and FN, Spon London 1999 |
| 4 | Aitcin P.C. "High performance concrete"-E and FN, Spon London 1998 |
| 5 | IS: 10262-2009, IS: 456- 2000 |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of $5^{th}$ week of the semester and Second test at the end of the $10^{th}$ week of the semester.
- ✓ The makeup test at the end of the $15^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of $4^{th}$ week and Second assignment at the end of $9^{th}$ week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the $13^{th}$ week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | ✓ | | | | | | ✓ | | | | | ✓ |
| CO2 | ✓ | ✓ | ✓ | | | | | | | | | ✓ |
| CO3 | ✓ | ✓ | | | | | | | | | | ✓ |
| CO4 | ✓ | ✓ | ✓ | | | | | | | | | ✓ |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **PAVEMENT DESIGN** | | | | | | |
| Course Code | **22CVT505C** | | | | | | |
| Category | **Professional Elective Course (PEC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objectives:** Gain knowledge about collecting data required for design, factors affecting pavement design, and pavement maintenance. Excel in the path of stress, strain, and deflection analysis in pavement. Understand design concepts of flexible pavement by various methods (CBR, IRC 37-2018, Mcleods, Kansas) and rigid pavement by IRC 58-2015. Understand the multiple causes leading to pavement failure and remedies for the same. Develop skills to perform functional and structural evaluation of pavement by suitable methods.

**UNIT – I** **8 Hours**

**INTRODUCTION:**

Desirable characteristics of pavement, Types and components, Difference between Highway pavement and Airfield pavement, Design strategies of variables, Functions of subgrade, sub-base, Base course, surface course, comparison between Rigid and flexible pavement Fundamentals of Design of Pavements: Stresses and deflections, Principle, Assumptions, and Limitations of Boussinesq's theory, Burmister theory and Numericals.

**UNIT – II** **8 Hours**

**DESIGN FACTORS:**

Design wheel load, contact pressure, Design life, Traffic factors, climatic factors, Road geometry, Subgrade strength, and drainage, ESWL concept Determination of ESWL by equivalent deflection criteria, Stress criteria, EWL concept, and problems on above. Flexible pavement Design: Assumptions, Mcleod Method, Kansas method, CBR method, AASHTO, IRC Method (old), CSA method using IRC-37-2018, Numericals.

**UNIT – III** **8 Hours**

**FLEXIBLE PAVEMENT FAILURES, MAINTENANCE AND EVALUATION:**

Types of failures, Causes, Remedial/Maintenance measures in flexible pavements, Functional Evaluation by Visual inspection and unevenness measurements, Structural evaluation by Benkelman beam deflection method, Falling weight deflectometer, GPR method.

**UNIT – IV** **8 Hours**

**STRESSES IN RIGID PAVEMENT:**

Types of stress, Analysis of Stresses, Westergaard's Analysis, Modified Westergaard equations, Critical stresses, Wheel load stresses, Warping stress, Frictional stress, combined stresses (using chart/equations), problems on above. Design of Rigid Pavement: Design of CC pavement by IRC: 58-2015 for dual and Tandem axle load, Reinforcement in slabs, Design of Dowel bars, Design of Tie bars, Numericals.

**AIRFIELD PAVEMENT:**

Design factors for runway pavements, methods for airfield pavement, and Numericals.

**UNIT – V** **8 Hours**

**RIGID PAVEMENT FAILURES, MAINTENANCE AND EVALUATION:**

Types of failures, causes, remedial/maintenance measures in rigid pavements, Functional evaluation by Visual inspection and unevenness measurements, wheel load and its repetition, properties of subgrade, properties of concrete. External conditions, joints, Reinforcement, Requirements of joints, Types of joints, Expansion joint, contraction joint, warping joint, construction joint, longitudinal joint, Design of joints, Numericals.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Understand and generate the required data for design of pavement (Highway & Airfield). |
| CO2 | Analyze stress, strain, and deflection by boussinesq's, burmister's and westergaard's theory. |
| CO3 | Design of rigid pavement and flexible pavement conforming to code of practice. |
| CO4 | Evaluate the performance of the pavement and also develop maintenance statement based on site-specific requirements. |

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos.

| **Text Books:** | |
|---|---|
| 1 | SK Khanna, CEG Justo, and A Veeraragavan, "Highway Engineering," Nem Chand & Brothers (2019). |
| 2 | L.R.Kadiyali and Dr.N.B.Lal, "Principles and Practices of Highway Engineering," Khanna publishers (2013). |
| **Reference Books:** | |
| 1 | Yang H. Huang, "Pavement Analysis and Design", University of Kentucky, (2009). |
| 2 | Yoder & Wit Zorac, "Principles of pavement design," John Wiley & Sons (2010). |
| **IRC Codes** | |
| 1 | Guidelines For The Design Of Flexible Pavements, IRC: 37 - 2018 |
| 2 | Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, IRC: 58 – 2015. |
| 3 | Tentative guidelines for structural strength evaluation of rigid airfield pavements, IRC: 76 – 1979. |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5$^{th}$ week of the semester and Second test at the end of the 10$^{th}$ week of the semester.
- ✓ The makeup test at the end of the 15$^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4$^{th}$ week and Second assignment at the end of 9$^{th}$ week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13$^{th}$ week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should

have a mix of topics under the Unit/module.

- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub-questions) from each unit.
- Each full question will have a sub-question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | ✓ | | | ✓ | ✓ | | | | | ✓ |
| CO2 | ✓ | ✓ | ✓ | | | | | | | | | ✓ |
| CO3 | ✓ | ✓ | ✓ | | | ✓ | | | | | | ✓ |
| CO4 | ✓ | ✓ | ✓ | | | ✓ | | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **MASONRY STRUCTURES** | | | | | | |
| Course Code | **22CVT505D** | | | | | | |
| Category | **Professional Elective Course (PEC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objectives:** To understand the basics of Masonry elements, walls and principles and design philosophy & principles of Masonry Elements as per IS code provisions. To solve the problems on Masonry structural elements subjected to axial load and eccentric load as per IS specifications.

**UNIT – I** **8 Hours**

**INTRODUCTION TO MASONRY STRUCTURES**:

Masonry Units, Materials, types and masonry construction: Bricks, Stone and Block masonry units-strength. Masonry as early building elements-Pyramids, Walls, Columns and Towers, Beams and Lintel, Primitive arch, Corbelled arches, Barrel Vaults, Domes. Defects and Errors in Masonry construction – cracks in masonry, types, reason for cracking, methods of avoiding cracks.

**STRENGTH AND STABILITY:**

Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing and ageing, and workmanship. Compressive strength formulae based on elastic theory and empirical formulae.

**UNIT – II** **8 Hours**

**PERMISSIBLE STRESSES:**

Types of walls, permissible compressive stress, stress reduction and shape modification factors, permissible stresses for eccentric and lateral load.

**DESIGN CONSIDERATIONS:**

Effective height of walls and columns, openings in walls, effective length and thickness, slenderness ratio, eccentricity, load dispersion, and arching action in lintels.

**UNIT – III** **8 Hours**

**BEHAVIOUR OF MASONRY WALLS UNDER LOADS:**

Mechanical behaviour of Masonry, Masonry in compression, Deformation properties of masonry in compression, Creep strain in masonry, Load considerations and Masonry design criteria subjected to axial loads. Masonry in Tension, Shear and Biaxial stress: Nature of Bond, Tensile bond strength, Flexural tensile strength, Strength of Masonry in shear and Biaxial loading.

**UNIT – IV** **8 Hours**

**DESIGN OF MASONRY WALLS FOR AXIAL AND ECCENTRIC LOADS:**

Design of walls subjected to concentrated axial loads: Solid walls, cavity walls, solid walls supported at the ends by cross walls, design of walls with openings.

Design of walls subjected to eccentric loads: Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls, cavity walls, design of walls with openings.

**UNIT – V** **8 Hours**

**DESIGN OF MASONRY WALLS FOR LATERAL AND TRANSVERSE LOADS:**

Design of lateral and transversely loaded walls: Design criteria, design of solid wall under wind loading, design of shear wall – design of compound walls.

In-filled frames: Types – modes of failures – design criteria for masonry retaining walls.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Understand the concepts and principles of Masonry and Masonry structural elements. |
| CO2 | Analysis of Masonry elements subjected to axial and eccentric loads. |

| | |
|---|---|
| CO3 | Design of Masonry structural elements such as Solid Walls and Cavity Walls as per IS code provisions. |

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

| **Text Books:** | |
|---|---|
| 1 | Arnold W. Hendry, "Structural Masonry", Second edition, Macmillan Education Press Ltd., 1990. |
| 2 | Dayaratnam P, "Brick and Reinforced Brick Structures", Oxford & IBH, 1987. |
| 3 | M. L. Gambhir, " Building and Construction Materials", McGraw Hill Education Pvt. Ltd. |
| **Reference Code Books:** | |
| 1. | IS 1905–1987 "Code of practice for structural use of un-reinforced masonry- (3rd revision) BIS, New Delhi. |
| 2. | SP-20(S&T) – 1991, "Hand book on Masonry Design and Construction (1st revision), BIS, New Delhi. |

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | ✓ | | ✓ | | | | | | | ✓ | | ✓ |
| CO2 | ✓ | ✓ | ✓ | | | | | | | | | ✓ |
| CO3 | ✓ | ✓ | ✓ | | | | | | | ✓ | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **EXTENSIVE SURVEY PROJECT** | | | | | | |
| Course Code | **22CVM506** | | | | | | |
| Category | **PROJECT** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **0** | **0** | **4** | **0** | **4** | **26** | **02** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objective:** To train and expose students to gain knowledge in Irrigation engineering, Highway engineering, Water supply and Sanitary Engineering; to locate suitable sites for New Tank Project, to exercise Restoration and Renovation of Old Tank to increase its storage capacity, To train for selection of suitable sites for construction of underground and overhead storage tanks.

General instructions, Reconnaissance of the sites and fly levelling to establish bench marks. **1 Day**

**NEW TANK PROJECTS:** **3 Day**

The work shall consist of

i) Alignment of center line of the proposed bund, Longitudinal and cross sections of the center line.
ii) Capacity contours.
iii) Details at Waste weir and sluice points.
iv) Canal alignment.

**WATER SUPPLY AND SANITARY PROJECT:** **2 Day**

Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks underground drainage system surveys for laying the sewers.

**HIGHWAY PROJECT:** **2 Day**

Preliminary and detailed investigations to align a new road (min. 1 to 1.5 km stretch) between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road**.**

**OLD TANK PROJECTS:** **2 Day**

The work shall consist of

i) Alignment of center line of the existing bund, Longitudinal and cross sections of the centre line.
ii) Capacity contours to explore the quantity.
iii) Details at existing Waste weir and sluice points.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Develop plans, maps and relative drawings for the construction and execution of Hydraulic structures such as New tank Project and Restoration of Old tanks. |
| CO2 | Develop plans, maps and relative drawings for the construction of roads. |
| CO3 | Develop plans, maps and relative drawings for the construction of water supply and sanitation structures. |

| **Text Books:** | |
|---|---|
| 1 | Surveying Vol–I and II– B.C. Punmia, Laxmi Publications, New Delhi. |
| 2 | Surveying Vol. I and II, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi |
| 3 | Surveying and Levelling – R Subramanian, Oxford University Press (2007) |
| 4 | Text Book of Surveying – C. Venkataramiah, Universities Press.(2009 Reprint) |

| **Reference Books:** | |
|---|---|
| 1 | Fundamentals of Surveying - Milton O. Schimidt – Wong, Thomson Learning. |
| 2 | Surveying , Arora |
| 3 | Maps by Survey of India. |

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | ✓ | ✓ | | ✓ | ✓ | | | | ✓ | ✓ | | ✓ |
| CO2 | ✓ | ✓ | | | ✓ | | | | ✓ | ✓ | | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | | | ✓ | | ✓ | ✓ | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

## Scheme of Teaching and Examination for VI Semester B.E. CBCS, Academic Year: 2024-25

## 2022 Scheme: CIVIL ENGINEERING

**VI SEMESTER**

| Sl. No | Course Category and Course Code | | Course Title | Teaching Department | Teaching Hours /Week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/ Drawing | Self - Study | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | IPCC | 22CVU601 | Design and Drawing of Steel Structural Elements | Civil | 3 | 0 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 2 | PCC | 22CVT602 | Hydrology and Water Resources Engineering | Civil | 4 | 0 | 0 | - | 03 | 50 | 50 | 100 | 4 |
| 3 | PEC | 22CVT603X | Professional Elective Course | Civil | 3 | 0 | 0 | - | 03 | 50 | 50 | 100 | 3 |
| 4 | OEC | 22CVT604X | Open Elective Course | Civil | 3 | 0 | 0 | - | 03 | 50 | 50 | 100 | 3 |
| 5 | PROJ | 22CVP605 | Major Project Phase - I | Civil | 0 | 0 | 4 | - | 03 | 100 | -- | 100 | 2 |
| 6 | PCCL | 22CVL606 | Software Application Lab | Civil | 0 | 0 | 2 | - | 03 | 50 | 50 | 100 | 1 |
| 7 | AEC / SDC | 22CVT607X OR 22CVL607X | Ability Enhancement Course / Skill Development Course - V | Civil | If the course is offered as a Theory | | | | 01 | 50 | 50 | 100 | 1 |
| | | | | | 1 | 0 | 0 | - | | | | | |
| | | | | | If course is offered as a practical | | | | | | | | |
| | | | | | 0 | 0 | 2 | - | | | | | |
| 8 | HS | 22CDN608 | Analytical and Reasoning Skills | Placement | 2 | 0 | 0 | - | - | 50 | - | 50 | PP/NP |
| 9 | MC | 22NSN609 | National Service Scheme (NSS) | NSS | 0 | 0 | 2 | - | - | 100 | - | 100 | PP/NP |
| | | 22PEN609 | Physical Education (PE) (Sports and Athletics) | Physical Education | | | | | | | | | |
| | | 22YON609 | Yoga | Yoga Teacher | | | | | | | | | |
| | | | | | | | | | **Total** | **550** | **300** | **850** | **18** |

**PCC**: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, **S**= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **PROJ**: Project /Mini Project. **PEC**: Professional Elective Course. **PROJ**: Project Phase -I, **OEC**: Open Elective Course.

| **Professional Elective Course 22CVT603X** | | | |
|---|---|---|---|
| 22CVT603A | Air Pollution and Control | 22CVT603D | Railways, Airport, Tunnel and Harbour Engineering |
| 22CVT603B | Structural Health Monitoring | 22CVT603E | Pre-Stressed Concrete |
| 22CVT603C | Foundation Engineering | 22CVT603F | Alternate Building Materials and Technologies |
| **Open Elective Course 22CVT604X** | | | |
| 22CVT604A | Integrated Solid Waste Management | 22CVT604C | Urban Transport System |
| 22CVT604B | Air Pollution and Control Methods | 22CVT604D | Natural Disaster Mitigation and Management |

| **Ability Enhancement Course / Skill Enhancement Course – V 22CVT607X OR 22CVL607X** | | | |
|---|---|---|---|
| 22CVT607A | Introduction to Technical Paper Writing | 22CVT607C | Industrial Visit |
| 22CVT607B | Introduction to Real Estate Management | 22CVT607D | MS Office for Civil Engineers |

**Professional Core Course (IPCC):**

Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

**National Service Scheme /Physical Education/Yoga:**

All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

**Professional Elective Courses (PEC):**

A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of Engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

**Open Elective Courses:**

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum number of students' strength for offering an Open Elective Course is 10. However, this condition
shall not be applicable to class where the admission to the program is less than 10.

**Project Phase-I :**

Students have to discuss with the mentor /guide and with their help he/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **DESIGN AND DRAWING OF STEEL STRUCTURAL ELEMENTS** | | | | | | |
| Course Code | **22CVU601** | | | | | | |
| Category | **Integrated Professional Core Course (IPCC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **2** | **0** | **5** | **50** | **04** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objective:** To know different terminologies related to steel design and construction in accordance with the latest codes. To study limit state concept of steel design and detailing. To understand design of members under axial loads like tension, compression and flexural loads. To acknowledge design of Column bases, simple and gusseted base connections.

**UNIT – I** **8 Hours**

**INTRODUCTION**:

Advantages and Disadvantages of Steel structures, Loads and Load combinations, Design considerations, Limit State Method (LSM) of design, Failure criteria for steel, Codes, Specifications and section classification.

**BOLTED CONNECTIONS**:

Introduction, Behaviour of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG), Pin Connections, Simple Connections, Moment resistant connections, Beam to Beam connections, Beam to Column connections & Semi rigid connections.

**UNIT – II** **8 Hours**

**WELDED CONNECTIONS**:

Introduction, Welding process, Welding electrodes, Advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of welds, Simple joints, Moment resistant connections, Continuous Beam to Column connections, Continuous Beam to Beam connections, Beam Column splices.

**UNIT – III** **8 Hours**

**DESIGN OF TENSION MEMBERS**:

Introduction, Types of tension members, Design of strands, Slenderness ratio, Behaviour of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, other sections, Design of tension member, Lug angles, Splices, Gussets.

**DESIGN OF COMPRESSION MEMBERS**:

Introduction, Failure modes, Behaviour of compression members, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members, Built up compression members.

**UNIT – IV** **8 Hours**

**DESIGN OF COLUMN BASES**:

Design of simple slab base and gusseted base.

**DESIGN OF BEAMS**:

Introduction, Beam types, Lateral stability of beams, factors affecting lateral stability, Behaviour of simple and built-up beams in bending(without vertical stiffeners), Design strength of laterally supported beams in Bending, Design strength of laterally unsupported beams, Shear strength of steel beams, Maximum deflection, Design of beams and purlins.

**UNIT – V** **8 Hours**

**PLASTIC BEHAVIOUR OF STRUCTURAL STEEL:**

Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorems of Plastic Analysis, Methods of Plastic analysis, Plastic analysis of continuous beams and Portal frames.

| Expt. No | LABORATORY COMPONENTS | No. of sessions |
|---|---|---|
| 1 | Beam to beam connections-Bolted & Welded. | 10 |
| 2 | Beam to Column Framed Connections-Bolted & Welded. | |
| 3 | Beam to column Unstiffened Connections-Bolted & Welded. | |
| 4 | Beam to column Stiffened Connections-Bolted & Welded. | |
| 5 | Splices: Bolted & Welded. | |
| 6 | Lacings: Bolted & Welded. | |
| 7 | Battens: Bolted & Welded. | |
| 8 | Slab Base Footing. | |
| 9 | Gusseted Base Footing. | |
| 10 | Grillage Footing. | |

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

| **Course Outcomes:** At the end of the course the student will be able to: | |
|---|---|
| CO1 | Define the fundamental principles of structural analysis and steel design with welded and bolted Connections. |
| CO2 | Demonstrate the contemporary methodologies, specifications, loads, sections/shapes and current codes are used in the analysis and design of steel structural elements such as tension and compression members, beams, columns, column bases and connections & their detailing (Hand sketch). |
| CO3 | Develop professional competencies in design and application of steel members in relevant Civil Engineering structures. |
| CO4 | Identify the failure modes, safety and serviceability through discussions and analyses of various steel structural members. |

| **Text Books:** | |
|---|---|
| 1 | Design of Steel Structures, Limit state method, N. Subramanian, 2nd edition, OxfordUniversity Press, 2016. |
| 2 | Limit State Design of Steel Structures, S.K Duggal, 3rd edition, Tata Mc Graw Hill Publishers, 2010. ISBN, 1283188783, 9781283188784. |
| 3 | Design of Steel Structures, Negi, 2nd edition, Tata Mc Graw Hill Publishers, 1997, ISBN, 0074623052, 9780074623053. |
| 4 | Design of Steel Structures, Arya and Ajaman, Nem Chand & Bros Publishers, 2011, ISBN-10. 8185240620 |
| 5 | Design of steel structures by Limit state method, S.S Bhavikatti, edition, TechSar Publications, 2017. ISBN 13: 978-9385909559. |

| **Reference Books:** | |
|---|---|
| 1 | " Design of steel structures", by Anand S Arya & Awadhesh Kumar, Nem Chand & Bro Publishers, 6th edition, 2014, ISBN-13 : .8185240732-978 |
| 2 | "Manual Detailing of steel structures", by S Kanthimathinathan, K International Publishing House Pvt ltd, 2014, ISBN-13 : 978-9381141441. |

| | |
|---|---|
| 3 | IS 800, Code of practice for General construction in Steel, SP 6-1: ISI Handbook for Structural engineers, IS 875(Part I-IV), coded of practice for Design Loads, Bureau of Indian standards (Steel table) latesh editions, New Delhi. |

**Process of Ascertaining (both CIE and SEE):**

**Continuous Internal Evaluation (CIE):**

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

**(i) Assessment of CIE theory component: (30 Marks)**

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

**(ii) Assessment of CIE theory component: (20 Marks)**

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

**(iii)Calculation of Final CIE marks for IPCC course:**

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

***CIE score = (Test 1 + Test 2) × 0.6 + Laboratory Component***

**Passing standard in CIE:**

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

**Passing Standards in SEE:**

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

**Weightage of CIE and SEE:**

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

| CO-PO Mapping | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | ✓ | | | | | | | | | ✓ | | |
| CO2 | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| CO3 | | | ✓ | | | ✓ | | ✓ | | | | ✓ |
| CO4 | | ✓ | ✓ | ✓ | | ✓ | | | | | | |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **HYDROLOGY & WATER RESOURCES ENGINEERING** | | | | | | |
| Course Code | **22CVT602** | | | | | | |
| Category | **PROFESSIONAL CORE COURSE (PCC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **4** | **0** | **0** | **0** | **4** | **50** | **04** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objectives:** The students will learn the basic concepts of hydrology and integrate the physical hydrological processes, measurement and estimation of hydrological components: evaporation, infiltration, estimation of runoff and development hydrograph to apply for engineering practices, estimate the quantity of water required by crops to plan and design irrigation projects, find the canal capacity, design the canal and compute the reservoir capacity.

**UNIT: I** **10 hours**

**ENGINEERING HYDROLOGY:**

Introduction, Hydrologic Cycle(Horton's qualitative cycle), Water Budget Equation, World Water Balance, History of Hydrology,Applications of hydrology in Engineering, Sources of Data.

**PRECIPITATION:**

Forms, Types, Characteristics, Measurement of rainfall, Rain gauge Network, preparation and Presentation of Data, Mean Precipitation over an Area.

**UNIT: II** **10 hours**

**LOSSES FROM PRECIPITATION:**

**EVAPORATION:**

Introduction, process, factors affecting evaporation, measurement using IS class A pan, Meyer's formula, Reservoir Evaporation and Methods for its reduction.

**EVAPOTRANSPIRATION:**

Introduction, consumptive use, AET, PET, factors affecting, measurement, estimation by Blaney-Criddle equation and problems.

**INFILTRATION:**

Introduction, factors affecting infiltration capacity, measurement by double ring infiltrometer, Horton's infiltration equation with problems, infiltration indices and problems.

**UNIT: III** **10 hours**

**RUNOFF:**

Definition, concept of catchment, factors affecting runoff, rainfall – runoff relationship using regression analysis.

**HYDROGRAPHS:**

Definition, components of hydrograph, base flow separation, unit hydrograph, assumption, application and limitations, derivation from simple storm hydrographs, S curve and its computations, Conversion of UH of different durations with problems.

**UNIT: IV** **10 hours**

**IRRIGATION:**

Definition, Benefits and ill effects of irrigation. Systems of irrigation: surface and ground water, flow irrigation, lift irrigation, Bandhara irrigation.

**WATER REQUIREMENTS OF CROPS:**

Duty, delta and base period, relationship between them with problems, factors affecting duty of water crops and crop seasons in India, irrigation efficiency, frequency of irrigation.

**UNIT: V** **10 hours**

**CANALS:**

Types of canals. Alignment of canals. Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor. Unlined and lined canals. Standard sections. Design of canals by Lacey's and Kennedy's method.

**RESERVOIRS:**

Definition, investigation for reservoir site, storage zones determination of storage capacity using mass curves, economical height of dam.

**Question paper pattern:**

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

**Teaching & Learning Process:** Chalk and talk, Power point presentations, Animations and Videos.

| **Course Outcomes:** | |
|---|---|
| CO 1 | Understand the basic concepts of hydrology and integrate the physical hydrological processes, measurement and estimation of hydrological components such as evaporation, infiltration, stream flow. |
| CO 2 | Estimate the quantity of water required by crops to plan and design irrigation projects. |
| CO 3 | Find the canal capacity, design the canal and compute the reservoir capacity. |

| **Text Books:** | |
|---|---|
| 1 | Engineering Hydrology – Subramanya. K; Tata McGraw Hill New Delhi-2008 (Ed) |
| 2 | A Text Book Of Hydrology - Jayarami Reddy, Laksmi Publications, New Delhi-2007 (Ed) |
| 3 | Irrigation, water Resources and water power Engineering- P.N. Modi- standard book house, New Delhi. |
| 4 | Irrigation and Water Power Engineering - Madan Mohan Das & Mimi Das Saikia; PHI Learning pvt. Ltd. New Delhi 2009 (Ed). |
| 5 | Irrigation Engineering and Hydraulic structures- S. K. Garg, 38th Edition, Vol. (II), Khanna Publication, New Delhi. |

| **Reference Books:** | |
|---|---|
| 1 | Introduction to Hydrology - Viessman, W, and Lewis, G. L, 5th Edition, PHI Learning Private Limited, New Delhi (2003). |
| 2 | Applied Hydrology - Chow, V. T., Maidment, D. R., and Mays, L.W, 1st Edition, McGraw-Hill International Edition, Civil Engineering Series, Singapore (1988). |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5$^{th}$ week of the semester and Second test at the end of the 10$^{th}$ week of the semester.
- ✓ The makeup test at the end of the 15$^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4$^{th}$ week and Second assignment at the end of 9$^{th}$ week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13$^{th}$ week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

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- Each full question will be for 20 marks.
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**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | | ✓ | | | | | ✓ |
| CO2 | ✓ | | | | | | | | | | | ✓ |
| CO3 | ✓ | | ✓ | | | | | | | | | ✓ |

| Course Title | **AIR POLLUTION AND CONTROL** | | | | | **Department of Civil Engineering** | |
|---|---|---|---|---|---|---|---|
| Course Code | **22CVT603A** | | | | | | |
| Category | **PROFESSIONAL ELECTIVE COURSE (PEC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objective:** To understand primary pollutants and study the formation of secondary air pollutants in the atmosphere. Study the influential factors (meteorological parameters) of air pollutants transportation in the atmosphere. Study the effects of air pollution on receptor (human, different species, and environment, etc., Learn the various air pollution control methods and to create awareness through community participation and legislation.

**UNIT – I** **8 Hours**

**INTRODUCTION:**

Definition – Classification and Characterization of Air Pollutants, Emission Sources, Behaviour and Fate of air Pollutants, Chemical Reactions in the Atmosphere, Photo - chemical Smog, Coal-induced smog, Air Pollution Inventories.

**EFFECTS OF AIR POLLUTION:**

On Human Health, Animals, Plants and Materials – Major Environmental Air Pollution Episodes – London Smog, Los Angeles Smog & Bhopal Gas Tragedy.

**UNIT – II** **8 Hours**

**METEOROLOGY:**

Introduction – Meteorological Variables, Primary and Secondary Meteorological Variables, Stability Conditions, Wind rose, General Characteristics of Stack Plumes and Inversions, Dispersion Models – Gaussian Plume Model.

**UNIT – III** **8 Hours**

**METEOROLOGY: (**Contd.)

Factors to be considered in Industrial Plant Location and Planning.

**SAMPLING AND ANALYSIS:**

Sampling and Measurement of Gaseous and Particulate matter, Stack Sampling, Analysis of Air Pollutants, Smoke and Smoke Measurement.

**UNIT – IV** **8 Hours**

**AIR POLLUTION CONTROL METHODS:**

Air Pollution Control Methods – Particulate Emission Control; Gravitational Settling Chambers, Cyclone Separators, Fabric Filters, Electrostatic Precipitators, Wet Scrubbers, Selection of a Particulate Collecting Equipment, Control of Gaseous Emissions; Adsorption by Liquids, Adsorption by Solids, Combustion Odours and their control.

**UNIT – V** **8 Hours**

**AIR POLLUTION DUE TO AUTOMOBILES:**

Air Pollution due to Gasoline Driven and Diesel Driven Engines, Effects, Direct and Indirect Methods of control.

**ENVIRONMENTAL ISSUES:**

- ✓ Acid Rain
- ✓ Global Warming
- ✓ Ozone Depletion in Stratosphere
- ✓ Indoor Air Pollution

**ENVIRONMENTAL LEGISLATION:** Environmental Policy, Environmental Protection Act, Air Pollution Standards.

| **Teaching & Learning Process:** |
|---|
| Chalk and talk, Power point presentations, Animations and Video. |

| **Course Outcomes:** The students will be able to | |
|---|---|
| 1 | Identify the various sources and formation of pollutants thoroughly and explain the effect of air pollutants on receptors (human, different species, materials and surrounding environment). |
| 2 | Understand the behaviour of pollutants in the atmosphere and the importance of the meteorological parameters and various dispersion Modeling methods. |
| 3 | Classify the various air pollutants sampling methods, analysis methods and also the factors to select a suitable industrial plant location to prevent and control the global air pollution. |
| 4 | Discus the air pollution episodes, control policies and climate changes like global warming, Ozone depletion, Indoor air pollution, Acid rain and vehicular pollution. |

| **Text Books** | |
|---|---|
| 1 | Air Pollution by M.N Rao and HVN Rao 2017 edition |
| 2 | Air Pollution by Rajni kand and Keshav Kant, Khanna Publishing 2019 edition |
| 3 | Air Pollution control by KVSG Murali Krishna USP Publishers 2017 |
| 4 | Air Pollution and control by Anjaneyalu, 2017 edition |

| **Reference Books:** | |
|---|---|
| 1 | Boubel, R.W., Donald, L.F., Turner, D.B., and Stern, A.C., (1994), Fundamentals of Air Pollution – Academic Press. |
| 2 | Crawford, M., (1980), Air Pollution Control Theory –TMH Edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi |
| 3 | Henry. C. Perkins, (1980), Air Pollution –McGraw Hill. |
| 4 | Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986), Environmental Engineering –Mc Graw Hill Book Co |
| 5 | Sincero, A.P and Sincero, G.A., (1999), Environmental Engineering – A Design Approach –Prentice Hall of India. |
| 6 | Wark, K., Warner, C.F. and Davies, W.T., (1998), Air Pollution- Its Origin and Control –Harper & Row Publishers, New York |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

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- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5$^{th}$ week of the semester and Second test at the end of the 10$^{th}$ week of the semester.
- ✓ The makeup test at the end of the 15$^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4$^{th}$ week and Second assignment at the end of 9$^{th}$ week of the semester.

- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | ✓ | ✓ | | | ✓ | | |
| CO2 | | ✓ | | | | | | | | ✓ | | |
| CO3 | | | ✓ | | | ✓ | ✓ | | ✓ | ✓ | | ✓ |
| CO4 | | ✓ | | | | ✓ | | | | ✓ | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **STRUCTURAL HEALTH MONITORING** | | | | | | |
| Course Code | **21CVT603B** | | | | | | |
| Category | **PROFESIONAL ELECTIVE COURSE (PEC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objective:** To understand the fundamental concepts of structural health monitoring for structures, analyse the different instruments and sensors needed for structural health monitoring, and describe various methods of damage detection, conditional assessment, and techniques for strengthening and retrofitting structures.

**UNIT – I** **8 Hours**

**INTRODUCTION TO STRUCTURAL HEALTH MONITORING:**

Need of Structural Health Monitoring, Definition & Concept of SHM, SHM & Biomimetic Comparison of SHM with NDT, Types & Components of SHM, Procedure of SHM, Objectives & Operational Evaluations of SHM, Advantages of SHM.

**UNIT – II** **8 Hours**

**HEALTH MONITORING SYSTEMS OF BUILDING STRUCTURES:**

Numerical modeling, Use of sensors, Data acquisition techniques, Data Processing, Diagnostic techniques, Wireless sensor network, Rehabilitation techniques.

**UNIT – III** **8 Hours**

**INSTRUMENTATIONS & SENSORS FOR SHM:**

Basics of Instrumentations & Measurements, Classifications, Input-Output Configurations of Instruments, Static & Dynamic Characteristics, Functions. Various Types of Electromechanical, Electronics & Digital Instruments for SHM. Data Acquisition Systems-Types, Hardware & It's Components. Basics of Sensors, Transducers & Actuators, Classification of Sensors, Characteristics & Working Principles of Various Types of Sensors like Strain Gauges, LVDT, Accelerometers etc. Concept of Smart Materials & Smart Structures with SHM, Basics of Smart Materials like Piezoelectric, Shape Memory Alloys, ER & MR Fluids etc.

**UNIT – IV** **8 Hours**

**STRUCTURAL ASSESSMENT:**

Structural Assessment & Need for retrofitting: Introduction to health assessment of structures, structural damages & failures, Principles of structural assessment, Classification & levels of assessment, Current scenario of infrastructure through case studies.

**NON-DESTRUCTIVE EVALUATIONS:**

Concrete strength assessment, Rebound hammer test, Ultrasonic pulse velocity tests, penetration resistance, pullout tests, core sampling and testing, chemical tests, carbonation, chloride, content and corrosion problem.

**UNIT – V** **8 Hours**

**RETROFITTING OF STRUCTURES:**

Concept of repair, rehabilitation & retrofitting of structures: Case studies of structural & foundation failure, performance problems, responsibility & accountability, causes of distress in structural members, design and material deficiencies, factors causing extensive deterioration.

Fundamentals of retrofitting, flow of retrofitting process, methods of retrofitting, materials for retrofitting (conventional and smart materials), selection of retrofitting methods.

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Understand the concepts of fundamental concepts of structural health monitoring and systems. |
| CO2 | Describe suitable Sensors & Instruments required in SHM for in-service performance of structures |
| CO3 | Assess the health of structures using different techniques of SHM. |
| CO4 | Summarize suitable technique for structural condition assessment, appropriate strengthening & retrofitting techniques to regain the structural strength. |

| **Text Books:** | |
|---|---|
| 1 | Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, Structural Health Monitoring, Wiley ISTE, 2006. |
| 2 | Nagayama, T. and Spencer Jr, B.F., Structural health monitoring using smart sensors, 2007 |
| 3 | Douglas E Adams, Health Monitoring of Structural Materials and Components-Methods with Applications, John Wiley and Sons, 2007. |
| 4 | Adams, John Wiley and Sons, Structural Health Monitoring and Intelligent Infrastructure, Vol1, 2007. |

| **Reference Books:** | |
|---|---|
| 1 | JJ.P. Ou, H.Li and Z.D. Duan, Structural Health Monitoring and Intelligent Infrastructure, Vol-1, Taylor and Francis Group, London, U.K, 2006. |
| 2 | Victor Giurglutiu, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc, 2007. |
| 3 | Gangbing Song, Chuji Wang and Bo wang, Structural Health Monitoring(SHM) of civil structures,MDPI, 2018 |

| **Reference Codes:** | |
|---|---|
| 1 | IS 13311-1: Method of Non-destructive testing of concrete |

**Process of Assessment (both CIE and SEE):**

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- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
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- ✓ First assignment at the end of 4$^{th}$ week and Second assignment at the end of 9$^{th}$ week of the semester.
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- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the

outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
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**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | | | | | | | |
| CO2 | ✓ | ✓ | | | ✓ | | | | | | | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO4 | ✓ | | | | | | | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| Course Title | **FOUNDATION ENGINEERING** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **22CVT603C** | | | | | | |
| Category | **Professional Elective Course (PEC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objectives:** The students will be learn to understand the stress distributions and compressibility characteristics of soil, know the earth pressure against retaining walls and stability of slopes against shear failure and interpret the soil condition at a given location and suggest the suitable type of foundation.

**UNIT – I** **08 Hours**

**STRESS DISTRIBUTION IN SOILS:**

Boussinesq's and Westergaard's theories for different types of loads, Pressure distribution diagrams, Approximate and exact methods, Newmark's influence chart, Contact Pressure.

**FOUNDATION SETTLEMENTS:**

Immediate, Primary consolidation and Secondary settlement.

**UNIT – II** **08 Hours**

**LATERAL EARTH PRESSURE:**

Types of earth pressure (Active, Passive and at-rest earth pressure). Rankine's theory of applications (Dry, moist, submerged, partially submerged, uniform surcharge, layered cohesionless, cohesive and cohesive – friction backfill). Graphical methods to compute active earth pressures for cohesionless backfill by Rebhaunn's and Culmann's method.

**UNIT – III** **08 Hours**

**STABILITY OF EARTH SLOPES:**

Factor of safety, Stability analysis of Infinite slopes by limiting equillbrium condition, Stability analysis of finite slopes by Swedish slip circle methods, Friction circle method, Fellineous method, Taylor's stability number.

**UNIT – IV** **08 Hours**

**BEARING CAPACITY OF SHALLOW FOUNDATION:**

Definitions of bearing capacity terms, Modes of shear failure, Terzaghi's and IS: 6403 method bearing capacity equations, Effect of ground water table and loading eccentricity on footing. Field methods to evaluation of allowable bearing capacity - Plate load test and Standard penetration test.

**UNIT – V** **08 Hours**

**BEARING CAPACITY OF PILE FOUNDATION:**

Classification of piles, Load transfer mechanism, Pile capacity by static formulae, dynamic formulae and pile load test, pile group, efficiency, Bearing capacity and settlement of piles on clayey soils, Negative skin friction, Underreamer piles.

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Estimate the state of stress below any type of loaded area and compute settlement. |
| CO2 | Estimate lateral earth pressures exerted on retaining walls and estimate factor of safey against shear for slopes. |

| | |
|---|---|
| CO3 | Evaluate bearing capacity of soil to design a shallow and deep foundations. |

| **Text Books:** | |
|---|---|
| 1 | Soil Mechanics and Foundation Engineering, Punmia B C, Laxmi Publications Co., New Delhi. |
| 2 | Basic and Applied Soil Mechanics - Gopal Ranjan and Rao A.S.R., New Age International (P) Ltd., New Delhi. |
| 3 | Geotechnical Engineering- Braja, M. Das, Thomson Business Information India (P) Ltd., India. |
| 4 | Principles of Soil Mechanics and Foundation Engineering- Murthy V. N. S., UBS Publishers and Distributors, New Delhi. |

| **Reference Books:** | |
|---|---|
| 1 | "Foundation analysis and design", Bowles J. E. (2001), 5th Edition, McGraw- Hill Publications. New Delhi. |
| 2 | "Soil Mechanics in Engineering Practice", Karl Terzaghi, Ralph B. Peck, Gholamreza Mesri (1996), 5th Edition, John Wiley & Sons Publishers. |
| 3 | "A Hand Book of Stress Distribution and Deformation in Soils", B.K. Ramaiah, Purushotham Raj, Krishnamurthy, Bangalore University (1970). |
| 4 | "Code of Practice for Determination of Bearing Capacity of Shallow Foundations", IS: 6403 – 2004, 7th Revision, Bureau of Indian Standards, New Delhi. |
| 5 | "Code of Practice for Design and Construction of Pile Foundations", IS: 2911(Part 1/Sec 1) – 2010, 2nd Revision, Bureau of Indian Standards, New Delhi. |

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| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | | | ✓ | | | | | | | |
| CO2 | ✓ | ✓ | | | ✓ | | | | | | | |
| CO3 | ✓ | | ✓ | | | | ✓ | | | ✓ | | |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **RAILWAYS, AIRPORT, TUNNEL AND HARBOUR ENGINEERING** | | | | | | |
| Course Code | **22CVT603D** | | | | | | |
| Category | **Professional Elective Course (PEC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objectives:** To summarize the various aspects of tracks like, geometrical elements, points and crossings, and significance of maintenance, to plan and design of airport layout, facilities required for runway, taxiway and impart the knowledge about visual aids, to apply the design features of tunnels, harbours, dock and necessary navigational aids; also expose them to various methods of tunneling and tunnel accessories.

**UNIT – I** **8 Hours**

**INTRODUCTION TO RAILWAYS:**

Role of railways in transportation, Indian Railways, Selection of Routes, Permanent way and its requirements, Gauges and types, Typical cross sections-single and double line broad gauge (BG) track in cutting, embankment and electrified tracks, Coning of wheels and tilting of rails.

**RAILS**:

Functions-requirements - types and sections, length-defects-wear-creep-welding-joints, creep of rails.

**SLEEPERS AND BALLAST:**

Functions, requirements, Types, Track fitting and fasteners-Dog spike, screw spike and Pandrol clip, Fish plates, bearing plates, Calculation of quantity of materials required for laying a track-Examples, Tractive resistances and hauling capacity with examples.

**UNIT – II** **8 Hours**

**GEOMETRIC DESIGN AND POINTS AND CROSSING:**

Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings (Explanation & Sketches of Right and Left hand turnouts only), Numercials.

**RAILWAY CONSTRUCTION AND MAINTENANCE:**

Stations and Types, Types of yards, Signalling-Objects and types of signals, station and yard Equipment-Turn table, Fouling mark, buffer stop, level crossing, track defects, and maintenance.

Earthwork – Stabilization of track on poor soil, Construction and maintenance of tracks, Modern methods of construct ion & maintenance – Urban rail – Infrastructure for Metro, Mono and underground railways.

**UNIT – III** **8 Hours**

**AIRPORT PLANNING:**

Air transport characteristics, airport classification, airport planning: objectives, components, layout characteristics, and socio-economic characteristics of the catchment area, criteria for airport site selection and ICAO stipulations, typical airport layouts, Parking and circulation area.

**UNIT – IV** **8 Hours**

**AIRPORT DESIGN:**

Runway Design: Orientation, Wind Rose Diagram, Runway length, Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles, Elements of Taxiway Design, Airport Zones, Passenger Facilities and Services, Runway and Taxiway Markings and lighting, Numercials.

**UNIT – V** **8 Hours**

**HARBOUR ENGINEERING:**

Harbour classifications, Layout with components, Natural phenomenon affecting the design of harbours - wind, wave and tide, currents, Breakwater-Types Wharf and Quays, Jetties and Piers, Dry dock and wet docks.

**TUNNEL ENGINEERING:**

Advantages and disadvantages, Size and shape of tunnels, Surveying-Transferring center line, and gradient from surface to inside the tunnel, Examples, Tunneling in rocks-methods(TBM's), Tunneling methods in soils-Needle beam, Liner plate, Tunnel lining, Tunnel ventilation, vertical shafts, Pilot tunneling, mucking and methods, drilling and drilling pattern, case study on report of geologically disturbed area.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Understand the knowledge of geometric design of railways and its considerations with different materials used for the construction of railway track. |
| CO2 | Study the basic components of air craft and airport facilities with the design of run way length and geometrics of various landing aids in an airport. |
| CO3 | Understand the fundamental principles related to methods of tunnelling and harbours with their layout and components. |

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos.

| **Text Books:** | |
|---|---|
| 1 | Railway Engineering - Saxena and Arora, Dhanpat Rai & Sons, 7th edition (2015), New Delhi. |
| 2 | Airport Planning and Design – Khanna Arora and Jain, Nem Chand Bros, 6th edition (2015), Roorkee. |
| 3 | Docks and Tunnel Engineering – R Srinivasan, Charaotar Publishing House, 28th edition (2019), New Delhi. |

| **Reference Books:** | |
|---|---|
| 1 | Docks and Harbor Engineering –H P Oza and G H OzaCharaotar Publishing House, 7th edition, New Delhi. |
| 2 | Railway Engineering – J S Mundrey, McGraw Hill Publications, 4th edition, New Delhi. |
| 3 | Indian Railway Track – M M Agarwal, Jaico Publications, 2nd edition, oxford university press, Bombay. |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and

PSo.

- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | | | ✓ |
| CO2 | ✓ | ✓ | ✓ | | | ✓ | | | | | | ✓ |
| CO3 | ✓ | ✓ | | | | ✓ | | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE TITLE | **PRE-STRESSED CONCRETE** | | | | | | |
| Course Code | **22CVT603D** | | | | | | |
| Category | **Professional Core Course (PCC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objectives:** To provide general principles of PSC members and design using the latest IS: 1343 code. To provide methods of design for bending, shear, and torsion of PSC structural elements.

**UNIT – I** **8 Hours**

**INTRODUCTION:**

Historic development- general principles of Prestressing, Types of pre stressing, pre- tensioning and post tensioning, advantages and limitation of prestressed concrete, Materials for pre stressed concrete- high strength steel and concrete, properties, Stress-strain characteristics of high strength steel and concrete.

**BASIC PRINCIPLES OF PRESTRESSING:**

Fundamentals of prestress, Load balancing concept, Stress concept, center of thrust, Pretensioning and post tensioning methods-Analysis of Pretensioning and post tensioning, Systems of pre stressing, End anchorages.

**UNIT – II** **8 Hours**

**ANALYSIS OF SECTIONS FOR FLEXURE:**

Elastic analysis of pre stressed concrete beams with straight, parabolic, triangular, trapezoidal cable profiles, Combination of cable profiles, Eccentric and concentric pre stressing,Numerical problems.

**UNIT – III** **8 Hours**

**LOSSES OF PRE-STRESS:**

Loss of prestress in pretensioned and post tensioned members due to elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage and frictional losses, Numerical on Losses during Prestress.

**DEFLECTIONS:**

Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection. Numerical on Short term and Long term deflections.

**UNIT – IV** **8 Hours**

**LIMIT STATE OF COLLAPSE:**

Flexure - IS Code recommendations – Ultimate flexural strength of sections. Numerical on Flexure. Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking. Numerical on Shear.

**UNIT – V** **8 Hours**

**DESIGN OF BEAMS:**

Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Design of prestressing force and eccentricity, limiting zone of pre-stressing force and cable profile. Transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses in end blocks

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Explain the basic concept of pre-stressing, post-tensioning, behavior of PSC members and use of high tensile strength steel. |

| | |
|---|---|
| CO2 | Analyze the pre-stress in pre-Tensioning and Post -Tensioning elements. |
| CO3 | Calculate deflection in PSC members with respect to short and long time application of forces. |
| CO4 | Analyze and design of beams for flexure both serviceability and economic point of view. |

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos.

| **Text Books:** | |
|---|---|
| 1 | Pre-stressed Concrete- N. Krishna Raju, Tata McGraw Publishers, 6th *Edition* (2022). |
| 2 | Pre-stressed Concrete- P Dayaratnam And P Sarah. Medtech Publisher, *7th* Edition *(2017).* |
| 3 | Pre-stressed Concrete- N. Rajgopalan, Alpha Sceince Publishers, 2nd *Edition* (2017). |

| **Reference Books:** | |
|---|---|
| 1 | Code of practice for Prestressed Concrete - IS: 1343: 2012. |
| 2 | Design of Pre-Stressed Concrete Structures- T.Y. Lin and Ned H. Burns - John Wiley & Sons, Wiley India Private Limited; 3rd Edition (2010). |
| 3 | Design of Pre-Stressed Concrete – Arthus H Nilson. Wiley Publishers, 2nd Edition (1991). |
| 4 | Fundamental of Pre-Stressed Concrete- N. C. Sinha & S. K. Roy, S Chand Publishing; 3rd Edition (2011). |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.

- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | | | | | ✓ | | |
| CO2 | | ✓ | | | | | | | | | | |
| CO3 | ✓ | ✓ | | | | | ✓ | | | | | |
| CO4 | ✓ | ✓ | ✓ | ✓ | | | | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES** | | | | | | |
| Course Code | **22CVT603F** | | | | | | |
| Category | **Professional Elective Course (PEC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objectives:** To understand environmental issues due to building materials and the energy consumption in manufacturing building materials, to study the various masonry blocks, masonry mortar and structural behaviour of masonry under compression, to study the alternative building materials in the present context, to understand the alternative building technologies which are followed in present construction field.

**UNIT – I** **8 Hours**

**INTRODUCTION:**

Energy in building materials, Environmental issues concerned to building materials, Global warming and construction industry. Environmental friendly and cost effective building technologies. Requirements for building of different climatic regions. Traditional building methods and vernacular architecture.

**UNIT – II** **8 Hours**

**ALTERNATIVE BUILDING MATERIALS:**

Characteristics of building blocks for walls, Stones and Laterite blocks, Bricks and hollow clay blocks, Concrete blocks, Stabilized blocks - Mud Blocks, Steam Cured Blocks, Fal-G Blocks and Stone Masonry Block, M-Sand.

**LIME-POZZOLANA CEMENTS:**

Raw materials, Manufacturing process, Properties and uses, Fibre reinforced concretes, Matrix materials, Fibres: metal and synthetic, Properties and applications, Fibre reinforced plastics, Matrix materials, Fibres: organic and synthetic, Properties and applications, Building materials from agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes,

**UNIT – III** **8 Hours**

**ALTERNATIVE BUILDING TECHNOLOGIES:**

Alternative for wall construction, Types, Construction method, Masonry mortars, Types, Preparation, Properties, Ferro cement and Ferro concrete building components.

Materials and specifications, Properties, Construction methods, Applications Alternative roofing systems, Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes

**UNIT – IV** **8 Hours**

**STRUCTURAL MASONRY:**

Compressive strength of masonry elements, Factors affecting compressive strength. Strength of units, prisms/wallets and walls, Effect of brick work bond on strength.

Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry. IS Code provisions, Design of masonry, compression elements and Concepts in lateral load resistance

**UNIT – V** **8 Hours**

**COST EFFECTIVE BUILDING DESIGN**:

Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost Analysis : Case studies using alternatives

**EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS:**

Machines for manufacture of concrete, Equipment for production of stabilized blocks, Moulds and methods of production of precast elements.

**Course Outcomes:** The students will be able to

| | |
|---|---|
| 1 | Explain the need of Alternative Building Materials in Construction industry. |
| 2 | Evaluate properties of mortar and other alternative construction materials. |
| 3 | Design methods for cost effective buildings by adopting cost effective materials and cost saving techniques. |

| **Text Books:** | |
|---|---|
| 1 | Alternative building methodologies for engineers and architects, lecture notes edited: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of Science, Bangalore. |
| 2 | Structural Masonry- Henry, A.W: Macmillan Education Ltd., 1990. |
| 3 | Alternative building methodologies for engineers and architects, lecture notes edited: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of Science, Bangalore. |
| 4 | Structural Masonry- Henry, A.W: Macmillan Education Ltd., 1990. |

| **Reference Books:** | |
|---|---|
| 1 | RJS Spence and DJ Cook, "Building Materials in Developing Countries", Wiley pub. |
| 2 | LEED India, Green Building Rating System, IGBC pub. |
| 3 | IGBC Green Homes Rating System, CII pub. |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of $5^{th}$ week of the semester and Second test at the end of the $10^{th}$ week of the semester.
- ✓ The makeup test at the end of the $15^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of $4^{th}$ week and Second assignment at the end of $9^{th}$ week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the $13^{th}$ week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.

✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | ✓ | ✓ | | | | | ✓ |
| CO2 | ✓ | | | ✓ | | | | | | | | ✓ |
| CO3 | | ✓ | ✓ | | | | ✓ | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **INTEGRATED SOLID WASTE MANAGEMENT** | | | | | | |
| Course Code | **22CVT604A** | | | | | | |
| Category | **Open Elective Course (OEC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objective:**

Understand the key principles and concepts of integrated solid waste management (ISWM), including waste generation, collection, treatment, and disposal. Analyze and evaluate different waste management strategies and technologies, considering their environmental, health impacts. Apply practical knowledge of waste reduction, recycling, composting, and energy recovery techniques to develop sustainable waste management plans. Demonstrate the ability to develop and implement comprehensive ISWM plans that align with regulatory requirements, community needs, and sustainability goals.

**UNIT – I** **8 Hours**

**INTRODUCTION AND WASTE GENERATION ASPECTS**:

Sources, types, functional elements of solid waste management, factors affecting solid waste generation and management, waste characteristics, health and environmental effects. Numerical on moisture content, density and energy content.

**UNIT – II** **8 Hours**

**WASTE PROCESSING TECHNIQUES:**

Purpose of processing, volume and size reduction, component separation, significance of source reduction, product recovery and recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and processes.

**COLLECTION, STORAGE, TRANSPORT OF WASTES:**

Collection components, storage-containers/collection vehicles, collection operation and route optimization, need and types of transfer stations, location of transfer station. Estimation of solid waste quantities.

**UNIT – III** **8 Hours**

**BIOLOGICAL CONVERSION TECHNOLOGIES:**

Definition of compost, classification of composting, key process variables of composting, different types of composting- aerobic composting, windrow composting, in-vessel composting, aerated static pile composting, vermicomposting, anaerobic composting. Site selection and design of composting. Specifications for composting as per Solid Waste Management Rules-2016.

**THERMAL CONVERSION TECHNOLOGIES:**

Definition of thermal process, categories of thermal conversion, Combustion Systems-Mass fired combustion systems, RDF-Fired combustion system, Fluidized bed combustion. Pyrolysis Systems, Gasification Systems. Environmental and air pollution control systems. Air Quality standards as per Solid Waste Management Rules-2016.

**UNIT – IV** **8 Hours**

**DISPOSAL OF SOLID WASTES:**

Sanitary landfills- Definition, environmental impact and its minimization, Landfilling methods-trench method, area method and canyon method. Essential components, site selection, landfill planning and design. Generation, movement and control of landfill gases. Formation, movement and control of leachate. Different types of Liner systems. Landfill closure and post closure care. Numerical on landfill area estimation. Specifications for Sanitary Landfills as per Solid Waste Management Rules-2016.

**UNIT – V** **8 Hours**

**SPECIAL WASTE MANAGEMENT:**
Definition, importance of special waste Management, Automotive Wastes, Construction and Demolition Wastes, Electronic Wastes, Industrial Solid Wastes, Medical Wastes, Plastic Wastes, Lead Battery Wastes (environmental significance, recovery, recycle and current management systems). Waste Management Laws in India.

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos and waste collection and disposal site visit.

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Narrate the basics of solid waste management towards sustainable development. |
| CO2 | Apply technologies to process waste for product and energy recovery options. |
| CO3 | Comprehend the principles and practices involved in the safe and environmentally sound disposal Technique. |
| CO4 | Analyze the need for special wastes management for safe and sustainable disposal. |

| **Text Books:** | |
|---|---|
| 1 | Integrated Solid Waste Management: Tchobanoglous: M/c Graw Hill. 2012 |
| 2 | Solid Waste Management in developing countries. Bhide and Sunderashan. 2017 |
| 3 | Environmental Engineering – Vol II.: S.K. Garg. 2015 |

| **Reference Books** | |
|---|---|
| 1 | Ramesha Chandrappa and Diganta Bhusan Das "Solid Waste Management: Principles and Practice", Springer Berlin Heidelberg, 2012. |
| 3 | William A. Worrell and P. Aarne Vesilind, "Solid Waste Engineering", Cengage Learning Inc, 2012. |
| 4 | Dr. R.Saravanan, "Municipal Solid Waste Management", Suchitra Publications, 2017. |
| 5 | P. White, M. Franke, P. Hindle "Integrated Solid Waste Management: A Lifecycle Inventory", 1995. |
| 6 | Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, "Environmental Engineering", McGraw Hill International Editions, 1985. |
| 7 | Sunil Kumar, "Municipal Solid Waste Management in Developing Countries", CRC Press, 2016. |

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- ✓ The question paper will have ten questions.
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• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
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• The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | | ✓ | | | | | ✓ |
| CO2 | ✓ | ✓ | | | | | ✓ | | | | | ✓ |
| CO3 | ✓ | | | ✓ | | | ✓ | | | | | ✓ |
| CO4 | ✓ | | | | | | ✓ | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **AIR POLLUTION AND CONTROL METHODS** | | | | | | |
| Course Code | **22CVT604B** | | | | | | |
| Category | **Open Elective Course (OEC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **03** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objective:**

Understand primary pollutants and study the formation of secondary air pollutants in the atmosphere. Study the influential factors (meteorological parameters) of air pollutants transportation in the atmosphere. Study the effects of air pollution on receptor (human, different species, and environment, etc., Learn the various air pollution control methods and to create awareness through community participation and legislation.

**UNIT – I** **8 Hours**

**INTRODUCTION:**

Definition – Classification and Characterization of Air Pollutants, Emission Sources, Behaviour and Fate of air Pollutants, Chemical Reactions in the Atmosphere, Photo - chemical Smog, Coal-induced smog, Air Pollution Inventories.

**EFFECTS OF AIR POLLUTION:**

On Human Health, Animals, Plants and Materials – Major Environmental Air Pollution Episodes – London Smog, Los Angeles Smog & Bhopal Gas Tragedy.

**UNIT – II** **8 Hours**

**METEOROLOGY:**

Introduction – Meteorological Variables, Primary and Secondary Meteorological Variables, Stability Conditions, Wind rose, General Characteristics of Stack Plumes and Inversions, Dispersion Models – Gaussian Plume Model.

**UNIT – III** **8 Hours**

**METEOROLOGY: (**Contd.)

Factors to be considered in Industrial Plant Location and Planning.

**SAMPLING AND ANALYSIS:**

Sampling and Measurement of Gaseous and Particulate matter, Stack Sampling, Analysis of Air Pollutants, Smoke and Smoke Measurement.

**UNIT – IV** **8 Hours**

**AIR POLLUTION CONTROL METHODS:**

Air Pollution Control Methods – Particulate Emission Control; Gravitational Settling Chambers, Cyclone Separators, Fabric Filters, Electrostatic Precipitators, Wet Scrubbers, Selection of a Particulate Collecting Equipment, Control of Gaseous Emissions; Adsorption by Liquids, Adsorption by Solids, Combustion Odours and their control.

**UNIT – V** **8 Hours**

**AIR POLLUTION DUE TO AUTOMOBILES:**

Air Pollution due to Gasoline Driven and Diesel Driven Engines, Effects, Direct and Indirect Methods of control.

**ENVIRONMENTAL ISSUES:**

- ✓ Acid Rain
- ✓ Global Warming
- ✓ Ozone Depletion in Stratosphere
- ✓ Indoor Air Pollution

**ENVIRONMENTAL LEGISLATION:**

| |
|---|
| Environmental Policy, Environmental Protection Act, Air Pollution Standards. |

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO 1 | Identify the various sources and formation of pollutants thoroughly and explain the effect of air pollutants on receptors (human, different species, materials and surrounding environment). |
| CO 2 | Understand the behaviour of pollutants in the atmosphere and the importance of the meteorological parameters and various dispersion Modeling methods. |
| CO 3 | Classify the various air pollutants sampling methods, analysis methods and also the factors to select a suitable industrial plant location to prevent and control the global air pollution. |
| CO 4 | Discus the air pollution episodes, control policies and climate changes like global warming, Ozone depletion, Indoor air pollution, Acid rain and vehicular pollution. |

| **Text Books** | |
|---|---|
| 1 | Air Pollution by M.N Rao and HVN Rao 2017 edition |
| 2 | Air Pollution by Rajni kand and Keshav Kant, Khanna Publishing 2019 edition |
| 3 | Air Pollution control by KVSG Murali Krishna USP Publishers 2017 |
| 4 | Air Pollution and control by Anjaneyalu, 2017 edition |

| **Reference Books:** | |
|---|---|
| 1 | Boubel, R.W., Donald, L.F., Turner, D.B., and Stern, A.C., (1994), Fundamentals of Air Pollution – Academic Press. |
| 2 | Crawford, M., (1980), Air Pollution Control Theory –TMH Edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi |
| 3 | Henry. C. Perkins, (1980), Air Pollution –McGraw Hill. |
| 4 | Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986), Environmental Engineering –Mc Graw Hill Book Co |
| 5 | Sincero, A.P and Sincero, G.A., (1999), Environmental Engineering – A Design Approach –Prentice Hall of India. |
| 6 | Wark, K., Warner, C.F. and Davies, W.T., (1998), Air Pollution- Its Origin and Control –Harper & Row Publishers, New York |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of $5^{th}$ week of the semester and Second test at the end of the $10^{th}$ week of the semester.
- ✓ The makeup test at the end of the $15^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of $4^{th}$ week and Second assignment at the end of $9^{th}$ week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and

PSo.

- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | ✓ | ✓ | | | ✓ | | |
| CO2 | | ✓ | | | | | | | | ✓ | | |
| CO3 | | | ✓ | | | ✓ | ✓ | | ✓ | ✓ | | ✓ |
| CO4 | | ✓ | | | | ✓ | | | | ✓ | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **URBAN TRANSPORT SYSTEM** | | | | | | |
| Course Code | **22CVT604C** | | | | | | |
| Category | **Open Elective Course (OEC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 3 | 0 | 0 | 0 | 3 | 40 | 03 |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objective:** To understand and apply the basic concepts and methods of urban transportation planning, to explain the various methods of designing, conducting and administering surveys to provide the data required for transportation planning, to understand the process of developing an organized mathematical modeling approach to solve select urban transportation planning problem and to illustrate the various types of models used for travel forecasting, prediction of future travel patterns.

**UNIT – I** **8 Hours**

**INTRODUCTION:**

Urbanization, urban class groups, transportation problems and identification, impacts of transportation, urban transport system planning process, modeling techniques in planning.

Urban mass transportation systems: urban transit problems, travel demand, types of transit systems, public, private, Para-transit transport, mass and rapid transit systems, BRTS and Metro rails, capacity, merits and comparison of systems, coordination, types of coordination.

**UNIT – II** **8 Hours**

**DATA COLLECTION AND INVENTORIES:**

Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

**UNIT – III** **8 Hours**

**TRIP GENERATION :**

Trip purpose, Factors governing trip generation and attraction, Category analysis, Problems.

**TRIP DISTRIBUTION:**

Methods, Growth factors methods and problems.

**UNIT – IV** **8 Hours**

**TRIP DISTRIBUTION:**

Synthetic methods- Fractor and Furness method and problems.

**MODAL SPLIT:**

Factors affecting, characteristics of split, Model split in urban transport planning, problems.

**UNIT – V** **8 Hours**

**TRIP ASSIGNMENT:**

Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. Numerical problems on Traffic Assignment. Introduction to land use planning models, land use and transportation interaction.

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

**Course Outcomes:** The students will be able to

| | |
|---|---|
| CO1 | Understand the importance of urban transport planning and administer surveys to provide the data required for transportation planning. |
| CO2 | Supervise the process of data collection about travel behaviour and analyse the data for use in transport planning. |
| CO3 | Apply the fundamental principles of mathematical models for the trip generation and its assignment techniques for modal split and trip distribution methods |

| **Text Books:** | |
|---|---|
| 1 | 'Traffic Engineering and Transportation Planning' Dr. Kadiyali. L. R., Khanna Publishers, New Delhi. |
| 2 | Principles of urban transport systems planning by Hutchinson, B. G. Publication date: 1974 Publisher: Washington, Scripta Book Co. |
| 3 | Introduction to transportation engineering- Jotin Kristey and Kentlal - PHI, New Delhi. |

| **Reference Books:** | |
|---|---|
| 1 | Urban Transport planning- Black John, Croom Helm limited- 1981, London, England. |
| 2 | Urban and Regional models in geography and planning- Wilson, A. G– John Wiley & Sons Inc Publishers |
| 3 | Transportation Engineering and Planning- Papacostas, Publisher-Prentice Hall India Learning Private Limited; 3rd edition |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5$^{th}$ week of the semester and Second test at the end of the 10$^{th}$ week of the semester.
- ✓ The makeup test at the end of the 15$^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4$^{th}$ week and Second assignment at the end of 9$^{th}$ week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13$^{th}$ week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.

- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | | | | ✓ | | | | | | |
| CO2 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | ✓ | | | |
| CO3 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | ✓ | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **NATURAL DISASTER MITIGATION AND MANAGEMENT** | | | | | | |
| Course Code | **22CVT604D** | | | | | | |
| Category | **Open Elective Course (OEC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 3 | 0 | 0 | 0 | 3 | 40 | 03 |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 hours** | | |

**Course Learning Objective:** To understand fundamental concepts relevant to natural disasters, their significance, types, and factors that cause the disaster and disaster management cycle, apply the approaches of disaster risk reduction (DRR) and the inter-relationship between disaster and development, as well as the regulations and application of science and technology in disaster management and disaster risk management in India.

**UNIT – I** **8 Hours**

**INTRODUCTION TO DISASTERS:**

Understanding the concepts and definitions of Disaster, Hazard, Vulnerability, Resilience, Risks, Capacity, Disaster and Development, and Disaster Management. Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warming Systems, building design and construction in highly seismic zones, retrofitting of buildings.

**UNIT – II** **8 Hours**

**DIFFERENT DISASTERS:**

Causes, Impacts: Geological Disasters (earthquakes, landslides, tsunami), Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder, storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire). Technological Disasters (electrical, chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, mining, road and rail accidents) Global Disaster Trends, Emerging Risks of Disasters, Climate Change and Urban Disasters.

**UNIT – III** **8 Hours**

**RISK REHABILITATION AND RECOVERY:**

Disaster Management Cycle, Pre-Disaster, Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Capacity Development, Awareness During Disaster, Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation, Post-disaster, Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment.

**UNIT – IV** **8 Hours**

**INTER-RELATIONSHIP BETWEEN DISASTERS & DEVELOPMENT:**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc., Climate Change Adaptation, IPCC Scenario and Scenarios in the context of specific region, Relevance of indigenous knowledge, appropriate technology, and local resources.

**UNIT – V** **8 Hours**

**DISASTER RISK MANAGEMENT IN INDIA:**

Hazard and Vulnerability profile of India, Mega disasters of India, Emergency Management Systems (EMS): Emergency medical and essential public health services, response and recovery operations, reconstruction, and rehabilitation. Disaster Management Act and Policy, Disaster Safe Designs and Constructions S&T Institutions for Disaster Management in India

**Teaching & Learning Process:** Chalk and talk, Power point presentations, Animations and Videos.

**Course Outcomes:** The students will be able to

| | |
|---|---|
| CO1 | Understand the concepts of disaster, various types of disasters, causes and their impact on environment and society. |
| CO2 | Discuss vulnerability, risk rehabilitation and recovery, disaster preparedness |
| CO3 | Discuss the impacts and relation between the disasters & development. |
| CO4 | Summarize the hazards and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment, Act and Policies. |

| **Text Books:** | |
|---|---|
| 1 | Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423 |
| 2 | Iyengar, "Natural Hazards in the Urban Habitat", C.B.R.I., Tata Mc graw Hill. Pub |
| 3 | Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011 |
| 4 | Jagbir Singh, Disaster Management-Future Challenges & Opportunities, I.K. International Publishing House. |

| **Reference Books:** | |
|---|---|
| 1 | R B Singh, Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, 2006. |
| 2 | Brig Khanna & Nina Khanna, Disasters: Strengthening Community Mitigation and Preparedness, New India Publishing Agency – NIPA, 2011. |

**Process of Assessment (both CIE and SEE):**

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

**Continuous Internal Evaluation (CIE):**

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5$^{th}$ week of the semester and Second test at the end of the 10$^{th}$ week of the semester.
- ✓ The makeup test at the end of the 15$^{th}$ week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4$^{th}$ week and Second assignment at the end of 9$^{th}$ week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13$^{th}$ week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination (SEE):**

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question

papers for the subject of duration 03 hours.

- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

**Question paper pattern:**

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | | | | | | | |
| CO2 | ✓ | ✓ | | | | ✓ | ✓ | | | | | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | | | |
| CO4 | ✓ | | | | | | | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

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|---|---|---|---|---|---|---|---|
| Course Title | **SOFTWARE APPLICATION LAB** | | | | | | |
| Course Code | **22CVL606** | | | | | | |
| Category | **Professional Core Course Lab (PCCL)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **0** | **0** | **2** | **0** | **2** | **25** | **01** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Learning Objectives:** To attain skill sets to analyze structure-using software. Learn the application of MS Excel and STAAD PRO to solve Civil Engineering problems.

**UNIT – I** **14 Hours**

**Applications of MS Excel**

i) Design of doubly reinforced rectangular beams
ii) Design of two way slabs.
iii) Design of Stair case
iv) Design of isolated footing.
v) Preparation of Bar bending schedules for the above RCC Elements
vi) Preparation of mix design as per IS 10262:2019.

**UNIT – II**

**STAAD Pro** **11 Hours**

i) Introduction to STAAD Pro
ii) Analysis and Design of a Simply Supported Beam carrying UDL and a Column Carrying Axial Load
iii) Analysis and Design of Portal Frames
iv) Analysis and Design of a Steel Roof Truss
v) Analysis and Design of a Framed Structure Building

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Understand the applications of software in analysing different RC structural components. |
| CO2 | Develop worksheets for different Civil Engineering problems using MS excel. |
| CO3 | Understand the Design of a Framed Structure using software |

**Teaching & Learning Process:**
Chalk and talk, Powerpoint presentations, Animations and Videos and experiential learning in Laboratory.

| **Text Books:** | |
|---|---|
| 1 | Learning Bentley Staad.Pro V8I for Structural Analysis – Sham Tickoo, Dreamtech Press New Delhi, ISBN-13 - 978-9351198093 |
| 2 | Design of Reinforced Concrete Structures- Unnikrishnan and Devadas Menon, 4th Edition, 2021, McGraw Hill, New Delhi, ISBN 978-9354601026 |
| 3 | An Introduction to EXCEL for Civil Engineers (2016)- Gunthar Pangaribuan- E book |
| 3 | IS 456:2000 - Plain and reinforced concrete - Code of practice |
| 4 | IS 10262:2019 - Concrete Mix Proportioning - Guidelines |

| **Reference Code Books:** | |
|---|---|
| 1 | IS 456:2000 - Plain and reinforced concrete - Code of practice |
| 2 | IS 10262:2019 - Concrete Mix Proportioning - Guidelines |

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | ✓ | | | | ✓ | | | | | | ✓ | ✓ |
| CO2 | ✓ | | | | ✓ | | | | ✓ | | | ✓ |
| CO3 | ✓ | | | | ✓ | | | | | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **INTRODUCTION TO TECHNICAL PAPER WRITING** | | | | | | |
| Course Code | **22CVT607A** | | | | | | |
| Category | **Ability Enhancement Course (AEC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **1** | **0** | **0** | **0** | **1** | **15** | **01** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 01 Hours** | | |

**Course Learning Objectives:** To understand the technique to improve technical report writing skills and level of readability. And to learn about what write in contents section of a technical report. Analyze the contents of literature. Create a typical technical article.

| | |
|---|---|
| **UNIT – I** | **3 Hours** |
| Planning and preparation, word order, breaking up long sentences, structuring paragraphs and sentences, being concise and removing redundancy, avoiding ambiguity and vagueness. | |
| **UNIT – II** | **3 Hours** |
| Clarifying who did what, highlighting your findings, hedging and criticizing, Paraphrasing and plagiarism, sections of paper, Abstracts, Introduction. | |
| **UNIT – III** | **3 Hours** |
| Review of the literature, literature gap, objectives, methods, results, discussion, conclusions and the final check. | |
| **UNIT – IV** | **3 Hours** |
| Key skills needed when writing a title, key skills needed when writing an abstract, key skills needed when writing an introduction, skills needed when writing a review of the literature. | |
| **UNIT – V** | **3 Hours** |
| Key skills needed when writing the methods, key skills needed when writing the results, skills needed when writing a discussion, skills needed when writing the conclusions. | |

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Describe the importance of basics of technical writing skills. |
| CO2 | Review and emphasise the result of literature review. |
| CO3 | Discuss the importance of various sections of technical report. |
| CO4 | Develop a complete conceptual technical report. |

**Teaching & Learning Process:**
Chalk and talk, Power point presentations, Animations and Videos.

| **Text Books:** | |
|---|---|
| 1 | Sharma, R.C. and K. Mohan. 2016. Business Correspondence and Report Writing. Fifth Edition. New Delhi: Tata McGraw Hill |
| 2 | Raman, Meenakshi and Sangeeta Sharma, 2011. Technical Communication: Principles and Practice. Second Edition. New Delhi: Oxford University Press. |
| 3 | Gerson, Sharon J and Stern M. Gerson. 2000. Technical Writing: Process and Product. Third Edition. India: Pearson Education Asia. |

| **Reference Books:** | |
|---|---|
| 1 | Goldbort (2006) writing for science, Yale University Press ( Available on Google books) |
| 2 | Day R (2006) How to write and publish a scientific paper, Cambridge university Press. |
| 3 | Highman N (1998) Handbook of writing for the mathematical sciences, SIAM, Highman's book. |

| | |
|---|---|
| 4 | AdianWallwork, English for writing research papers, Springer New York Dordrecht Heidelberg London, 2011 |

**Process of Assessment (both CIE and SEE):**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% ( 18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

**Continuous Internal Examination (CIE)**

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5$^{th}$ week of the semester
2. Second test at the end of the 10$^{th}$ week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4$^{th}$ week of the semester
2. Second assignment at the end of 9$^{th}$ week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities / Seminar / Quiz will be for 50 marks and shall be scaled for the same.

**Semester End Examinations (SEE)**

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | | | | | | | |
| CO2 | ✓ | ✓ | | | | | | | | | | |
| CO3 | ✓ | ✓ | | | | | | | | ✓ | | ✓ |
| CO4 | ✓ | ✓ | | | | | | | | ✓ | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **INTRODUCTION TO REAL ESTATE MANAGEMENT** | | | | | | |
| Course Code | **22CVT607B** | | | | | | |
| Category | **Ability Enhancement Course (AEC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **15** | **01** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 02 Hours** | | |

**Course Learning Objectives:**

To offer hands on experience that is vital to excel in the real estate market by understanding the principles and practices of real estate.

To explore real-world scenarios, best practices and effective management techniques for competing successfully in today's dynamic global markets.

**UNIT – I** **3 Hours**

**REAL ESTATE MARKET:**

Real estate scope, Classification of real estate activities and peculiarities, Factors affecting real estate market - role of government in real estate market, Statutory provisions, laws, rules, and regulations application, Land use controls in property development

**UNIT – II** **3 Hours**

**PARTICIPANTS AND STAKEHOLDERS:**

Role, Scope, Working characteristics and Principal functions of real estate participants and stakeholders - real estate consultants and their activities - Roles and responsibilities of property managers, Good practices and managerial responsibilities.

**UNIT – III** **3 Hours**

**REAL ESTATE DEVELOPMENT:**

Functions of real estate development like project formulation, Feasibility studies, Risk management, Marketing/advertising, Post construction management- real estate investment, Sources and related issues.

**UNIT – IV** **3 Hours**

**DOCUMENTATION:**

Interest rates in real estate - documentation in real estate processes - Transfer of titles and title records - Real estate appraisal

**UNIT – V** **3 Hours**

**REAL ESTATE MANAGEMENT SKILLS:**

Promote innovation within team, Project team building, Motivation techniques, Legal framework

| **Course Outcomes:** The students will be able to | |
|---|---|
| CO1 | Understand the classification, factors affecting and regulations in real estate market. |
| CO2 | Reiterate the roles, responsibilities, rights and liabilities of different real estate stakeholders. |
| CO3 | Describe the functions of real estate management and related issues. |
| CO4 | Summarize the documentation procedures for different real estate and skills needed for real estate management. |

**Teaching & Learning Process:**

Chalk and talk, Power point presentations.

| **Text Books:** | |
|---|---|
| 1 | A.K.Jain, "Real Estate Management", Discovery Publishing House, 2013 |

| | |
|---|---|
| 2 | Mike E. Miles, "Real Estate Development- Principles and process", 5th Edition, 2015 |
| 3 | Institute of Real Estate, "Principles of Real Estate Management", 18th Edition, 2023 |

| **Reference Books:** | |
|---|---|
| 1 | Ashwinder R Singh, "Master Residential Real Estate" Zebra learn books,2023 |

**Process of Assessment (both CIE and SEE):**

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**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | | | | | | | | | ✓ | | |
| CO2 | | | | | | ✓ | | | | | ✓ | |
| CO3 | | | | | | | | ✓ | | | ✓ | ✓ |
| CO4 | | | ✓ | | | ✓ | | | ✓ | | | ✓ |

**Dr. Ambedkar Institute of Technology, Bengaluru – 560056**
**Department of Civil Engineering**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title | **MS OFFICE FOR CIVIL ENGINEERS** | | | | | | |
| Course Code | **22CVT607D** | | | | | | |
| Category | **Ability Enhancement Course / Skill Enhancement Course (AEC)** | | | | | | |
| Scheme & Credits | No. of Hours per week | | | | | Total Teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | **1** | **0** | **0** | **0** | **1** | **15** | **01** |
| **CIE Marks: 50** | **SEE Marks:50** | | **Total Max. Marks: 100** | | **Duration of SEE: 01 hour** | | |

**Course Learning Objective:** To understand the basics of MS office. To create the documents using MS word. To develop data sheets and charts using MS Excel. To design power point presentation using MS office.

**UNIT – I** **3 Hours**

**INTRODUCTION MS WORD:**

Usage of various tools of tool bar – Open, Save document, Style, Font, Size of text, Text alignment, Line Spacing, Inserting Bullets and Numbering, Insert table, pictures, shapes, charts, Inserting page breaks and section breaks, Inserting header and footer, Inserting equations and symbols, Setting size, orientation, margins, columns using page layout tool, spelling check and grammar using references tool.

**UNIT – II** **3 Hours**

**REPORT WRITING USING MS WORD:**

Generation of table of contents, List of figures, List of tables. Referencing styles, proofing and printing.

**UNIT – III** **3 Hours**

**INTRODUCTION TO MS EXCEL:**

Introduction to excel, formatting excel work book, Perform calculations with functions, sort and filter data with excel, create effective charts and present data visually and graphically, analyse data using pivot tables and pivot charts, protecting and sharing of workbook, use macros to automate tasks.

**UNIT – IV** **3 Hours**

**INTRODUCTION TO MS POWER POINT:**

Setting up power point environment, creating slides and applying various tools, working with bullets and numbering, working with objects, hyperlinks and action buttons, usage of smart art and tables, animation and slide transition.

**UNIT – V** **3 Hours**

**PREPARATION OF POWER POINT PRESENTATION FOR PROJECT:**

Using templates and create own design.

**Teaching & Learning Process:**
Power point presentations, videos and hands on training.

| **Course Outcomes:** At the end of the course the student will be able to: | |
|---|---|
| CO1 | Understand the basics of MS office. |
| CO2 | Create the documents using MS word. |
| CO3 | Develop data sheets and charts using MS Excel. |
| CO4 | Design of power point presentation using MS office. |

| **Text Books:** | |
|---|---|
| 1 | Randy Nordell, Kathleen Stewart, Annette Easton and Pat Graves, "Microsoft office 365: In practice". McGrawhill 1st Edtion, 2023, ISBN10: 1266773150 |
| 2 | Mansifield and Ron, "Working in Microsoft office". Tata McGrawhill, 2008, ISBN:9780074632673 |

| | |
|---|---|
| 3 | Jow Habraken, "Microsoft office 2003 all in one". Que 1st edition, 2003, ISBN:0789729369 |

| **Reference Books:** | |
|---|---|
| 1 | Leonard J Ledger , Microsoft Office 365 For Beginne, Teams & Access, July 2023. |
| 2 | Tom Bunzel, "Sams teach yourself Microsoft office power point". Sams 1st edition, 2003, ISBN:0672325551 |

**Process of Assessment (both CIE and SEE):**

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| CO1 | | | | | ✓ | | | | ✓ | ✓ | | ✓ |
| CO2 | | | | | ✓ | | | | ✓ | ✓ | | ✓ |
| CO3 | | | | | ✓ | | | | ✓ | ✓ | | ✓ |
| CO4 | | | | | ✓ | | | | ✓ | ✓ | | ✓ |