# BIRLA INSTITUTE OF TECHNOLOGY

**NEP-2020 CURRICULUM BOOK**
***(Effective from Academic Session: Monsoon 2024)***

**Bachelor of Technology**

**DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING**

**INSTITUTE VISION**

To become a Globally Recognized Academic Institution in consonance with the social, economic and ecological environment, striving continuously for excellence in education, research and technological service to the National needs.

**INSTITUTE MISSION**

To educate students at Undergraduate, Postgraduate, Doctoral, and Post-Doctoral levels to perform challenging engineering and managerial jobs in industry.

- To provide excellent research and development facilities to take up Ph.D. programmes and research projects.
- To develop effective teaching and learning skills and state of art research potential of the faculty.
- To build national capabilities in technology, education and research in emerging areas.
- To provide excellent technological services to satisfy the requirements of the industry and overall academic needs of society.

**DEPARTMENT VISION**

To develop quality intellectuals through education, research and motivation so that they can bring a positive contribution to society in the area of Civil and Environmental Engineering.

**DEPARTMENT MISSION**

1. To develop professional skills through quality education & research.
2. To outreach various sectors of society through interdisciplinary programmes and practical oriented approach.
3. To create dynamic, logical and effective leaders with inspiring mindsets.

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

1. **PEO1:** Attain the analytical expertise to create, analyse, formulate, and solve challenging problems in the field of Civil Engineering; and recognize and develop the necessary and suitable tools for the same.
2. **PEO2:** Develop technical and management flair to take responsibility for engineering projects and research programs significantly.
3. **PEO3:** Uncover multidisciplinary approach and co-relate engineering issues to social and human background in broader sense, in which their engineering helping hand will be utilised.
4. **PEO4:** Develop attitude of lifelong learning for becoming successful civil engineers.
5. **PEO5:** Implant sensitivity towards ethics, public policies and their responsibilities towards the society.

**PROGRAMME OUTCOMES (POs)**

1. **PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **PO8: Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9. **PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
10. **PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

**PROGRAMME SPECIFIC OUTCOMES (PSOs)**

1. **PSO1:** Plan, analyse, and design infrastructural projects and its components in various areas of Civil Engineering like Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Environmental Engineering, and Transportation Engineering.
2. **PSO2:** Execute the construction of buildings and other components of various projects in Civil Engineering including its layout, management, and quality control.
3. **PSO3:** Implement the provisions made in Indian Standard Codes/ other relevant codes/ specifications/ guidelines and applicable laws including labour laws and environmental laws.

**Mapping of Pos and PSOs with PEOs**

| | PEO1 | PEO2 | PEO3 | PEO4 | PEO5 |
|---|---|---|---|---|---|
| **PO1** | **3** | **0** | **0** | **0** | **0** |
| **PO2** | **3** | **0** | **0** | **0** | **0** |
| **PO3** | **2** | **1** | **2** | **0** | **0** |
| **PO4** | **3** | **0** | **0** | **0** | **0** |
| **PO5** | **3** | **2** | **0** | **0** | **0** |
| **PO6** | **1** | **0** | **3** | **0** | **3** |
| **PO6** | **0** | **0** | **3** | **0** | **3** |
| **PO7** | **0** | **2** | **2** | **0** | **1** |
| **PO8** | **0** | **1** | **1** | **0** | **0** |
| **PO9** | **0** | **3** | **1** | **1** | **0** |
| **PO10** | **2** | **1** | **0** | **3** | **1** |
| **PO11** | **3** | **1** | **1** | **0** | **0** |
| **PSO1** | **1** | **3** | **1** | **0** | **1** |
| **PSO2** | **1** | **1** | **3** | **1** | **3** |
| **PSO3** | **3** | **0** | **0** | **0** | **0** |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**Program Course Structure**

| **Birla Institute of Technology, Mesra, Ranchi<br>Course Structure for B.Tech. (Civil and Environmental Engineering)<br>Based on NEP-2020, CBCS and OBE, Effective from 2024-2025** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Semester of Study (Recommended)** | **Category of Course** | **Course Code** | **Subjects** | **Mode of Delivery & Credits** *L-Lecture; T-Tutorial; P-Practical* | | | **Total Credits** |
| | | | | | **L (*Periods/ Week*)** | **T (*Periods/ Week*)** | **P (*Periods/ Week*)** | |
| | FIRST | **THEORY** | | | | | | |
| I.1 | | FS | MA24101 | Mathematics - I | 3 | 1 | 0 | 4 |
| I.2 | | | PH24101 | Physics | 3 | 1 | 0 | 4 |
| I.3 | | | BE24101 | Biological Sciences for Engineers | 2 | 0 | 0 | 2 |
| I.4 | | GE | CS24101 | Programming for Problem Solving | 3 | 1 | 0 | 4 |
| I.5 | | | EE24101 | Basics of Electrical Engineering | 2 | 1 | 0 | 3 |
| | | LABORATORIES | | | | | | |
| I.6 | | FS | PH24102 | Physics Lab | 0 | 0 | 2 | 1 |
| I.7 | | GE | CS24102 | Programming for problem Solving Lab. | 0 | 0 | 2 | 1 |
| I.8 | | | EE24102 | Electrical Engineering Lab. | 0 | 0 | 2 | 1 |
| I.9 | | | HS24131 | Communication Skill - I | 0 | 0 | 3 | 1.5 |
| I.10 | | MC | MC24 101/ 102 /103/ 104/105 | Choice of : NCC/NSS/ PT & Games/ Creative Arts (CA) /Entrepreneurship | 0 | 0 | 2 | 1 |
| TOTAL (Theory + Labs) | | | | | | | | **22.5** |
| | SECOND | THEORY | | | | | | |
| II.1 | | FS | MA24103 | Mathematics - II | 3 | 1 | 0 | 4 |
| II.2 | | | CH24101 | Chemistry | 3 | 1 | 0 | 4 |
| II.3 | | GE | EC24101 | Basic Electronics | 2 | 1 | 0 | 3 |
| II.4 | | | ME24101 | Basics of Mechanical Engineering | 2 | 1 | 0 | 3 |
| II.5 | | FS | CE24101 | Environmental Science | 2 | 0 | 0 | 2 |
| | | LABORATORIES | | | | | | |
| II.6 | | FS | CH24102 | Chemistry Lab | 0 | 0 | 2 | 1 |
| II.7 | | GE | EC24102 | Basic Electronics Lab | 0 | 0 | 2 | 1 |
| II.8 | | | ME24102 | Engineering Graphics | 0 | 0 | 4 | 2 |
| II.9 | | HSS | PE24102 | Workshop Practice | 0 | 0 | 2 | 1 |
| II.10 | | MC | MC24 106 /107/108/109/110 | Choice of : NCC/NSS/ PT & Games/ Creative Arts (CA) /Entrepreneurship | 0 | 0 | 2 | 1 |
| TOTAL (Theory + Labs) | | | | | | | | **22** |
| GRAND TOTAL FOR FIRST YEAR | | | | | | | | **44.5** |
| Vocational Courses for Exit after 1st Year | | | | | | | | |
| **Vocational Course I: CE24151 Building Drawing** | | | | | **1** | **0** | **4** | **3** |
| **Vocational Course II: CE24152 Surveying** | | | | | **1** | **0** | **4** | **3** |
| | | | | | | | | |

**Birla Institute of Technology, Mesra, Ranchi**
**Course Structure for B.Tech. (Civil and Environmental Engineering)**
**Based on NEP-2020, CBCS and OBE, Effective from 2024-2025**

| Sr. No. | Semester of Study (Recommended) | Category of Course | Course Code | Subjects | Mode of Delivery & Credits *L-Lecture; T-Tutorial; P-Practical* | | | Total Credits |
|---|---|---|---|---|---|---|---|---|
| | | | | | L (*Periods/ Week*) | T (*Periods/ Week*) | P (*Periods/ Week*) | |
| | THIRD | THEORY | | | | | | |
| III.1 | | FS | MA24201 | Numerical Methods | 2 | 0 | 0 | 2 |
| III.2 | | PC | CE24201 | Solid Mechanics | 4 | 0 | 0 | 4 |
| III.3 | | | CE24202 | Structural Analysis - I | 3 | 0 | 0 | 3 |
| III.4 | | | CE24203 | Fluid Mechanics | 4 | 0 | 0 | 4 |
| III.5 | | | CE24204 | Building Materials and Construction | 3 | 0 | 0 | 3 |
| III.6 | | HSS | MT24131 | UHV-II: Understanding Harmony | 3 | 0 | 0 | 3 |
| | | LABORATORIES | | | | | | |
| III.7 | | FS | MA24202 | Numerical Methods Laboratory | 0 | 0 | 2 | 1 |
| III.8 | | PC | CE24205 | Civil Engineering Drawing | 0 | 0 | 4 | 2 |
| III.9 | | | CE24206 | Fluid Mechanics Laboratory | 0 | 0 | 2 | 1 |
| III.10 | | MC | MC24 201/202/203/204 /205 | Choice of : NCC/NSS/ PT & Games/ Creative Arts (CA) / Entrepreneurship | 0 | 0 | 2 | 1 |
| | TOTAL (Theory + Labs) | | | | | | | **24** |
| | FOURTH | THEORY | | | | | | |
| IV.1 | | PC | CE24207 | Structural Analysis - II | 3 | 0 | 0 | 3 |
| IV.2 | | | CE24208 | Surveying | 3 | 0 | 0 | 3 |
| IV.3 | | | CE24209 | Construction Engineering and Management | 3 | 0 | 0 | 3 |
| IV.4 | | | CE24210 | Earthquake Engineering and Disaster Management | 2 | 0 | 0 | 2 |
| IV.5 | | PE | CE2425X | Elective - I | 3 | 0 | 0 | 3 |
| IV.6 | | OE | XX24XXX/ MO24201 | Open Elective - I / MOOC - I | 3 | 0 | 0 | 3 |
| IV.7 | | MC | HU24211 | Indian Knowledge System | 2 | 0 | 0 | 0 |
| | | LABORATORIES | | | | | | |
| IV.8 | | PC | CE24211 | Structural Engineering Laboratory - I | 0 | 0 | 2 | 1 |
| IV.9 | | | CE24212 | Surveying Field Work | 0 | 0 | 4 | 2 |
| IV.10 | | | CE24213 | Specifications Estimation and Costing | 1 | 0 | 2 | 2 |
| IV.11 | | | CE24214 | Solid Mechanics Laboratory | 0 | 0 | 2 | 1 |
| IV.12 | | MC | MC24 206/207/208/209/210 | Choice of : NCC/NSS/ PT & Games/ Creative Arts (CA) / Entrepreneurship | 0 | 0 | 2 | 1 |
| TOTAL (Theory + Labs) | | | | | | | | **24** |
| GRAND TOTAL FOR SECOND YEAR | | | | | | | | **48** |
| **Vocational Course III: CE24251 Cement Concrete and Road Materials** | | | | | **1** | **0** | **4** | **3** |
| **Vocational Course IV: CE24252 Soil Investigations and Testing** | | | | | **1** | **0** | **4** | **3** |

**Birla Institute of Technology, Mesra, Ranchi**
**Course Structure for B.Tech. (Civil and Environmental Engineering)**
**Based on NEP-2020, CBCS and OBE, Effective from 2024-2025**

| Sr. No. | Semester of Study (Recommended) | Category of Course | Course Code | Subjects | Mode of Delivery & Credits *L-Lecture; T-Tutorial; P-Practical* | | | Total Credits |
|---|---|---|---|---|---|---|---|---|
| | | | | | L (*Periods/ Week*) | T (*Periods/ Week*) | P (*Periods/ Week*) | |
| | FIFTH | | | THEORY | | | | |
| V.1 | | PC | CE24301 | Structural Design - I | 4 | 0 | 0 | 4 |
| V.2 | | | CE24302 | Water Resources Engineering | 3 | 0 | 0 | 3 |
| V.3 | | | CE24303 | Geotechnical Engineering | 3 | 0 | 0 | 3 |
| V.4 | | | CE24304 | Environmental Engineering | 3 | 0 | 0 | 3 |
| V.5 | | | CE24305 | Transportation Engineering | 3 | 0 | 0 | 3 |
| V.6 | | OE | XX24XXX/ MO24301 | Open Elective - II / MOOC - II | 3 | 0 | 0 | 3 |
| | | | | LABORATORIES | | | | |
| V.7 | | PC | CE24306 | Water Resources Engineering Laboratory | 0 | 0 | 2 | 1 |
| V.8 | | | CE24307 | Environmental Engineering Laboratory | 0 | 0 | 2 | 1 |
| V.9 | | HSS | HU24133 | Communication Skill - II | 0 | 0 | 3 | 1.5 |
| V.10 | | PC | CE24300 | Project - I | | | | 2 |
| TOTAL (Theory + Labs) | | | | | | | | **24.5** |
| | SIXTH | | | THEORY | | | | |
| VI.1 | | PC | CE24308 | Structural Design - II | 4 | 0 | 0 | 4 |
| VI.2 | | PE | CE2435X | Elective - II | 3 | 0 | 0 | 3 |
| VI.3 | | | CE2435X | Elective - III | 3 | 0 | 0 | 3 |
| VI.4 | | | CE2435X | Elective - IV | 3 | 0 | 0 | 3 |
| VI.5 | | OE | XX24XXX/ MO24303 | Open Elective - III / MOOC - III | 3 | 0 | 0 | 3 |
| | | | | LABORATORIES | | | | |
| VI.6 | | PC | CE24309 | Structural Engineering Laboratory - II | 0 | 0 | 2 | 1 |
| VI.7 | | | CE24310 | Computer Aided Analysis and Design | 1 | 0 | 2 | 2 |
| VI.8 | | | CE24311 | Geotechnical Engineering Laboratory | 0 | 0 | 2 | 1 |
| VI.9 | | | CE24312 | Transportation Engineering Laboratory | 0 | 0 | 2 | 1 |
| VI.10 | | | CE24350 | Project - II | | | | 2 |
| TOTAL (Theory + Labs) | | | | | | | | **23** |
| GRAND TOTAL FOR THIRD YEAR | | | | | | | | **47.5** |
| | SEVENTH | | | THEORY | | | | |
| VII.1 | | PE | CE2445X | Elective - V | 3 | 0 | 0 | 3 |
| VII.2 | | | CE2445X | Elective - VI | 3 | 0 | 0 | 3 |
| VII.3 | | | CE2445X | Elective - VII | 3 | 0 | 0 | 3 |
| VII.4 | | OE | XX24XXX/ MO24401 | Open Elective - IV / MOOC - IV | 3 | 0 | 0 | 3 |
| VII.5 | | HSS | MT24204 | Constitution of India | 2 | 0 | 0 | 0 |
| | | | | | | | | |

| Birla Institute of Technology, Mesra, Ranchi<br>Course Structure for B.Tech. (Civil and Environmental Engineering)<br>Based on NEP-2020, CBCS and OBE, Effective from 2024-2025 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Semester of Study (Recommended)** | **Category of Course** | **Course Code** | **Subjects** | **Mode of Delivery & Credits** *L-Lecture; T-Tutorial; P-Practical* | | | **Total Credits** |
| | | | | | **L (*Periods/ Week*)** | **T (*Periods/ Week*)** | **P (*Periods/ Week*)** | |
| | | LABORATORIES | | | | | | |
| VII.6 | | PC | CE24402 | Remote Sensing and GIS Laboratory | 0 | 0 | 2 | 1 |
| VII.7 | | MC | CE24403 | Advanced Instrumentation Laboratory | 0 | 0 | 2 | 1 |
| VII.8 | | | MC24400 | Summer Training (Minimum Four Weeks / 160 Hrs) | | | | 4 |
| VII.9 | | PC | CE24400 | Project - III | | | | 3 |
| TOTAL (Theory + Labs) | | | | | | | | **21** |
| VIII.1 | EIGHTH | PC | CE24450/ CE24490 | Project-IV / Industry Internship | | | | 6 |
| VIII.2 | | | CE24498 | Comprehensive Viva | | | | 1 |
| | TOTAL (Theory + Labs) | | | | | | | **7** |
| GRAND TOTAL FOR FOURTH YEAR | | | | | | | | **28** |
| GRAND TOTAL FOR B.TECH. | | | | | | | | **168** |

| Programme Electives for Students of B.Tech. (Civil Engineering) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Semester of Study (Recommended)** | **Category of Course** | **Course Code** | **Subjects** | **Mode of Delivery & Credits** *L-Lecture; T-Tutorial; P-Practical* | | | **Total Credits** |
| | | | | | **L (*Periods/ Week*)** | **T (*Periods/ Week*)** | **P (*Periods/ Week*)** | |
| PE1 | FOURTH | PE | CE24251 | Advanced Solid Mechanics | 3 | 0 | 0 | 3 |
| PE1 | FOURTH | PE | CE24252 | Concrete Technology | 3 | 0 | 0 | 3 |
| PE1 | FOURTH | PE | CE24253 | Open Channel Hydraulics | 3 | 0 | 0 | 3 |
| PE2 | SIXTH | PE | CE24351 | Advanced Structural Analysis | 3 | 0 | 0 | 3 |
| PE2 | SIXTH | PE | CE24352 | Finite Element Method | 3 | 0 | 0 | 3 |
| PE2 | SIXTH | PE | CE24353 | Structural Dynamics | 3 | 0 | 0 | 3 |
| PE3 | SIXTH | PE | CE24354 | Transportation Planning | 3 | 0 | 0 | 3 |
| PE3 | SIXTH | PE | CE24355 | Traffic Engineering and Management | 3 | 0 | 0 | 3 |
| PE3 | SIXTH | PE | CE24356 | Harbour and Airport Engineering | 3 | 0 | 0 | 3 |
| PE4 | SIXTH | PE | CE24357 | Air Pollution and Control | 3 | 0 | 0 | 3 |
| PE4 | SIXTH | PE | CE24358 | Solid Waste Management | 3 | 0 | 0 | 3 |
| PE4 | SIXTH | PE | CE24359 | Environmental Impact Assessment | 3 | 0 | 0 | 3 |

| Programme Electives for Students of B.Tech. (Civil Engineering) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Semester of Study (Recommended)** | **Category of Course** | **Course Code** | **Subjects** | **Mode of Delivery & Credits** *L-Lecture; T-Tutorial; P-Practical* | | | **Total Credits** |
| | | | | | **L (*Periods/ Week*)** | **T (*Periods/ Week*)** | **P (*Periods/ Week*)** | |
| PE5 | SEVENTH | PE | CE24451 | Pre-stressed Concrete | 3 | 0 | 0 | 3 |
| PE5 | SEVENTH | PE | CE24452 | Advanced Concrete Structures Design | 3 | 0 | 0 | 3 |
| PE5 | SEVENTH | PE | CE24453 | Advanced Steel Structures Design | 3 | 0 | 0 | 3 |
| PE6 | SEVENTH | PE | CE24454 | Advanced Surveying | 3 | 0 | 0 | 3 |
| PE6 | SEVENTH | PE | CE24455 | Advanced Soil Mechanics | 3 | 0 | 0 | 3 |
| PE6 | SEVENTH | PE | CE24456 | Foundation Engineering | 3 | 0 | 0 | 3 |
| PE7 | SEVENTH | PE | CE24457 | Remote Sensing in Civil Engineering | 3 | 0 | 0 | 3 |
| PE7 | SEVENTH | PE | CE24458 | Groundwater Engineering | 3 | 0 | 0 | 3 |
| PE7 | SEVENTH | PE | CE24459 | Design of Hydraulic Structures | 3 | 0 | 0 | 3 |

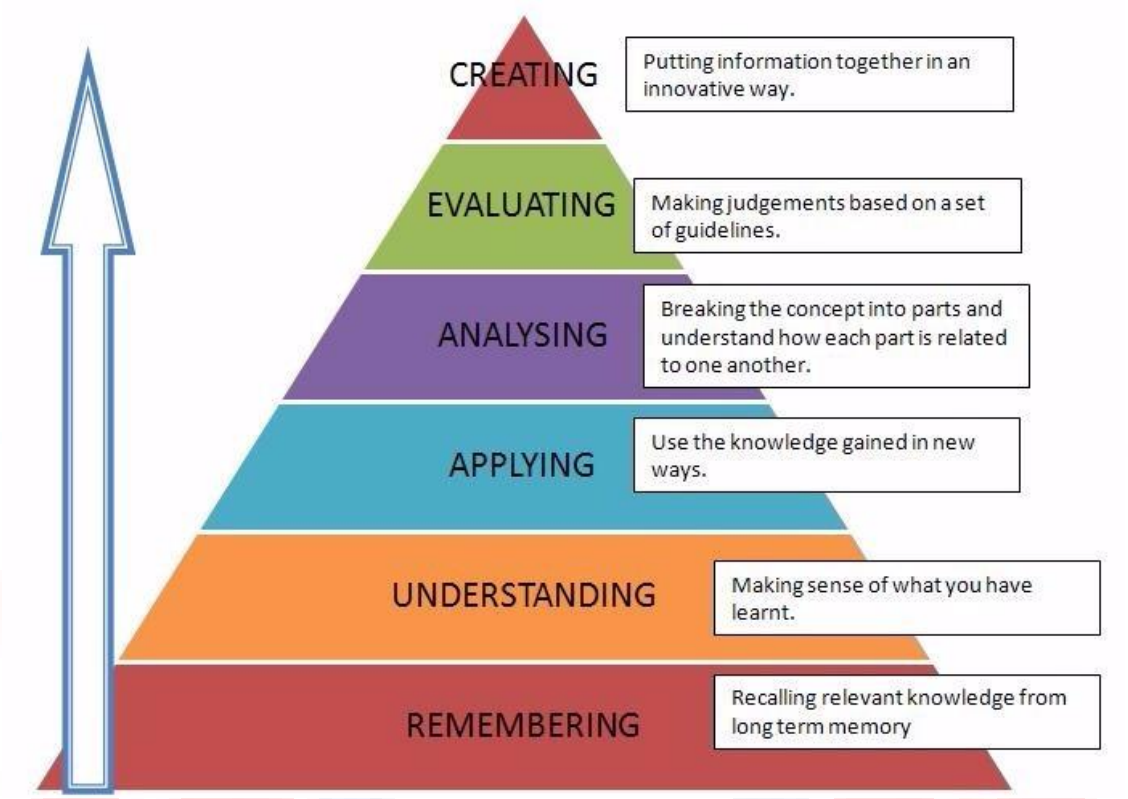
| Open Electives Offered by Department of Civil and Environmental Engineering for Students of Other Departments | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Semester of Study (Recommended)** | **Category of Course** | **Course Code** | **Subjects** | **Mode of Delivery & Credits** *L-Lecture; T-Tutorial; P-Practical* | | | **Total Credits** |
| | | | | | **L (*Periods/ Week*)** | **T (*Periods/ Week*)** | **P (*Periods/ Week*)** | |
| OE1 | FOURTH | OE | CE24291 | Building Construction | 3 | 0 | 0 | 3 |
| OE2 | FIFTH | OE | CE24391 | Environmental Management | 3 | 0 | 0 | 3 |
| OE3 | SIXTH | OE | CE24392 | Disaster Management | 3 | 0 | 0 | 3 |
| OE4 | SEVENTH | OE | CE24491 | Construction Management | 3 | 0 | 0 | 3 |

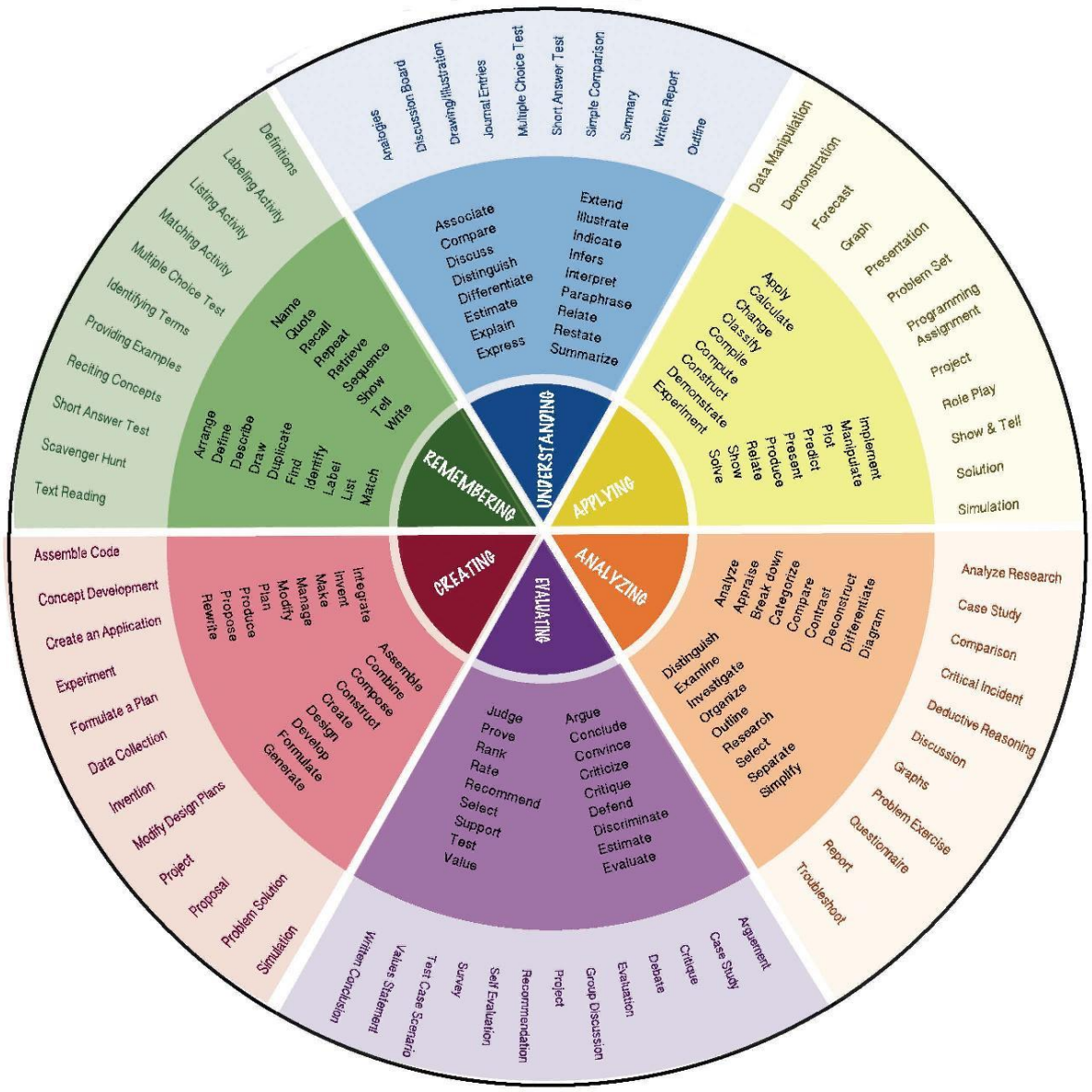
| Vocational Courses<br>After Completion of First Year of B.Tech. | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Category of Course** | **Course Code** | **Subjects** | **Mode of Delivery & Credits** *L-Lecture; T-Tutorial; P-Practical* | | | **Total Credits** |
| | | | | **L (*Periods/ Week*)** | **T (*Periods/ Week*)** | **P (*Periods/ Week*)** | |
| 1 | VOC1 | CE24151 | Building Drawing | 1 | 0 | 4 | 3 |
| 2 | VOC2 | CE24152 | Surveying | 1 | 0 | 4 | 3 |
| **After Completion of Second Year of B.Tech. (Civil Engineering)** | | | | | | | |
| 1 | VOC3 | CE24XXX | Cement Concrete and Road Materials | 1 | 0 | 4 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | VOC4 | CE24XXX | Soil Investigations and Testing | 1 | 0 | 4 | 3 |

**BLOOM'S TAXONOMY FOR CURRICULUM DESIGN AND ASSESSMENT:**

*Preamble*
The design of curriculum and assessment is based on Bloom's Taxonomy. A comprehensive guideline for using Bloom's Taxonomy is given below for reference.






Bloom's Taxonomy is used to formulate questions. It facilitates the formulation of action verbs in connection with the various tiers of thinking to achieve a balance between basic retrieval and more complex abilities. Questions at the Remember level, e.g., may use verbs to define or list, questions at the Understand level may use verbs to explain or summarize, at the Apply level use or demonstrate, at the Analyze level differentiate or compare, at the Evaluate level justify or critique, and then at the Create level design or formulate.

## COURSE INFORMATION SHEET

**Course Code: MA24101**
**Course Title: MATHEMATICS-I**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 4** L: 3 T: 1 P: 0
**Class schedule per week: 4**
**Class: B.Tech**.
**Semester / Level: I / 1**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Infinite sequences and series |
| **2.** | Theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations, eigenvalues, eigenvectors etc. |
| **3.** | Multivariable functions, partial differentiation, properties and applications of partial derivatives. |
| **4.** | Integrals of multivariable functions viz. double and triple integrals with their applications |
| **5.** | Properties like gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Decide the behavior of sequences and series using appropriate tests. |
| **CO2** | Handle problems related to the theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations, eigenvalues, eigenvectors etc. |
| **CO3** | Get an understanding of partial derivatives and their applications in finding maxima - minima problems. |
| **CO4** | Apply the principles of integrals (multivariable functions viz. double and triple integrals) to solve a variety of practical problems in engineering and sciences. |
| **CO5** | Get an understanding of gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions and demonstrate a depth of understanding in advanced mathematical topics, enhance and develop the ability of using the language of mathematics in engineering. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Sequences and Series**<br>Sequences, Convergence of Sequence. Series, Convergence of Series, Tests for Convergence: Comparison tests, Cauchy's Integral test, Ratio test, Cauchy's root test, Raabe's test, Gauss test, Alternating series, Leibnitz test, Absolute and Conditional Convergence. | **9** |
| **Module – II: Matrices**<br>Rank of a Matrix, elementary transformations. Vectors, Linear Independence and Dependence of Vectors. Consistency of system of linear equations. Eigenvalues, Eigenvectors, Cayley - Hamilton theorem. | **9** |
| **Module – III: Advance Differential Calculus**<br>Function of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Chain rules, Jacobians and its properties, Taylor series for function of two variables, Maxima – Minima. | **9** |
| **Module – IV: Advance Integral Calculus**<br>Double integrals, double integrals in polar coordinates, Change of order of integration, Triple Integrals, cylindrical and spherical coordinate systems, transformation of coordinates, Applications of double and triple integrals in areas and volumes. | **9** |
| **Module – V: Vector Calculus**<br>Scalar and vector point functions, gradient, directional derivative, divergence, curl. Line Integral, Work done, Conservative field, Green's theorem in a plane, Surface and volume integrals, Gauss – divergence theorem, Stoke 's theorem. | **9** |

**TEXTBOOKS:**


1. M. D. Weir, J. Hass and F. R. Giordano: Thomas' Calculus, 11th edition, Pearson Educations, 2008E.
2. H. Anton, I. Brivens and S. Davis, Calculus, 10th Edition, John Wiley and sons, Singapore Pte. Ltd., 2013.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.


**REFERENCE BOOKS:**


1. M. J. Strauss, G. L. Bradley And K. J. Smith, Calculus, 3rd Ed, Dorling. Kindersley (India) Pvt. Ltd. (P Ed), Delhi, 2007.
2. David C. Lay, Linear Algebra and its Applications (3rd Edition), Pearson Ed. Asia, Indian Reprint, 2007.
3. Robert Wrede & Murray R. Spiegel, Advanced Calculus, 3rd Ed., Schaum's outline series, McGraw-Hill Companies, Inc.,2010.
4. D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, Fourth Edition, 2011.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS) --**

**POS MET THROUGH GAPS IN THE SYLLABUS --**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN --**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN --**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |
| **CD4** | Laboratory experiments/teaching aids |
| **CD5** | Industrial/guest lectures |
| **CD6** | Industrial visits/in-plant training |
| **CD7** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | | | |
| CO2 | 3 | 3 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | | | |
| CO3 | 3 | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | | | |
| CO4 | 3 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 2 | | | |
| CO5 | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: PH24101**
**Course Title: PHYSICS**
**Pre-requisite(s): Intermediate Physics and Intermediate Mathematics**
**Co- requisite(s): Mathematics I**
**Credits: 4** L: 3 T: 1 P: 0
**Class schedule per week: 4**
**Class: B.Tech.**
**Semester / Level: I**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | The principles of physical optics and basic concept of fiber optics. |
| **2.** | Fundamental laws of electromagnetism leading to Maxwell's equations. |
| **3.** | The posulates of special theory of relativity, Lorenz transformation equation and their consequences: Einstein energy mass relation and relativistic energy-momentum relation |
| **4.** | The limitations of classical physics and basic concepts such as wave-particle duality, and working of quantum mechanics with the help of particles in a box problem |
| **5.** | Concepts of stimulated emission and working principle of laser with examples, concepts of nuclear physics and plasma physics |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Analyse the intensity variation of light due to polarization, interference and diffraction. |
| **CO2** | Formulate and solve the problems on electromagnetism |
| **CO3** | Explain and apply concepts of special theory of relativity and its consequences |
| **CO4** | Apply the concepts of quantum mechanics such as wave-particle duality and obtain the solution of simple quantum mechanical problems. |
| **CO5** | Esxplain working principle of lasers and to summarize its applications, describe basic concepts of nuclear and plasma physics |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Physical Optics**<br>Polarization, Malus' Law, Brewster's Law, Double Refraction, Interference in thin parallel films, Interference in wedge-shaped layers, Newton's rings, Fraunhofer diffraction by single slit and double slit. Elementary ideas of fibre optics and application of fibre optic cables | **8** |
| **Module – II: Electromagnetic Theory**<br>Gradient, Divergence and Curl, Statement of Gauss theorem & Stokes theorem, Gauss's law, Applications, Concept of electric potential, Relationship between E and V, Polarization of dielectrics and dielctric constant, Boundary conditions for E & D, Gauss's law in magnetostatics, Ampere's circuital law, Boundary conditions for B & H, Equation of continuity, Displacement current, Maxwell's equations. | **8** |
| **Module – III: Special Theory of Relativity**<br>Introduction, Inertial frame of reference, Galilean transformations, Postulates, Lorentz transformations and its conclusions, Length contraction, time dilation, velocity addition, Mass change, Einstein's mass energy relation. | **6** |
| **Module – IV: Quantum Mechanics**<br>Planck's theory of black-body radiation, Compton effect, Wave-particle duality, De Broglie waves, Davisson and Germer's experiment, Uncertainty principle, Brief idea of Wave Packet, Wave Function and its physical interpretation, Schrodinger equation in one-dimension, free particle, particle in an infinite square well | **9** |
| **Module – V: Modern Physics**<br>Laser-Spontaneous and stimulated emission, Einstein's A and B coefficients, Population inversion, Light amplification, Basic laser action, Ruby and He-Ne lasers, Properties and applications of laser radiation, Nuclear Physics: Binding Energy Curve, Nuclear Force, Liquid drop model, Introduction to Shell model, Applications of Nuclear Physics, Concept of Plasma Physics and its applications. | **9** |

**TEXTBOOKS:**


1. A. Ghatak, Optics, 4th Edition, Tata Mcgraw Hill, 2009
2. Mathew N.O. Sadiku, Elements of Electromagnetics, Oxford University Press, 2001
3. Arthur Beiser, Concept of Modern Physics, 6th edition, Tata McGraw- Hill, 2009
4. F. F. Chen, Introduction to Plasma Physics and controlled Fusion, Springer, Edition 2016.


**REFERENCE BOOKS:**


1. Fundamentals of Physics, Halliday, Walker and Resnick


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment/Quiz** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | | | |
| CO2 | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | | | |
| CO3 | 2 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | | | |
| CO4 | 2 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | | | |
| CO5 | 2 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

**COURSE INFORMATION SHEET**

**Course Code: BE24101**
**Course Title: BIOLOGICAL SCIENCE FOR ENGINEERS**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 2** L:2 T: 0 P: 0
**Class schedule per week: 2**
**Class: B. Tech.**
**Semester / Level: I**
**Branch: Biotechnology**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Understand fundamental concepts of biology relevant to engineering. |
| **2.** | Explore the structure and function of biological molecules and cells. |
| **3.** | Learn about genetic principles and molecular biology techniques. |
| **4.** | Understand the applications of biological science in various engineering fields considering global challenges and ethical considerations. |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Comprehend and apply the fundamental concepts of biological sciences in the context of engineering. |
| **CO2** | Analyze the structure and function of biological molecules and cells and their relevance to engineering solutions. |
| **CO3** | Demonstrate understanding of genetic principles and molecular biology techniques and their applications in engineering. |
| **CO4** | Apply knowledge of biological sciences to innovate and develop solutions in various engineering domains and critically evaluate the role of biological sciences in addressing global challenges, including ethical and safety considerations. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction to Biological Sciences**<br>Overview and importance of biology in engineering, Origin of Life, Cell Theory and Structure. | **6** |
| **Module – II: Molecular Biology and Genetics**<br>Central Dogma of Molecular Biology, DNA, RNA and Protein structure and function, Mendelian Genetics, rDNA Technology and Genome Editing. | **6** |
| **Module – III: Biochemistry**<br>Cell Metabolism, Enzymes and Catalysis, Cell Communication and Signalling. | **6** |
| **Module – IV: Applications of Biological Sciences in Engineering**<br>Biomaterials, Bioinformatics, Biosensors and Bioelectronics (Biological Sensors- Ear & Eye), Synthetic Biology, Nanobiotechnology. | **6** |
| **Module – V: Global Challenges and Ethical Considerations**<br>Convergence of AI and Biology, Climate change and food security, Biosafety and Biohazards, Ethical Considerations. | **6** |

**TEXTBOOKS:**

1. Lehninger A, Principals of Biochemistry
2. Stryer L, Biochemistry
3. K. Wilson & K.H. Goulding, A biologist's guide to Principles and Techniques of Practical Biochemistry.
4. Biology for Engineers" by Arthur T. Johnson

**REFERENCE BOOKS:**

1. Purves et al, Life: The Science of Biology
2. R. Dulbecco, The Design of Life.
3. Biological Science Edited by Soper, Cambridge low price edition.
4. Synthetic Biology: A Primer" by Paul S. Freemont and Richard I. Kitney
5. "Introduction to Bioinformatics" by Arthur Lesk Genomes" by T.A. Brown

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**
**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 |
|---|---|---|---|---|
| Continuous Internal Assessment | √ | √ | √ | √ |
| Semester End Examination | √ | √ | √ | √ |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Assignments/Seminars |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| Course Outcomes (CO) | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 3 | 3 |
| **CO3** | 1 | 3 | 3 | 3 | | 1 | 1 | 1 | | 1 | 1 | 2 | 3 | 3 |
| **CO4** | 2 | 2 | 2 | 2 | | 2 | 2 | 2 | | 1 | 1 | 3 | 2 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |

# COURSE INFORMATION SHEET

**Course Code: CS24101**
**Course Title: PROGRAMMING FOR PROBLEM SOLVING**
**Pre-requisite(s): School-level mathematics and Science**
**Co- requisite(s):**
**Credits: 4** L: 3 T: 1 P:0
**Class schedule per week: 4**
**Class: UG**
**Semester / Level: I**
**Branch: ALL**
**Name of Teacher:**

## COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Develop Programming Skill. |
| **2.** | Understand the fundamental Concepts of Coding |
| **3.** | Learn how to Debug Programs |
| **4.** | Convert Problems to Programs |

## COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Formulate Algorithms for arithmetic and logical problems. |
| **CO2** | Translate the algorithms to programs. |
| **CO3** | Test and execute the programs and correct syntax and logical errors. |
| **CO4** | Apply programmatic skills for solving scientific problems. |
| **CO5** | Decompose problems into functions and structured programming. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I**<br>Representation of an Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs: source code, variables and memory locations, Syntax and Logical Errors in compilation, object and executable code. | **6** |
| **Module – II**<br>Structure of a C program, variables and data types, Operators – precedence and associativity, Evaluating expressions, Basic I/O – use of printf, scanf, getchar etc. and format specifiers, Conditional Branching statements – If, If - else, If-else- if, switch case, Writing nested conditional statements. | **8** |
| **Module – III**<br>Iterative programming structures – for loops, while loops, do while loops. Understanding break and continue and their usage. Writing Nested loops, Arrays – creation and usage, Strings and string handling. | **8** |
| **Module – IV**<br>Functions (including using built in libraries), Parameter passing in functions, call by value, Recursion, as a different way of solving problems, Nested function calls. Understanding scope and lifetime of a variable. | **8** |
| **Module – V**<br>Structures - Defining structures, Accessing structures elements, Creating an array of Structures, Nested structures. Some advanced concepts – typedef, enum, macros. An introduction to pointers – understanding, creating pointers and accessing variables using pointers. Passing arrays to functions: idea of call by reference, passing parameters to main. | **10** |

**TEXTBOOKS:**

1. Let us C, Yashwant Kanetkar, 18th Edition, BPB Publications
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. R.G.Dromey, How to Solve it by Computer, Pearson Education

**REFERENCE BOOKS:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

1. The syllabus focused on the concepts and basics of Program writing skills.
2. Industry often requires debugging of their existing programs/software compare to the new program, which is a knowledge beyond the basics, including real-world software (collection of programs) experience.
3. More memory management practices, file handling and library functions

**POS MET THROUGH GAPS IN THE SYLLABUS: YES [PO1-PO5 & PO10-PO12]**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:**

File Handling with memory management, pre processor directives, Graphics, Data Arrangement, Task scheduling and assembly level programs.

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN: YES**
[PO1-PO5]

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**
2. **Student Feedback on Faculty/Content Delivery**
3. **Student Feedback on Evaluation Procedures**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars/ Quiz (s) |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Self-Learning, Group Study, Coding Contest |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 0 | 1 | 2 | 2 | 2 | | | |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | 0 | 1 | 2 | 2 | 2 | | | |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 0 | 1 | 2 | 2 | 2 | | | |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 0 | 1 | 2 | 2 | 2 | | | |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | 0 | 1 | 2 | 2 | 2 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD3, CD5 |
| **CO3** | CD3, CD5, CD7 |
| **CO4** | CD2, CD3, CD4, CD6, CD7 |
| **CO5** | CD1, CD3, CD5, CD7 |

## COURSE INFORMATION SHEET

**Course Code: EE24101**
**Course Title: BASICS OF ELECTRICAL ENGINEERING**
**Pre-requisite(s): NA**
**Co- requisite(s): Basic Sciences**
**Credits: 3** L: 2 T: 1 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: I/1**
**Branch: All**
**Name of Teacher:**

**COURSE OBJECTIVES**
This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Realize the electrical signals, elements, and their properties. |
| **2.** | Understand the mathematical representation of AC, DC signals and theorems/laws for solving electrical circuits with variations of voltage and frequency. |
| **3.** | Perceive the 3-phase AC signal representation and 3-phase circuit analysis for balanced and unbalanced condition. |
| **4.** | Understand the characteristics of magnetic material and analysis of magnetic circuits. |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Explain the voltage, current signals and their characteristics in electrical circuit elements. |
| **CO2** | Apply the theorems/laws for electrical circuit analysis. |
| **CO3** | Solve the electrical circuits for variable voltage and frequency to observe the resonance, power and power factor in the electric circuit. |
| **CO4** | Analyze the 1-phase and 3-phase AC balanced and unbalanced circuits |
| **CO5** | Apply the concept of magnetic circuits for magnetic circuit analysis. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction**<br>Importance of Electrical Engineering in day-to-day life, Electrical elements, properties (linear, non-linear, unilateral, bilateral, lumped and distributed, etc.) and their classification, Ideal and Real Sources, Source Conversion, Star-Delta conversion, KCL and KVL, Mesh current and Nodal voltage method. | **8** |
| **Module – II: D.C. Circuits**<br>Steady state analysis with independent and dependent sources; Series and Parallel circuits.<br>**Circuit Theorems:** Superposition, Thevenin's, Norton's, and Maximum Power Transfer theorems for Independent and Dependent Sources applied to DC circuits. | **8** |
| **Module – III: Single-phase AC Circuits**<br>Common signals and their waveforms, RMS and Average value. Form factor & Peak factor of a sinusoidal waveform.<br>**Series Circuits**: Impedance of Series circuits. Phasor diagram. Active Power. Power factor. Power triangle.<br>**Parallel Circuits**: Admittance method, Phasor diagram, Power and Power factor Power triangle, Series-parallel Circuit, Power factor improvement, Circuit Theorems applied to AC circuits.<br>**Series and Parallel Resonance**: Resonance curve, Q–factor, Dynamic Impedance, and Bandwidth. | **12** |
| **Module – IV: Three-Phase AC Circuits**<br>Importance and use of a 3-phase network, types of 3-phase connections- Star and Delta, Line and Phase relations for Star and Delta connection, Phasor diagrams, Power relations, analysis of balanced and unbalanced 3-phase circuits, Measurement of Power in 3-phase star and delta network. | **6** |
| **Module – V: Magnetic Circuits**<br>Introduction, Series-parallel magnetic circuits, Analysis of Linear and Non-linear magnetic circuits, Energy storage, A.C. excitation, Eddy currents and Hysteresis losses.<br>**Coupled Circuits**: Dot rule, Self and mutual inductances, Coefficient of coupling, working of transformer. | **6** |

**TEXTBOOKS:**


1. W. H. Hayt, Jr J. E. Kemmerly and S. M. Durbin, Engineering Circuit Analysis, 7th Edition TMH, 2010.
2. Hughes, Electrical Technology, Revised by McKenzie Smith, Pearson.
3. Fitzgerald and Higginbotham, Basic Electrical Engineering, McGraw Hill Inc, 1981


**REFERENCE BOOKS:**


1. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, 3rd Edition, TMH, New Delhi, 2009.
2. Electrical Engineering Fundamental, Vincent Del Toro, Prentice Hall, New Delhi.
3. Rajendra Prasad, Fundamentals of Electrical Engineering, 2nd Edition, PHI, New Delhi, 2011.

4. Raymond A. DeCarlo, Prn-Min Lin, Linear Circuit Analysis Time Domain, Phasor and Laplace Transform Approaches, 2nd Edition, Oxford University, 2001
5. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, Basic Electrical Engineering, Tata McGraw Hill Publication, 2009.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

1. Application of principles of magnetic circuits to electrical machines like transformers, generators and motors.
2. Field applications of three phase equipment and circuits in power system.
3. Applications of circuit theorems in electrical and electronics engineering

**POS MET THROUGH GAPS IN THE SYLLABUS:** 6, 4, 11

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

1. Concepts of electric, magnetic and electromagnetic fields.
2. 3 - Φ power generation, transmission, and distribution.
3. Power factor improvement for three phase systems.
4. Utility of reactive power for creation of electric and magnetic fields.

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:** 3, 4, 6.

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Quiz (s) | 10 |
| Mid Semester Examination | 25 |
| End Semester Examination | 50 |
| Assignment | 10 |
| Teacher Assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | | | | | |
| Semester End Examination | | | | | |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Self- learning such as use of NPTEL materials and internets |
| **CD8** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO1 0** | **PO1 1** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 3 | 2 | 3 | 1 | 1 | 2 | 3 | 1 | 2 | 1 | 2 | |
| CO2 | 3 | 1 | 3 | 3 | 3 | 1 | 1 | 2 | 3 | 1 | 2 | 3 | 3 | |
| CO3 | 3 | 2 | 3 | 3 | 3 | 1 | 2 | 1 | 3 | 1 | 2 | 3 | 3 | |
| CO4 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 1 | 3 | 1 | 2 | 3 | 3 | |
| CO5 | 3 | 2 | 1 | 1 | 3 | 1 | 2 | 1 | 3 | 1 | 2 | 3 | 3 | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD5 |
| **CO2** | CD1, CD2, CD4, CD5, CD7 |
| **CO3** | CD1, CD2, CD5, CD7, CD8 |
| **CO4** | CD1, CD2, CD5, CD7, CD8 |
| **CO5** | CD1, CD2, CD4, CD5, CD7, CD8 |

# COURSE INFORMATION SHEET

**Course Code: PH24102**
**Course Title: PHYSICS LABORATORY**
**Pre-requisite(s): Intermediate Physics**
**Co- requisite(s):**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: I**
**Branch: All**
**Name of Teacher:**

## COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | Understand the fundamentals of physical measurements and learn to account for inevitable errors in physical measurements. |
| **2.** | Understand and verify the basic principles of physics by hands-on experiments and making suitable measurements. |
| **3.** | Make electrical connections reliably to form functional circuits for measuring electrical quantities such as voltage, current, resistance, and resistivity |
| **4.** | Learn to set up different types of oscillating systems to study their characteristics, viz -a-viz resonant frequency, frequency response, phase relationship, bandwidth, and quality factor |
| **5.** | Develop an understanding of optical phenomena like dispersion, interference and diffraction and make measurements on the patterns produced to obtain physical quantities such as wavelength of light and refractive index of transparent materials. |

## COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Make reliable measurements and report results along with errors. |
| **CO2** | Wire simple electrical circuits for experimentally determining measurable electrical quantities. |
| **CO3** | Build electral and mechanical oscillating systems, characterize them, and make measurements over them. |
| **CO4** | Construct setups to produce interference and diffraction patterns and make measurements for determining physical quantities. |

**SYLLABUS (List of experiments)**

1. Error analysis in Physics Laboratory (CO: 1)
2. To determine the frequency of AC mains with the help of a sonometer. (CO:1, 2, 3)
3. To determine the resistance per unit length of a Carey Foster's bridge wire and resistivity of unknown wire. (CO:1, 2)
4. Measurement of electrical equivalent of heat (CO:1, 2)
5. To determine the wavelength of sodium lines by Newton's rings method (CO:1, 4)
6. To determine the frequency of tuning fork using Melde's Experiment (CO:1,3)
7. Measurement of voltage and frequency of a given signal using CRO (CO: 1,2, 3)
8. To determine the emf of a cell using stretched wire potentiometer (CO:1, 2)
9. Determination of refractive index of the material of a prism using spectrometer and sodium light (CO:1, 4)
10. To study the frequency response of a series LCR circuit (CO:1, 2, 3)
11. To study Lorentz force using Current balance (CO:1,2)
12. To study electromagnetic induction and verification of Faraday's laws. (CO:1,2,3)
13. To measure the wavelength of prominent spectral lines of mercury light by a plane transmission grating. (CO:1, 4)
14. To determine the Planck's constant using photocell and optical wavelength filters. (CO:1, 2)

**REFERENCE MATERIALS:**

1. Lab manuals (available on department website)

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Introductory lecture by use of boards/LCD projectors |
| **CD2** | Laboratory experiments/ teaching aid |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 2 | 1 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | | | |
| CO 2 | 2 | 1 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | | | |
| CO 3 | 2 | 1 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | | | |
| CO 4 | 2 | 1 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CS24102**
**Course Title: PROGRAMMING FOR PROBLEM SOLVING LABORATORY**
**Pre-requisite(s): NA**
**Co- requisite(s): CS24101**
**Credits:1** L:0 T:0 P:2
**Class schedule per week:**
**Class: B.Tech.**
**Semester / Level: I / 1**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | The basics of computer programming. |
| **2.** | Ideas about converting problem statements to programs. |
| **3.** | Ideas about handling data at scale. |
| **4.** | Knowledge about accessing the memory of a computer using code. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Write basic programs using fundamental control structures. |
| **CO2** | Demonstrate the accessing of arrays. |
| **CO3** | Write simple functions to modularize programs. |
| **CO4** | Work with user defined data types. |
| **CO5** | Access memory using pointers and manipulate data using them. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I**<br>Programming using basic control structures including sequential programs, selection logic including nested selection logic switch structures. | **3** |
| **Module – II**<br>Write programs using basic iterative structures, nested iterations, programs using looping with selections, controlled loop exit, Manipulating n-dimensional arrays. | **3** |
| **Module – III**<br>Modularize programs using functions, functions calling functions, elementary string handling programs, recursive programs. | **3** |
| **Module – IV**<br>Programs using user defined data types, arrays of user defined data types, basic usage of pointers, functions and pointers. | **3** |
| **Module – V**<br>Advanced usage of pointers, string handling using pointers, parameterizing main, manipulating arrays using pointers. | **3** |

**TEXTBOOKS:**

1. Programming in C, Yashwant Kanetkar, BPB Publications.

**REFERENCE BOOKS:**

1. C Programming, Byron Gottfried, Addison Wesley Press

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

1) Elementary file handling

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Laboratory Quiz | 20 |
| Laboratory Performance | 30 |
| Laboratory Viva | 20 |
| Continuous Evaluation | 30 |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 3 | 1 | 2 | | | 3 | 1 | | | | | |
| **CO2** | 3 | 3 | 2 | 1 | 2 | | | 3 | 1 | | | | | |
| **CO3** | 3 | 3 | 2 | 1 | 2 | | | 3 | 1 | | | | | |
| **CO4** | 3 | 3 | 2 | 1 | 2 | | | 3 | | | | | | |
| **CO5** | 3 | 2 | 2 | 1 | 2 | | | 1 | | | | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

## COURSE INFORMATION SHEET

**Course code: EE 24102**
**Course Title: Electrical Engineering Laboratory**
**Pre-requisite(s):** Physics, Fundamentals of Mathematics and Electrical Engineering.
**Co- requisite(s):**
**Credits:** 01 L: 0 T: 0 P: 2
**Class schedule per week:** 02
**Class:** B. Tech
**Semester / Level:** I (II)/1
**Branch:** EEE
**Name of Teacher**
**Course Objectives**

This course enables the students:

| | |
|---|---|
| 1. | To describe students' practical knowledge of active and passive elements and operation of measuring instruments |
| 2. | To demonstrate electrical circuit fundamentals and their equivalent circuit models for both 1-φ and 3- φ circuits and use circuit theorems |
| 3. | To establish voltage & current relationships with the help of phasors and correlate them to experimental results |
| 4. | 1. To conclude performance of 1 – Φ AC series circuits by resonance phenomena<br>2. To evaluate different power measurements for both 1-φ and 3- φ circuits |

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

| | |
|---|---|
| CO1 | classify active and passive elements, explain working and use of electrical components, different types of measuring instruments; |
| CO2 | illustrate fundamentals of operation of DC circuits, 1-φ and 3- φ circuits and also correlate the principles of DC, AC 1-φ and 3- φ circuits to rotating machines like Induction motor and D.C machine |
| CO3 | measure voltage, current, power, for DC and AC circuits and also represent them in phasor notations; |
| CO4 | analyze response of a circuit and calculate unknown circuit parameters; |
| CO5 | recommend and justify power factor improvement methods in order to save electrical |

LIST OF EXPERIMENTS ***(The experiment list may vary to accommodate recent development in the field)***

**EXPERIMENT – 1**

Name: - Measurement of low and high resistance of a DC shunt motor

Aim: - (i) To measure low resistance of armature winding of DC shunt motor.
(ii) To measure high resistance of field winding of DC shunt motor.

**EXPERIMENT – 2**

Name: - AC RLC series circuit

Aim: - To obtain current and voltage distribution in AC RLC series circuit and draw the phasor diagram of voltage distribution.

**EXPERIMENT – 3**

Name: - Single phase power factor measurement by three voltmeter method

Aim: - To obtain power and power factor of the single-phase load using three voltmeter method and draw the phasor diagram.

**EXPERIMENT – 4**

Name: - AC RLC parallel circuit

Aim: - To obtain current and voltage distribution in a AC RLC parallel circuit and draw the current phasor diagram.

**EXPERIMENT – 5**

Name: - Single phase power factor measurement by three Ammeter method

Aim: -To obtain power and power factor of single-phase load using three ammeter method and draw the phasor diagram.

**EXPERIMENT – 6**

Name: -Study of resonance in a RLC series circuit

Aim: - To obtain the resonance condition in AC RLC series circuit and draw the phasor diagram.

**EXPERIMENT – 7**

Name: -Three phase Delta connection

Aim: - To obtain the relation between line and phase quantities in a three-phase Delta connected load and obtain the phasor diagram.

**EXPERIMENT – 8**

Name: - Three phase Star connection

Aim: -To obtain the relation between line and phase quantities in a three-phase Star connected load and draw the phasor diagram.

**EXPERIMENT – 9**

Name: - Measurement of three phase power by two wattmeter method.

Aim: - To measure the power input to a three-phase induction motor by two-wattmeter method and draw the phasor diagram.

**EXPERIMENT – 10**

Name: - Verification of superposition and Thevenin's Theorems.

Aim: - (i) To verify Thevenin's Theorem for a given circuit.
(ii) To verify Superposition Theorem for a given circuit.

**Gaps in the syllabus (to meet Industry/Profession requirements)**

1. Application of principles of magnetic circuits to electrical machines like transformers, generators and motors.
2. Visualize Phase sequence.

**POs met through Gaps in the Syllabus:** 1, 2, 4, 6.

**Topics beyond syllabus/Advanced topics/Design**

1. Assignment: Simulation of electrical circuits with dependent/independent sources by various techniques (Mesh current/Node Voltage/Thevenin's theorem/Norton's theorem/Maximum power transfer theorem etc.) using MATLAB/PSIM/C++ software.
2. Active/reactive power calculation for 3 – Φ circuits

**POs met through Topics beyond syllabus/Advanced topics/Design:** 3, 4, 5, 6.

**Mapping lab experiment with Course Outcomes**

| Experiment | Course Outcomes | | | | |
|---|---|---|---|---|---|
| | CO1 | CO2 | CO3 | CO4 | CO5 |
| 1 | 3 | 3 | 1 | 1 | |
| 2 | 3 | 3 | 3 | 3 | 3 |
| 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 3 | 3 | 3 | 3 | 3 |
| 5 | 3 | 3 | 3 | 3 | 3 |
| 6 | 3 | 3 | 3 | 3 | |
| 7 | 3 | 3 | 3 | 1 | |
| 8 | 3 | 3 | 3 | 1 | 1 |
| 9 | 3 | 3 | 3 | 2 | 2 |
| 10 | 3 | 3 | 2 | 2 | |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **3** | **2** | **3** | **2** | **3** | **1** | **2** | **3** | **3** | **1** | **2** | **1** | **2** | |
| CO2 | **3** | **2** | **3** | **2** | **3** | **1** | **2** | **3** | **3** | **1** | **2** | **3** | **3** | |
| CO3 | **3** | **2** | **3** | **2** | **3** | **1** | **2** | **3** | **3** | **1** | **2** | **3** | **3** | |
| CO4 | **3** | **2** | **3** | **2** | **3** | **1** | **2** | **3** | **3** | **1** | **2** | **3** | **3** | |
| CO5 | **3** | **2** | **3** | **2** | **3** | **2** | **2** | **3** | **3** | **1** | **2** | **3** | **3** | |

| Course Delivery methods | |
|---|---|
| **CD1** | Laboratory experiments/teaching aids |
| **CD2** | Mini projects/Projects |
| **CD3** | Tutorials/Assignments |
| **CD4** | Self- learning, such as the use of NPTEL materials and the internet |

## COURSE INFORMATION SHEET

**Course Code:** HS24131
**Course Title:** Communication Skills I
**Pre-requisite(s):** -
**Co- requisite(s):** -
**Credits:** 1.5 (L:0 T:0 P: 3)
**Class schedule per week:** 3
**Class:** B. Tech
**Semester / Level:** FIRST
**Branch:** Biotechnology
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | **Develop Language Proficiency and communicative competence**: Improve students' ability to read, write, speak, and listen effectively in English. In addition, students will also learn and improve politeness strategies in communicative contexts. |
| **2.** | **Enhance Verbal and Non-Verbal Communication**: Train students in both spoken and body language communication for personal and professional interactions. |
| **3.** | **Enhance Reading Ability:** Equip students with the ability to strategically comprehend and interpret visual and textual information. |
| **4.** | **Enhancing Writing Proficiency**: Enable students to write structured reports, emails, resumes, and other professional documents. |
| **5.** | **Developing Presentation and Public Speaking Skills:** Self-assurance during talks, presentations and speeches. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | In a variety of pragmatic and communicative contexts, students will be able to confidently and fluently articulate their ideas. |
| **CO2** | This will enable learners to accurately interpret messages for effective interaction by comprehending audio texts and listening selectively. |
| **CO3** | Learners will be able to examine texts for particular and intricate details, draw inferences, and provide interpretations. |
| **CO4** | Learners will be capable of creating organized written pieces, including paragraphs, essays, and narratives, and will also be able to summarize, paraphrase, and create précis of ideas effectively. |
| **CO5** | Learners will be capable of confidently using verbal and non-verbal communication during speeches and presentations. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I Theory**<br>**Principles of Fundamental Communication.**<br>Communication theory, various types and methods of communication, communication flow (upward, downward, and horizontal), characteristics of successful communication, obstacles, and approaches, verbal and non-verbal communication, and social context communication— requests, refusals, compliments, and providing constructive feedback.<br>**Practice Communication:**<br>Study relevant materials or case studies on effective communication, obstacles, strategies, and both verbal and non-verbal aspects. Understand and contextualize the influence of culture and society on communication in both writing and speaking.<br>**Role plays:**<br>Engage in scenario-based questions focusing on communication, body language, and courtesy.<br>**Dialogue writing:**<br>Presenting viewpoints based on various situations or scenarios—including requests, refusals,<br>compliments, and criticism—in both writing and speaking. | **6** |
| **Module – II Theory**<br>**Communicating, Depicting, and Hearing:**<br>Salutations, Presenting oneself/others, Descriptive communication for locations, objects, scenarios, challenges, etc. Proficient listening abilities and the various aspects of listening, including types such as intensive, responsive, selective and extensive. A brief introduction to Varieties of English Accents (neutral accent) through audio and video examples.<br>**Practice tasks**<br>**Introducing people/Describing people:**<br>• Introducing oneself and others<br>• Characterizing an individual, image, circumstance<br>• Discussing traits (positive/negative/critical) about a person, object, scenario, or image.<br>**Listening skills:**<br>• Engaging in attentive listening activities<br>• Listening selectively to complete the blanks<br>• Hearing a passage and rephrasing the precise information in your own words (listening comprehension)<br>• Listening to a discussion on a topic and responding critically.<br>• Attending to informal workplace interactions and dialogues. | **6** |

| | |
|---|---|
| **Module – III Theory**<br>**Enhancing Vocabulary and Grammar**<br>Lexicon (Affixes- Inflections-Derivations), Registers, Idiomatic Expressions and Phrasal Verbs, vocabulary in context. Opposites, similar words, and one-word alternatives. Sentence constructions (word order like SVO, etc.), Paragraphs (Thesis statement, main idea, topic sentences), Generating ideas for paragraph composition.<br>W. S Allen (Book)<br>**Practice**<br>**Vocabulary Building:**<br>• Students utilize specific vocabulary related to various registers to construct paragraphs, narratives, and more.<br>• Students incorporate phrasal verbs to create a coherent paragraph.<br>Exercises involving antonyms, synonyms, and word substitution can be conducted using worksheets.<br>• Engage graphic organizers such as word associations and concept mapping for vocabulary enhancement activities.<br>Identify suffixes, prefixes, idioms, and phrasal verbs:<br>• Analyze texts to find suffixes and prefixes along with their definitions.<br>• Word association and spider diagrams can be utilized to uncover suffixes and prefixes.<br>**Paragraph writing:**<br>• Generate ideas about a topic/concept/idea and prompt students to compose a detailed<br>• paragraph. | **6** |
| **Module – IV**<br>**Theory**<br>**Elements of Reading and Writing**<br>Present the sub-skills involved in reading and writing, including the different types of reading such as close reading and intensive reading. Techniques like mind mapping and note-taking. Generating ideas through brainstorming, structuring thoughts, and creating coherent written pieces consisting of an introduction, body, and conclusion. Writing letters, summaries, précis, resumes, essays, narratives, biographies, and news articles.<br>Practice **Reading:**<br>• Encourage students to distinguish between factual and inferential information from a text.<br>• Read a passage and create a mind map outlining the main and supporting ideas of the content.<br>• Read the text and take notes.<br>• Read and interpret the author's perspective.<br>• Read and conduct a critical analysis of the text.<br>• Read a passage and provide constructive feedback. (speaking/writing modality)<br>**Writing:**<br>• Compose a summary.<br>• Write a précis.<br>• Create a resume.<br>• Develop an essay.<br>• Write a narrative account, whether personal or about others.<br>Produce a news column. | **6** |

| | |
|---|---|
| **Module – V Theory**<br>**Public speaking and presentation abilities**<br>Public speaking and presentation techniques<br>Public speaking, objectives of a speech – to inform, entertain, persuade, or commemorate/celebrate. Methods of persuasion in speeches – ethos, logos, and pathos. Speech preparation – researching background information, organizing content, crafting an introduction, developing main points, and concluding effectively. Showcasing structured speeches – welcome addresses, farewell remarks, expressions of gratitude (examples may be provided in written scripts, videos, or audio recordings).<br>Presentation etiquette, verbal presentations, poster displays, and delivering speeches.<br>**Practice**<br>**Public speaking:**<br>• Deliver an opening speech (during the Annual day, General meeting, sports day, cultural events)<br>• Present a farewell address<br>• Express gratitude through a vote of thanks<br>• Make a persuasive speech (given a specific scenario)<br>Engage in an extempore speech<br>**Presentations:**<br>• Conduct a role play<br>• Prepare a PowerPoint presentation<br>Create a poster presentation | **6** |

**TEXTBOOKS:**

- Communication Skills (2015) 2nd edition, Sanjay Kumar & Pushp Lata, Oxford University Press
- Business Correspondence and Report Writing (2017), R.C.Sharma, Krishna Mohan. McGraw Hill

**REFERENCE BOOKS:**


1. Basic Business Communication-(2004). Lesikar I Flatley, McGraw Hill
2. Business Communication Today, (2017), Bovee, Thill and Chatterjee, Pearson
3. Krishnan, M, & Jha, S.(2024). *Focus: A course in Communication Skills*. Cambridge University Press
4. Suparna Dutta, 2013 Business Communication, PHI Learning Pvt Ltd, New Delhi


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS) POS MET THROUGH GAPS IN THE SYLLABUS**
**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**
**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**
**DIRECT ASSESSMENT**

| **Assessment Tool** | **% Contribution during CO Assessment** |
|---|---|
| Continuous Internal Assessment | 60 |
| End Semester exams | 40 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Day-to-day performance & assignments | 30 |
| Quiz 1 | 10 |
| Viva- Voce | 20 |

| End Semester Examination | % Distribution |
|---|---|
| Examination: Submission of reports | 30 |
| Viva- Voce | 10 |

| **Assessment Components** | **CO1** | **CO2** | **CO 3** | **CO 4** | **CO 5** |
|---|---|---|---|---|---|
| Continuous Internal Assessment | ✓ | ✓ | ✓ | ✓ | ✓ |
| Examination: Submission of reports | ✓ | ✓ | ✓ | ✓ | ✓ |

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**
**INDIRECT ASSESSMENT**

**1.Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Assignments/Seminars |
| **CD3** | Laboratory experiments/teaching aids |
| **CD4** | Industrial/guest lectures |
| **CD5** | Industrial visits/in-plant training |
| **CD6** | Self- learning, such as the use of NPTEL materials and the internet |
| **CD7** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 1 | | 1 | 1 | | 2 | 3 | 3 | 2 | 3 | | | |
| CO2 | 1 | | | 1 | 1 | 1 | | 1 | 2 | 2 | 1 | 2 | | | |
| CO3 | 2 | 3 | 1 | 2 | 2 | 1 | | 1 | 2 | 2 | 1 | 3 | | | |
| CO4 | 2 | 2 | 2 | 1 | 2 | 1 | | 2 | 2 | 3 | 2 | 3 | | | |
| CO5 | 1 | 1 | 1 | | 2 | 2 | 1 | 2 | 3 | 3 | 2 | 3 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD2, CD 3 |
| **CO2** | CD 3, CD 6 |
| **CO3** | CD 1, CD 2 |
| **CO4** | CD 3, CD6 |
| **CO5** | CD 2, CD3, CD6 |

## COURSE INFORMATION SHEET

**Course Code: MA24103**
**Course Title: MATHEMATICS II**
**Pre-requisite(s): Mathematics - I**
**Co- requisite(s): NA**
**Credits: 4** L: 3 T: 1 P: 0
**Class schedule per week: 4**
**Class: B.Tech.**
**Semester / Level: II/1**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | various methods to solve linear differential equations of second and higher order |
| **2.** | special functions viz. Legendre's and Bessel's and different properties associated with them |
| **3.** | diverse mathematical techniques for solving partial differential equations of first order, along with their applications in wave and heat equations using Fourier series |
| **4.** | the theory of functions of a complex variable, complex differentiation and integration |
| **5.** | about random variables and elementary probability distribution |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | investigate the occurrence of ordinary differential equations in real-life problems and identify the suitable methods available for their solutions. |
| **CO2** | develop skills to solve and implement various forms of differential equations and special functions in diverse domains. |
| **CO3** | learn to solve various forms of partial differential equations arising in real-world. |
| **CO4** | gain an understanding of complex variable functions and their properties in science and engineering. |
| **CO5** | comprehend and apply the concept of probability distributions in solving problems related to uncertainty. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I Ordinary Differential Equations – I**<br>Linear differential equations, Wronskian, Linear independence and dependence of solutions, Linear differential equations of $2^{nd}$ and higher order with constant coefficients, Operator method, Euler – Cauchy's form of linear differential equation, Method of variation of parameters. | **9** |
| **Module – II Ordinary Differential Equations – II**<br>Ordinary and singular points of differential equation, Power and Frobenius' series solutions (root differ by non integer and equal roots). Bessel's differential equation, Bessel function of first kind and its important properties. Legendre's differential equation, Legendre's polynomial and its important properties. | **9** |
| **Module – III Fourier series and Partial Differential Equations**<br>Fourier series: Euler formulae for Fourier series, Half range Fourier series.<br>Partial Differential Equations: Method of separation of variables and its application in solving one dimensional wave and heat equations. | **9** |
| **Module – IV Complex Variable-Differentiation & Integration**<br>Function of a complex variable, Analyticity, Analytic functions, Cauchy – Riemann equations. Cauchy's theorem, Cauchy's Integral formula, Taylor and Laurent series expansions. Singularities and its types, Residues, Residue theorem. | **9** |
| **Module – V Applied Probability**<br>Discrete and continuous random variables, cumulative distribution function, probability mass and density functions, expectation, variance. Introduction to Binomial, Poisson and Normal Distribution. | **9** |

**TEXTBOOKS:**


1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, Fourth Edition, 2011.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
4. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing, 3rd Ed, 2009.
5. R. A. Johnson, I. Miller and J. Freund: Probability and Statistics for Engineers, PHI
6. S. C. Gupta and V. K. Kapoor: Fundamental of Mathematical Statistics, Sultan Chand and Sons


**REFERENCE BOOKS:**


1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
4. G. F. Simmons, Differential Equations with Applications and Historical Notes, TMH, 2nd ed., 2003.
5. P. L. Meyer: Introductory Probability and Statistical Applications, Oxford & IBH.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS) --**

**POS MET THROUGH GAPS IN THE SYLLABUS --**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN ---**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN --**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |
| **CD4** | Laboratory experiments/teaching aids |
| **CD5** | Industrial/guest lectures |
| **CD6** | Industrial visits/in-plant training |
| **CD7** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 2 | | | |
| CO2 | 3 | 3 | 2 | 3 | 2 | 1 | 0 | 0 | 1 | 1 | 2 | | | |
| CO3 | 3 | 3 | 2 | 3 | 2 | 1 | 0 | 0 | 1 | 1 | 2 | | | |
| CO4 | 3 | 2 | 2 | 2 | 2 | 1 | 0 | 0 | 1 | 1 | 2 | | | |
| CO5 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CH24101**
**Course Title: CHEMISTRY**
**Pre-requisite(s): Intermediate level Chemistry**
**Co- requisite(s): NA**
**Credits: 4** L: 3 T: 1 P: 0
**Class schedule per week: 4**
**Class: B.Tech.**
**Semester / Level: II**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To create concept of chemical bonding in coordination chemistry |
| **2.** | To understand the basics of stereochemistry, aromaticity and reaction mechanism of organic molecules |
| **3.** | To understand the reaction dynamics and to know different types of catalysis |
| **4.** | To apprehend the basic principles and the application of vibrational, electronic and NMR spectroscopy |
| **5.** | To develop knowledge on the physical state and electrochemistry of molecules |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to explain the bonding in a coordination complex |
| **CO2** | Able to explain the 3D structure, aromaticity and stereochemistry of organic molecules |
| **CO3** | Able to predict the rate, molecularity and mechanism of a simple as well as catalytic reaction |
| **CO4** | Able to explain the UV-vis, IR and NMR spectra of unknown molecules |
| **CO5** | Able to interpret the phase diagram of simple one and two component heterogeneous systems in equilibrium and the electrochemical behavior of the molecules |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Bonding in Coordination Complex**<br>Introduction to Chemical Bonding, Werner's Theory, Bonding in coordination complexes, Crystal Field Theory, Octahedral, Tetrahedral and Square planar complexes, CFSE, Jahn Teller theorem, Spectral, electronic and magnetic properties of coordination complexes. | **8** |
| **Module – II: Organic Structure and Reactivity**<br>Aromaticity, Geometrical isomerism: cis–trans, E/Z, and syn-anti isomerism; Optical isomerism & Chirality; Wedge, Fischer, Newmann and Sawhorse projection formulae and interconversions; D/L, R/S nomenclature system; Conformational studies of n-butane. Addition, Elimination, Substitution and Rearrangement reaction. | **8** |
| **Module – III: Kinetics and Catalysis**<br>Kinetics of Chain, Parallel/Competing/Side, Consecutive reactions; Fast reactions; Outline of Catalysis, Acid-base catalysis, Enzyme catalysis (Michaelis-Menten equation), Important catalysts in industrial processes: Hydrogenation using Wilkinsons catalyst, Phase transfer catalyst**.** | **8** |
| **Module – IV: Spectroscopic Techniques**<br>Absorption Spectroscopy, Lambert-Beers law, Principles and applications of UV-Visible spectroscopy, Principles and applications of Vibrational spectroscopy; Introduction of NMR spectroscopy. | **8** |
| **Module – V: Phase and Chemical equilibrium**<br>Phase rule: terms involved, Phase diagram of one component (Water) & two component (Pb/Ag) system & their applications; Gibbs Free energy, Van't Hoff equation and Chemical Equilibrium; Nernst Equation, Standard electrode potential, EMF measurement and its application, Batteries and Fuel Cells. | **8** |

**TEXTBOOKS:**


1. Huheey, J. E., Inorganic Chemistry: Principles of Structure and Reactivity, 4 th edition, Pearson.
2. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Seventh Edition, Pearson
3. Atkins, P. W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014.


**REFERENCE BOOKS:**


1. Lee, J. D. Concise Inorganic Chemistry ELBS, 1991.
2. Mortimer, R. G. Physical Chemistry 3rd Ed., Elsevier (2009).
3. William Kemp, Organic Spectroscopy, 3 rd Ed., 2008 Macmillan.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

Limited exposure to computational tools, industrial case studies, and skill-based training needed for industry readiness.

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback onCourse Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |
| **CD4** | Seminars |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | | | |
| CO2 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | | | |
| CO3 | 3 | 3 | 3 | 2 | 1 | 1 | 0 | 0 | 1 | 0 | 3 | | | |
| CO4 | 3 | 2 | 1 | 3 | 3 | 0 | 0 | 0 | 2 | 0 | 2 | | | |
| CO5 | 3 | 3 | 2 | 2 | 1 | 2 | 0 | 0 | 1 | 0 | 3 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: EC24101**
**Course Title: BASIC ELECTRONICS**
**Pre-requisite(s): N/A**
**Co- requisite(s): N/A**
**Credits: 3** L:2 T:1 P: 0
**Class schedule per week: 3**
**Class: B. Tech.**
**Semester / Level: II/1**
**Branch: ALL B.TECH.**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| 1. | To understand PN Junction, diodes and their applications. |
| 2. | To comprehend BJT and the bias configurations. |
| 3. | To understand operating principles of FETs |
| 4. | To understand op amp and its applications. |
| 5. | To apprehend number system, Logic Gates and Boolean algebra. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand the characteristics of electronic devices like PN-diode, BJT, JFET and MOSFET |
| **CO2** | Classify and analyze the various circuit configurations of BJTs and MOSFETs. |
| **CO3** | Analyze the characteristics of operational amplifier. |
| **CO4** | Design electronic circuits using diodes, transistors, op-amp and logic gates for analogand digital applications. |
| **CO5** | Solve day-to-day life problems using electronic circuits. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Diodes and Applications**<br>Introduction to semiconductor materials, PN junctiondiode, barrier potential, depletion layer width, junction capacitance,diode current equation, I-Vplot, diode-resistance, temperature dependence,breakdown mechanisms, Zener diode – operation and applications, Diode as a Rectifier: Half Wave and Full Wave Rectifiers with and without C-Filters. | **8** |
| **Module – II: Bipolar Junction Transistors (BJT)**<br>Basic operation of PNP and NPN Transistors, Input and Output Characteristics of CB, CE and CC Configurations.Transistor biasing: operating point, Fixed bias, emitter bias, voltage divider bias, stability factor, small signal analysis (h-parametermodel) of CE configuration. | **8** |
| **Module – III: Field Effect Transistors**<br>JFET: Principle of operation,transfer characteristics, MOSFET: Operation of N-MOS, P-MOS, enhancement and depletion type, transfer characteristics, CS biasing of JFET and MOSFET. | **8** |
| **Module – IV: Operational Amplifiers**<br>Introduction of Operational Amplifier, Characteristics of Operational Amplifier, Differential Amplifier, CMRR, Slew Rate, input and output offset voltages, Inverting and non-inverting amplifiers, Summing Amplifier, Difference amplifier, Differentiator and Integrator. | **8** |
| **Module – V: Boolean Algebra and Logic Gates**<br>Boolean Algebra, Boolean operators, Truth table of different digital logic gates (AND, OR, NOT, NAND, NOR, EXOR, EX-NOR),application of diode for design of logic gates, realization of logic gates using universal gates, adder, subtractor. | **8** |

**TEXTBOOKS:**


1. Millman J., Halkias C.C. “Integrated Electronics: Analog and Digital Circuits and Systems”, Tata McGraw-Hill.
2. Boylstead R.L., Nashelsky L., “Electronic Devices and Circuit Theory”, Pearson Education, Inc, 11/e.
3. Mano M.M., Michael D. Ciletti, “Digital Design”, Pearson Education, Inc, 5/e, 2011.


**REFERENCE BOOKS:**


1. Millman J., Halkias C.C., Parikh Chetan, “Integrated Electronics: Analog and Digital Circuits and Systems”, Tata McGraw-Hill, 2/e.
2. Millman J., Halkias C.C., Satyabrata Jit, “Millman’s Electronic Devices and Circuits”, Tata McGraw-Hill, 3/e.
3. Albert Paul, Malvino, David J. Bates, “Electronic principles”, McGraw-Hill, 8/e, 2015.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**PO MET THROUGH GAPS IN THE SYLLABUS**

3, 11, 12

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**
2, 3, 11, 12

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| First Quiz | 10 |
| Mid Semester Examination | 25 |
| Assignment | 10 |
| Teacher's Assessment | 5 |
| End Semester Examination | 50 |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Faculty**
2. **Students' Feedback on Course Outcome.**

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 | 3 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 1 |
| CO2 | 3 | 3 | 1 | 2 | 3 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 1 |
| CO3 | 3 | 3 | 1 | 2 | 3 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 1 |
| CO4 | 3 | 3 | 1 | 2 | 3 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 1 |
| CO5 | 3 | 3 | 1 | 2 | 3 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 1 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3, CD8 |
| **CO2** | CD1, CD2, CD3, CD8 |
| **CO3** | CD1, CD2, CD3, CD8 |
| **CO4** | CD1, CD2, CD3, CD8 |
| **CO5** | CD1, CD2, CD3, CD8 |

## COURSE INFORMATION SHEET

**Course Code: ME24101**
**Course Title: BASICS OF MECHANICAL ENGINEERING**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 2 T:1 P: 0
**Class schedule per week: 3**
**Class: B. Tech.**
**Semester / Level: II**
**Branch: Mechanical Engineering**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Introduce system of forces, and write equation of equilibrium. |
| **2.** | Analyse motion of particle and rigid body subjected to force. |
| **3.** | Grasp the importance of internal and external combustion engines. |
| **4.** | Apprehend the fundamentals of friction. |
| **5.** | Understand the different sources of energy. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Explain the basics of Mechanical Engineering. |
| **CO2** | Apply various laws of mechanics on static and dynamic elements and bodies. |
| **CO3** | Analyse various problems of mechanics related to static and dynamic bodies. |
| **CO4** | Evaluate the real life problem related to mechanics and energy for its probable solution. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: System of Forces and Structure Mechanics**<br>Addition of Forces, Moment of a Force, Couple, Varignon's theorem, Free Body Diagram, Equilibrium in Two and Three Dimensions, Equivalent Forces and Moment. Types of Plane Trusses, Analysis of Plane Trusses by: Method of Joints and Method of Sections. Hooke's Law of elasticity, Stress and Strain, Relation between elastic constants. | **8** |
| **Module – II: Kinematics & Kinetics of rigid bodies**<br>Types of rigid body motion– translation, rotation about fixed axis, equations defining the rotation of a rigid body about a fixed axis, plane motion, absolute and relative velocity in plane motion, instantaneous center of rotation. Equation of motion and D'Alembert's principle. | **8** |
| **Module – III: Friction**<br>Interfacial Friction (a) Laws of dry friction, static & kinetic co-efficient of friction, Analysis of static, kinetic and rolling friction. (b) Analysis of frictional forces in inclined planes, wedges, screw jacks and belt drives. | **8** |
| **Module – IV: Boilers and Internal Combustion Engine**<br>Classification of Boilers, Fire tube and Water Tube boilers. Boiler Mountings and Accessories. Boiler efficiency. Classification of I C Engines. Basic components and terminology of IC engines, working principle of four stroke and two stroke - petrol and diesel engine. | **6** |
| **Module – V: Non-Conventional Energy Sources**<br>Renewable and Non-renewable Energy Resources, Advantages and Disadvantages of Renewable Resources, Renewable Energy Forms and Conversion- Solar Energy, Wind Energy, Hydro Energy. | **5** |

**TEXTBOOKS:**


1. Engineering Mechanics, Irving H. Shames, P H I. ltd, 2011.
2. Boiler operator, Wayne Smith, LSA Publishers, 2013.
3. Internal Combustion Engines, M. L. Sharma and R. P. Mathur, Dhanpat Rai Publications, 2014.
4. Fundamentals of Renewable Energy Processes, Aldo Vieira Da Rosa, Elsevier publication, 2012.


**REFERENCE BOOKS:**


1. Engineering Mechanics: statics, James L. Meriam, L. G. Kraige, Wiley, 7th Edition, 2011.
2. Engineering Mechanics, S. Rajasekaran & G. Sankarasubramaniam, Vikash publishing house, 2018.
3. An Introduction to Steam Boilers, David Allan Low, Copper Press Publisher, 2012.
4. Internal Combustion Engines – V Ganesan, McGraw hill, 2017.
5. Non Conventional Energy Resources, B. H. Khan, McGraw Hill Education Publisher, 2017.
6. Principles of Mechanical Engineering, R. P. Sharma & Chilkesh Ranjan, Global Academic Publishers, 2016.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS) : NA**

**POS MET THROUGH GAPS IN THE SYLLABUS: NA**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN: NA**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN: NA**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Progressive Evaluation | 50 |
| End Semester Examination | 50 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Semester Examination | 25 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's Assessment | 5 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 |
|---|---|---|---|---|
| Continuous Internal Assessment | √ | √ | √ | √ |
| Semester End Examination | √ | √ | √ | √ |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | | |
|---|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors | √ |
| **CD2** | Assignments/Seminars | √ |
| **CD3** | Laboratory experiments/teaching aids | |
| **CD4** | Industrial/guest lectures | |
| **CD5** | Industrial visits/in-plant training | |
| **CD6** | Self- learning such as use of NPTEL materials and internets | √ |
| **CD7** | Simulation | |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 1 | | 2 | 1 | 1 | | 2 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO4 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD 6 |
| **CO2** | CD1, CD2, CD 6 |
| **CO3** | CD1, CD2, CD 6 |
| **CO4** | CD1, CD2, CD 6 |

## COURSE INFORMATION SHEET

**Course code: CE24101**
**Course title: ENVIRONMENTAL SCIENCE**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 2**
**Class: B.TECH.**
**Semester / Level: I1/1**
**Branch: ALL**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To develop basic knowledge of ecological principles and their applications in environment. |
| **2.** | To identify the structure and composition of the spheres of the earth, the only planet sustaining life. |
| **3.** | To analyse, how the environment is getting contaminated and probable control mechanisms for them. |
| **4.** | To generate awareness and become a sensitive citizen towards the changing environment. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to explain the structure and function of ecosystems and their importance in the holistic environment. |
| **CO2** | Able to identify the sources, causes, impacts and control of air pollution |
| **CO3** | Able to distinguish the various types of water pollution happening in the environment and understand about their effects and potential control mechanisms. |
| **CO4** | Able to judge the importance of soil, causes of contamination and need of solid waste management. |
| **CO5** | Able to know the impacts of noise pollution and its management. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Ecosystem and Environment**<br>Concepts of Ecology and Environmental Science, ecosystem: structure, function and services, Biogeochemical cycles, energy and nutrient flow, ecosystem management. Concept of Biodiversity. | **6** |
| **Module – II: Air Pollution**<br>Structure and composition of unpolluted atmosphere, classification of air pollution sources, types of air pollutants, effects of air pollution, monitoring of air pollution, Air pollution control and management. | **6** |
| **Module – III: Water Pollution**<br>Water Resource; Water Pollution: types and Sources of Pollutants; effects of water pollution; Water quality monitoring, Water quality index, water and wastewater treatment: primary, secondary and tertiary. | **6** |
| **Module – IV: Soil Pollution and Solid Waste Management**<br>Soil profile, soil properties, soil pollution, and Municipal solid waste management. MSW – Functional elements of MSW. | **6** |
| **Module – V: Noise Pollution**<br>Noise pollution: introduction, sources, outdoor and indoor noise propagation, Effects of noise on health, criteria noise standards and limit values, Noise measurement techniques, prevention and control of noise pollution. | **6** |

**TEXTBOOKS:**


1. A, K. De. (3rd Ed). 2008. Environmental Chemistry. New Age Publications India Ltd.
2. R. Rajagopalan. 2016. Environmental Studies: From Crisis to Future by, 3rd edition, Oxford University Press.
3. Eugene P. Odum. 1971. Fundamentals of Ecology (3rd ed.) -. WB Sunders Company, Philadelphia.
4. C. N. Sawyer, P. L. McCarty and G. F. Parkin. 2002. Chemistry for Environmental Engineering and Science. John Henry Press.
5. S.C. Santra. 2011. Environmental Science. New Central Book Agency.


**REFERENCE BOOKS:**


1. D.W. Conell. Basic Concepts of Environmental Chemistry, CRC Press.
2. Peavy, H.S, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw – Hill International
3. G.M. Masters & Wendell Ela. 1991. Introduction to Environmental Engineering and Science, PHI Publishers.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS): NA**

**POS MET THROUGH GAPS IN THE SYLLABUS: NA**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN: NA**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN: NA**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internet |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | |
| CO2 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | |
| CO3 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | |
| CO4 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | |
| CO5 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2 |
| **CO2** | CD1, CD2 |
| **CO3** | CD1, CD2 |
| **CO4** | CD1, CD2 |
| **CO5** | CD1, CD2 |

## COURSE INFORMATION SHEET

**Course Code: CH24102**
**Course Title: CHEMISTRY LABORATORY**
**Pre-requisite(s): Intermediate level Chemistry**
**Co- requisite(s): NA**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: II**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To gain an understanding of the synthesis of organic and inorganic compounds. |
| **2.** | To interpret and analyze spectroscopic data effectively. |
| **3.** | To develop a strong concept of potentiometric and pH-metric titrations of acids and bases. |
| **4.** | To understand and calculate the rate constant of chemical reactions. |
| **5.** | To acquire knowledge of determining melting points and estimating eutectic and transition temperatures. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to perform the synthesis of organic and inorganic compounds. |
| **CO2** | Able to interpret and analyze spectroscopic data. |
| **CO3** | Able to carry out potentiometric and pH-metric titrations of acids and bases. |
| **CO4** | Able to determine the rate constant of chemical reactions. |
| **CO5** | Able to measure melting points and estimate eutectic and transition temperatures. |

**SYLLABUS (List of experiments)**

1. Gravimetric estimation of Nickel using Dimethylglyoxime.
2. Determination of total Hardness of a given water Sample (Complexometric Titration).
3. Verification of Beer's Law using $Fe^{3+}$ solution by spectrophotometer/colorimeter, and determination of the concentration of an unknown $Fe^{3+}$ solution.
4. Preparation of Diazoamino Benzene and reporting of its melting point and yield.
5. Construction of a melting point–mass percent composition diagram for a two-component mixture and determination of its eutectic temperature.
6. Study of the kinetics of acid-catalyzed hydrolysis of ethyl acetate and evaluation of the rate constant.
7. Determination of the strength of a strong acid using potentiometric titration with a strong base.
8. Determination of the transition temperature of a given salt hydrate.
9. Separation of binary organic mixture by acid-base extraction and analysis using given FTIR and NMR spectrum.
10. Construction of a pH-titration curve for a strong acid versus a strong base

**REFERENCE MATERIALS:**


1. https://bitmesra.ac.in/edudepartment/content/1/140/553 (link of Lab Manual)
2. Experimental Physical Chemistry – B. Viswanathan, P. S. Raghavan, Narosa Publishing House (1997).
3. Vogel's Textbook of Practical Organic Chemistry
4. Experiments in General Chemistry – C. N. R. Rao, U. C. Agarwal.
5. Experimental Organic Chemistry, Vol. 1 & 2 – P. R. Singh, D. S. Gupta, K. S. Bajpai, Tata McGraw-Hill


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Introductory lecture by use of boards/LCD projectors |
| **CD2** | Laboratory experiments/ teaching aid |
| **CD3** | Self- learning such as use of NPTEL materials and internets |
| **CD4** | Seminars (discussion of experimental results and error analysis). |
| **CD5** | Group discussions/problem-solving sessions (to analyze experimental data and calculations). |
| **CD6** | Industrial/guest lectures (applications of chemical analysis techniques in industry). |
| **CD7** | Industrial visits (exposure to real chemical laboratories and processes). |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 2 | 2 | | | |
| CO2 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 3 | 2 | 3 | | | |
| CO3 | 3 | 3 | 1 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 2 | | | |
| CO4 | 3 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | | | |
| CO5 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 3 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: EC24102**
**Course Title: BASIC ELECTRONICS LABORATORY**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits:** L: 0 T: 0 P: 2 C:1
**Class schedule per week: 2**
**Class: B. Tech.**
**Semester / Level: II/1**
**Branch: ALL B.TECH.**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To measure magnitude, time-period, frequency, phase of signals using CRO |
| **2.** | To know PN junction characteristics and its applications |
| **3.** | To understand the working of transistor amplifier |
| **4.** | To understand the working of operational amplifier and circuits |
| **5.** | To realize logic gates and implement simple Boolean expression |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Familiarize with electronics components like diode, transistors, ICs |
| **CO2** | Make use of measuring instruments and function generators |
| **CO3** | Verify characteristics of diodes, transistors and op-amp |
| **CO4** | Design electronic circuits using diodes, transistors, op-amp for analog applications |
| **CO5** | Design electronic circuits using logic gates for digital applications |

**SYLLABUS (List of experiments)**

**(A) HARDWARE BASED EXPERIMENTS**

1. MEASURMENTS USING CRO
   - AIM-1: To understand the Measurement of voltage, time-period and frequency of different signals on CRO.
   - AIM-2: To measure the frequency and phase of two different signals using Lissajous pattern.
2. HALF-WAVE AND FULL WAVE RECTIFIER CIRCUITS
   - AIM-1: To understand the basic operation principle of Half-wave rectifier circuit and measurement of rectification efficiency and ripple factor with and without C-Filter.
   - AIM-2: To understand the basic operation principle of Full-wave rectifier circuit and measurement of rectification efficiency and ripple factor with and without C-Filter.
3. COMMON EMITTER (CE) TRANSISTOR AMPLIFIER
   - AIM-1: To understand the basic operation principle of CE transistor amplifier circuit and finding its frequency response.
   - AIM-2: To determine the gain bandwidth product of CE transistor amplifier from its frequency response.
4. INVERTING OPERATIONAL AMPLIFIER (OP-AMP)
   - AIM: To design the inverting operational amplifier using IC741 OP-AMP and find its Gain and Frequency Response.
5. DIFFERENTIAL AMPLIFIER
   - AIM-1: To design common mode and differential mode circuit using IC741 OP-AMP
   - AIM-2: To obtain common mode gain and differential mode gain and calculate CMRR.
6. REALIZATION OF LOGIC GATES
   - AIM-1: To understand basic Boolean logic functions (NOT, AND, OR).
   - AIM-2: To realize the basic logic gates (AND, OR, NOT) using NAND Gate (IC-7400).

**(B) SOFTWARE BASED EXPERIMENTS**

1. PN JUNCTION CHARACTERISTICS
   - AIM-1: To determine the forward bias V-I characteristics of PN junction diode and finding itsforward cut-in voltage.
   - AIM-2: To determine the reverse bias V-I characteristics of PN junction diode and finding its reverse breakdown voltage.
2. ZENER DIODECHARACTERISTICS
   - AIM-1: To design a basic voltage regulator circuit using Zener diode.
   - AIM-2: To determine the reverse bias V-I characteristics of Zener diode and finding its reverse breakdown voltage.
3. FIELD EFFECT TRANSISTOR CHARACTERISTICS
   - AIM-1: To determine the output and transfer characteristics of JFET.
   - AIM-2: To measure the voltage,gain of JFET.
4. NON-INVERTING OPERATIONAL AMPLIFIER (OP-AMP)
   - AIM: To design the non-inverting operational amplifier using IC741 OP-AMP and find its Gain and Frequency Response.
5. DIFFERENTIATOR AND INTEGRATOR CIRCUITS USING OP-AMP
   - AIM-1: To design differentiator circuit using IC741 OP-AMP and observe waveforms.
   - AIM-2: To design integrator circuit using IC741 OP-AMP and observe waveforms.
6. IMPLEMENTATION OF BOOLEAN FUNCTION
   - AIM-1: To understand the AND Gate IC (IC 7408) and OR Gate IC (IC 7432)
   - AIM-2: To implement a given Boolean expression using logic gate ICs.

**TEXTBOOKS:**

1. Millman J., Halkias C.C., Parikh Chetan, "Integrated Electronics: Analog and Digital Circuits and Systems", Tata McGraw-Hill, 2/e.
2. Mano M.M., "Digital Logic and Computer Design", Pearson Education, Inc, Thirteenth Impression, 2011.

**REFERENCE BOOK:**

1. Boylstead R.L., Nashelsky L., "Electronic Devices and Circuit Theory", Pearson Education, Inc, 10/e.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of Boards/LCD Projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars/ Quiz (s) |
| **CD4** | Mini Projects/Projects |
| **CD5** | Laboratory Experiments/Teaching Aids |
| **CD6** | Industrial/Guest Lectures |
| **CD7** | Industrial Visits/In-plant Training |
| **CD8** | Self- learning such as use of NPTEL Materials and Internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 2 | 2 | | | |
| CO2 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 3 | 2 | 3 | | | |
| CO3 | 3 | 3 | 1 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 2 | | | |
| CO4 | 3 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | | | |
| CO5 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 3 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD5, CD9 |
| **CO2** | CD1, CD5, CD9 |
| **CO3** | CD1, CD5, CD9 |
| **CO4** | CD1, CD5, CD9 |
| **CO5** | CD1, CD5, CD9 |

## COURSE INFORMATION SHEET

**Course Code: ME24102**
**Course Title: ENGINEERING GRAPHICS LABORATORY**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 2** L:0 T: 0 P:4
**Class schedule per week: 4**
**Class: B. Tech.**
**Semester / Level: II**
**Branch: Mechanical Engineering**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Understand the basic principles of Engineering Graphics, which include projections of 1D, 2D and 3D objects. |
| **2.** | Visualize a solid object (including sectioned) and convert it into drawing. |
| **3.** | Visualize different views of any object. |
| **4.** | Develop skill to draw objects using AutoCAD software. |
| **5.** | Inculcate the imagination and mental visualization capabilities for interpreting the geometrical details of common engineering objects. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Explain the fundamentals of Engineering Graphics and projection and acquire visualization skills. |
| **CO2** | Demonstrate the concept of projections of points and lines for various engineering applications. |
| **CO3** | Apply the concept of projections to construct planes and solids, and its orthographic projections which are positioned in various configurations.. |
| **CO4** | Demonstrate the understanding of AutoCAD software commands to draw projections of points, lines, planes and solids. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I**<br>Introduction to Engineering Graphics, dimensioning and projections, orthographic projections, Fundamentals of First and Third Angle projection, Orthographic projections of points. | **9** |
| **Module – II**<br>Orthographic projections of straight lines: lines parallel to HP and VP, lines inclined to HP and Parallel to VP, line inclined to VP and parallel to HP, line inclined to both reference planes.<br>Orthographic projections of planes/lamina: lamina perpendicular to both HP and VP, lamina parallel to HP and perpendicular to VP (and vice versa), lamina inclined to HP and perpendicular to VP, lamina inclined to VP and perpendicular to HP, lamina inclined to both reference planes. | **9** |
| **Module – III**<br>Projections of solids (cube, prism, pyramid, tetrahedron) - axis perpendicular to HP and inclined to VP and inclined to one or both planes.<br>Section of solids: sectional plane perpendicular to one plane and parallel/inclined to another plane. | **9** |
| **Module – IV**<br>Working with AutoCAD Commands, Cartesian Workspace, Basic Drawing & Editing Commands, Drawing: Lines, Rectangles, Circles, Arcs, Polylines, Polygons, Ellipses, Creating Fillets and Chamfers, Creating Arrays of Objects, Working with Annotations, Adding Text to a Drawing, Hatching, Adding Dimensions, Dimensioning Concepts, Adding Linear Dimensions, Adding Radial & Angular Dimensions, Editing the Dimensions. | **9** |
| **Module – V**<br>Create views of points, lines, planes, and various types of solids (cube, prism, pyramid, tetrahedron, etc.) using AutoCAD software. | **9** |

**TEXTBOOKS:**


1. Engineering Drawing by N. D. Bhatt, Charotar Publishing House Pvt.Ltd., 53rd, Edition, 2014.
2. Engineering Drawing and Graphics + AutoCAD by K. Venugopal, New Age International (P) Limited, 4th Reprint: June, 2017.


**REFERENCE BOOKS:**


1. Engineering Graphics with Autocad by J. D. Bethune, Prentice Hall, 2007.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS) : NA**

**POS MET THROUGH GAPS IN THE SYLLABUS: NA**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN: NA**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN: NA**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Progressive Evaluation | 60 |
| End Semester Test | 40 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Day to day performance & Lab files | 30 |
| Lab Quiz 1 | 10 |
| Viva-voce | 20 |
| **End Semester Examination** | **% Distribution** |
| Examination: Experiment Performance | 30 |
| Lab Quiz 2 | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 |
|---|---|---|---|---|
| Continuous Internal Assessment | √ | √ | √ | √ |
| Semester End Examination | √ | √ | √ | √ |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | | |
|---|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors | |
| **CD2** | Assignments/Seminars | |
| **CD3** | Laboratory experiments/teaching aids | √ |
| **CD4** | Industrial/guest lectures | |
| **CD5** | Industrial visits/in-plant training | |
| **CD6** | Self- learning such as use of NPTEL materials and internets | |
| **CD7** | Simulation | |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | | 2 | | | | 2 | | 2 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 2 | | 2 | | | | 2 | | 2 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 2 | | | 2 | 2 | | 2 | 2 | 2 | 2 |
| CO4 | 2 | 2 | 2 | 2 | 3 | | | 2 | 3 | 2 | 2 | 2 | 2 | 2 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD3 |
| **CO2** | CD3 |
| **CO3** | CD3 |
| **CO4** | CD3 |

**COURSE INFORMATION SHEET**

**Course Code: PE24102**
**Course Title: WORKSHOP PRACTICE**
**Pre-requisite(s): NA**
**Co-requisite(s): NA**
**Credits: 1** L:0 T:0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: II**
**Branch: Production and Industrial Engineering**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students to:

| | |
|---|---|
| **1** | Familiarize with the basics of manufacturing processes. |
| **2** | Impart knowledge and skill to use tools, machines, equipment, and measuring instruments. |
| **3** | Practice on manufacturing of components using workshop trades. |
| **4** | Educate students on the safe handling of machines and tools. |
| **5** | Exercise individual as well as group activity with hands-on training in different workshop trades. |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Be conversant with the basic manufacturing processes. |
| **CO2** | Identify and apply suitable tools and instruments for carpentry, foundry, welding, fitting, and conventional and modern machining. |
| **CO3** | Manufacture different components using various workshop trades. |
| **CO4** | Take safety and precautionary measures for self and machines during operations. |
| **CO5** | Develop skills to work as an individual or in a team during trade practices. |

**SYLLABUS (List of experiments)**

1. To study the various tools, instruments, and equipment used in carpentry practice.
2. To perform the carpentry work by making a wooden job using different tools.
3. To get acquainted with various tools and equipment used in making green sand mould (to practice green sand mould making with single-piece patterns).
4. To get acquainted with melting and pouring metal in a mould (given two-piece patterns of handle) and to make aluminium casting.
5. To study arc welding processes including arc welding machines (AC & DC), electrodes and equipment. To join two pieces of given metal by the arc welding process.
6. To study gas welding processes, including types of flames produced, filler metals and fluxes, etc. To join two pieces of given metal by the gas welding process.
7. To study the various tools used in the fitting shop and perform fitting operations (like marking, chipping, hack-sawing, filing, drilling, etc.)
8. To make a job clamping plate as per the given drawing by fitting operations and to check for its assembly with a given component.
9. To study lathe machine and to machine a given job on the center lathe as per drawing.
10. To study the Shaper machine and to machine a given job on the shaper as per drawing.
11. To provide an introduction to the functionality and operation of the CNC Lathe Machine through practical demonstration.
12. To provide an introduction to the functionality and operation of the CNC Surface Grinding Machine through practical demonstration

**TEXTBOOKS:**

1. S K Hajra Choudhury, A K. Hajra, “Elements of Workshop Technology: Vol- I and Vol -II”, Media Promotors Pvt Ltd. (T1)
2. B S Raghuwanshi, "A course in Workshop Technology", Dhanpat Rai Publications. (T2)

**REFERENCE BOOKS:**

1. P.N. Rao, “Manufacturing Technology Vol-1and Vol-II”, Tata McGraw Hill. (R1)
2. Kalpakjian, "Manufacturing Engineering and Technology", Pearson. (R2)

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Continuous Internal Assessment | 60 |
| Semester End Examination | 40 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Day to day performance & Lab files | 30 |
| Quiz 1 | 10 |
| Viva-voce | 20 |

| End Semester Examination | % Distribution |
|---|---|
| Examination: Experiment Performance | 30 |
| Quiz 2 | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | √ | √ | √ | √ | √ |
| Examination: Experiment Performance | √ | √ | √ | √ | √ |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | | |
|---|---|---|
| CD1 | Lecture by use of boards/LCD projectors/OHP projectors | √ |
| CD2 | Assignments/Seminars | |
| CD3 | Laboratory experiments/teaching aids | √ |
| CD4 | Industrial/guest lectures | |
| CD5 | Industrial visits/in-plant training | |
| CD6 | Self- learning such as use of NPTEL materials and internets | |
| CD7 | Simulation | √ |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO 9 | PO 10 | PO 11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 2 |
| CO2 | 2 | 3 | 2 | 1 | 3 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 3 |
| CO3 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| CO4 | 1 | 1 | 2 | 1 | 2 | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 2 |
| CO5 | 1 | 1 | 2 | 0 | 1 | 0 | 1 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |

Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD3, CD6 |
| **CO2** | CD1, CD3 |
| **CO3** | CD1, CD3 |
| **CO4** | CD1, CD3 |
| **CO5** | CD3 |

## COURSE INFORMATION SHEET

**Course Code: MA24201**
**Course Title: NUMERICAL METHODS**
**Pre-requisite(s): NA**
**Co- requisite(s): Numerical Methods Lab.**
**Credits: 2** L: 2 T: 0 P: 0
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: III / 2**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | comprehend suitable numerical methods to solve algebraic and transcendental equations |
| **2.** | learn proper numerical methods to solve linear system of equations |
| **3.** | approximate a function using various interpolation techniques |
| **4.** | evaluation of derivatives and integrals using interpolating polynomials |
| **5.** | find the numerical solutions of initial value problems |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | solve algebraic and transcendental equations using numerical methods for real-world problem solving |
| **CO2** | apply numerical techniques to solve linear system of equations in scientific and engineering computations |
| **CO3** | use interpolation methods to approximate functions in data analysis and modeling |
| **CO4** | compute derivatives and integrals for complex mathematical and physical problems |
| **CO5** | solve ordinary differential equations numerically for dynamic system modeling and simulations |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: ERRORS AND NONLINEAR EQUATIONS**<br>Types and sources of errors, Propagation of errors.<br>Bisection method, Regula-Falsi method, Secant method, Newton-Raphson method and its variants, General Iterative method. | **5** |
| **Module – II: SYSTEM OF LINEAR EQUATIONS**<br>Gaussian Elimination, Gauss-Jordan, LU Decomposition (Crout's method), Gauss-Jacobi and Gauss-Siedel methods to solve linear system of equations. | **5** |
| **Module – III: INTERPOLATION**<br>Lagrange's interpolation, Newton's divided differences interpolation formulas, Interpolating polynomial using Newton forward and backward differences | **5** |
| **Module – IV: DIFFERENTIATION AND INTEGRATION**<br>Differentiation using interpolation formulas, Integration using Newton-Cotes formulas: Trapezoidal rule, Simpson's one-third and three-eighth rules. | **5** |
| **Module – V: SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**<br>Euler's method, modified Euler's method, Runge-Kutta Methods of second and fourth order to solve initial value problems. | **5** |

**TEXTBOOKS:**


1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age Publications, Fourth Edition, 2004.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI, Fourth Edition, 2005.
3. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.


**REFERENCE BOOKS:**


1. S.C. Chapra and R. P. Canale, Numerical Methods for Engineers, McGraw Hill, Seventh Edition, 2014.
2. C.F. Gerald and P.O. Wheatley, Applied Numerical Analysis, Pearson Education, Seventh Edition, 2003.
3. R. W. Hamming, Numerical Methods for Scientists and Engineers, Second Edition, Dover Publications Inc. 1987


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS) --**

**POS MET THROUGH GAPS IN THE SYLLABUS --**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN ---**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN --**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |
| **CD4** | Laboratory experiments/teaching aids |
| **CD5** | Industrial/guest lectures |
| **CD6** | Industrial visits/in-plant training |
| **CD7** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 0 | 0 | 0 | 1 | 1 | 2 | | | |
| CO2 | 3 | 3 | 2 | 2 | 2 | 0 | 0 | 0 | 1 | 1 | 2 | | | |
| CO3 | 3 | 2 | 2 | 2 | 3 | 0 | 0 | 0 | 1 | 1 | 2 | | | |
| CO4 | 3 | 2 | 2 | 2 | 3 | 0 | 0 | 0 | 1 | 1 | 2 | | | |
| CO5 | 3 | 3 | 2 | 3 | 3 | 0 | 0 | 0 | 1 | 1 | 2 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24201**
**Course Title: SOLID MECHANICS**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 4** L: 4 T: 0 P: 0
**Class schedule per week: 4**
**Class: B.Tech.**
**Semester / Level: III / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Develop basic knowledge of strength of material. |
| **2.** | Understand behaviour of different materials subjected to simple and complex mechanical stresses. |
| **3.** | Analyse structural members under different loading conditions. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand the fundamental concept of stress, strain and material properties of structural elements. |
| **CO2** | Understand the concept of transformation of stress and strain and evaluate principal stress and strain. |
| **CO3** | Evaluate the behaviour and strength of structural elements under flexural loading. |
| **CO4** | Evaluate the behaviour and strength of structural elements under torsional action. |
| **CO5** | Understand the concept of buckling and evaluate the behaviour and strength of structural elements under uni-axial and bi-axial loading. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Stress and Strain**<br>Definition and concept of stress and strain, Stress at a point, Generalized Hooke's law, Poisson's ratio, Elastic constants and their relationship. Stress-Strain diagram (ductile and brittle), proof stress, true and engineering stress and strain, Thermal stress, Elongation of axially loaded bars. | **10** |
| **Module – II: Transformation of stress**<br>Stress-strain matrix. Plane stress and plane strain condition, Transformation of stress and strain, Principal stress and strain, Maximum shear stress, Mohr's circle, Introduction to theories of Failure –(a) Maximum principal stress theory (Rankine's theory), (b) Maximum shearing stress theory (Tresca's theory), (c) Maximum strain energy theory and (e) Maximum strain theory (St. Venant's theory). | **10** |
| **Module – III: Bending and Shear Stresses in Beams**<br>Bending moment and shear force of statically determinate beams. Euler-Bernoulli Beam theory (section modulus, flexural rigidity), Bending stress distribution, shear stress distribution, Shear centre. | **10** |
| **Module – IV: Torsion**<br>Pure torsion, Assumptions, derivation of torsional equation for circular, rectangular, triangular and I section, torsional rigidity, and polar section modulus, Power transmitted by a shaft. | **8** |
| **Module – V: Columns and Struts**<br>Short and long columns. Euler's Buckling theory, Uni-axial and Bi-axial Loading, Uni-axial and Biaxial bending, Limitations of Euler's theory | **8** |

**TEXTBOOKS:**


1. Elements of Strength of Materials, D.H. Young, S.P. Timoshenko East West Press Pvt. Ltd.
2. Introduction to Textbook of Strength of materials by R. K. Bansal, Laxmi publications Pvt. Ltd., New Delhi.
3. Advanced Mechanics of Solids by L S Srinath, McGraw-Hill Education India
4. Engineering Mechanics of Solids by Egor P. Popov, Pearson India
5. Strength of materials by R. Subramanian, Oxford university press, New Delhi


**REFERENCE BOOKS:**


1. Introduction to Strength of Materials, William A. Nash, McGraw Hill.
2. Strength of Materials, Andrew Pytel, Ferdinand L. Singer, Harper & Row.
3. Mechanics of Materials, Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf, David F. Mazurek, McGraw Hill Education.
4. Mechanics of Materials, James M. Gere, Cengage Learning.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Md Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 2 |
| CO2 | 3 | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 2 |
| CO3 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24202**
**Course Title: STRUCTURAL ANALYSIS - I**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: III**
**Branch: CEE**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Develop basic knowledge of structural analysis so that the students can solve real engineering problems. (K1, K2). |
| **2.** | Understand behaviour of different kinds of determinate structures subjected to simple and complex mechanical loadings. (K1, K2) |
| **3.** | Analyse and design safe and sound civil engineering structures. (K3, K4) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Evaluate the stability and determinacy of a given structure. (K1, K2, K3) |
| **CO2** | Evaluate safety of a proposed determinate structure before construction and manufacturing. (K4) |
| **CO3** | Evaluate the behaviour of determinate structures under the action of complex static loads. (K1, K2, K3, K4) |
| **CO4** | Evaluate the behaviour of determinate structures under the action of moving loads. (K1, K2, K3, K4) |
| **CO5** | Evaluate deflections in a given determinate structure. (K3, K4) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction**<br>Structure. Structural Elements, Types of Structures. Idealized structure. Equilibrium Static Equation. Principle of superposition. Determinacy and Stability. | **8** |
| **Module – II: Analysis of statically determinate trusses and beams**<br>Trusses: Method of joints, Method of sections, Zero force members.<br>Beams: Shear Force (SF) and Bending Moments (BM) diagrams under concentrated and uniformly distributed load (UDL) and their combinations with or without having internal hinges. | **8** |
| **Module – III: Analysis of statically determinate cables and arches**<br>Cables subjected to concentrated loads and UDL. Catenary curve.<br>Arches: Types of arches. Three hinged arch: Eddy's theorem; BM diagrams, Normal thrust and Radial shear at any c/s. | **8** |
| **Module – IV: Deflection and Influence line diagrams for beams**<br>Deflection: Elastic curve, Double integration method, Moment area method, Conjugate beam method. Influence Line Diagram (ILD) for reaction, shear force, and bending moment for beams; Absolute maximum shear and moment in beam; ILD for trusses, Muller-Breslau principle for qualitative ILD. | **8** |
| **Module – V: Energy methods**<br>External work: Force and Moment, Strain energy: Axial, Shear, Bending and Torsion. Maxwell-Betti law of reciprocal deflection, Principle of virtual work and Castiglano's Theorems: Application to determinate structures. | **8** |

**TEXTBOOKS:**

1. Structural Analysis by Hibbeler, R.C. – Pearson Publications.
2. Basic Structural Analysis by Reddy, C.S. – The McGraw Hill Publications.

**REFERENCE BOOKS:**

1. Fundamentals of Structural Analysis – Leet, K.M. – McGraw Hill Publications.
2. Theory of Structures by Timoshekno S. P. & Young.
3. Mechanics of materials, by Ferdinand P. Beer and others, Tata McGraw Hill Publications.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | | | | | 2 | 1 | | | 2 | | |
| CO2 | 3 | 3 | 1 | | | | | 2 | 1 | | | | 2 | |
| CO3 | 3 | 3 | 1 | | | | | 2 | 1 | | | | | 2 |
| CO4 | 3 | 3 | 1 | | | | | 2 | 1 | | | 2 | 2 | |
| CO5 | 3 | 3 | 1 | | | | | 2 | 1 | | | | | 2 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24203**
**Course Title: FLUID MECHANICS**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 4** L: 4 T: 0 P: 0
**Class schedule per week: 4**
**Class: B.Tech.**
**Semester / Level: III / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To get introduced about the concepts of fluid mechanics useful for civil engineering applications. |
| **2.** | To apply the concepts of fluid mechanics to analyse and solve engineering problems involving fluids such as flow in pipes, open channels, jets, turbines and pumps, hydraulic structures, rivers and in sub-surface both at static and dynamic conditions. |
| **3.** | To understand and analyse various types of flows in open channels. |
| **4.** | To study and design pumps and hydraulic turbines. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand the fluid properties and solve the engineering problems using principles of fluid statics. (K1, K2, K3) |
| **CO2** | Solve the engineering problems using principles of fluid kinematics and fluid dynamics. (K1, K2, K3) |
| **CO3** | Solve engineering problems using various applications of fluid dynamics. (K1, K2, K3) |
| **CO4** | Apply the principles of fluid mechanics to investigate open channel flows. (K1, K2, K3) |
| **CO5** | Analyse and design pumps and hydraulic turbines. (K1, K2, K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Fluid Properties and Fluid Statics**<br>*Fluid properties*: Mass density, Specific weight, Specific gravity, Viscosity, Vapour pressure, Bulk modulus of elasticity, Surface tension, Capillarity<br>*Fluid Statics*: Fluid pressure, Measurement of pressure, Manometers, Hydrostatic forces on surfaces, Horizontal plane surface, Vertical plane surface, Inclined plane surface, Curved surfaces, Buoyancy and floatation, Metacentre and metacentric height | **10** |
| **Module – II: Fluid Kinematics and Fluid Dynamics**<br>*Fluid kinematics*: Velocity, Types of flow, Streamlines, Continuity equation, Acceleration, Velocity potential, Stream function, Flownet<br>*Fluid dynamics*: Equation of motion, Euler's equation of motion, Bernoulli's energy equation, Kinetic energy correction factor, Applications of Bernoulli's energy equation, Venturimeter, Orificemeter, Pitot tube | **10** |
| **Module – III: Fluid Dynamics (Continued)**<br>*Fluid dynamics (continued)*: Impulse momentum equation, Momentum correction factor, Applications of impulse momentum equations, Force on a pipe bend, Orifice and mouthpiece, Notch and weir<br>*Laminar flow and turbulent flow*: Laminar flow, Steady laminar flow in circular pipes, Hazen-Poiseuille equation, Laminar flow between parallel plates, Darcy's law, Stoke's law, Turbulent flow, Velocity distribution, Darcy-Weisbach equation, Flow through pipes<br>*Drag and lift*: Boundary layer, Empirical equations for laminar and turbulent boundary layers, Drag on sphere, Drag on cylinder, Drag on flat plate, Drag on airfoil, Lift on cylinder, Lift on airfoil<br>*Dimensional analysis*: Buckingham $\pi$ Method, Dimensionless numbers, Models | **10** |
| **Module – IV: Open Channel Flow**<br>*Uniform Flow*: Classification of channels, Types of flow, Geometrical properties of channel sections, Velocity distribution, Uniform flow, Chezy's formula, Manning's formula, Most economical channel section, Specific energy and critical depth, Specific force, Critical flow, Channel transitions, Measuring flumes, Estimation of mean velocity and discharge in channels<br>*Non-uniform flow*: Gradually varied flow, Dynamic equation of GVF, Classification of channel slopes and surface profiles, Practical examples, Integration of GVF equation, Step method, Graphical method, Direct integration, Hydraulic jump, Assumptions, Hydraulic jump in rectangular channels, Loss of energy, Types of hydraulic jump, Applications of hydraulic jump, Waves and surges in open channels | **10** |
| **Module – V: Hydraulic Machines**<br>*Pump*: Types of pumps, Reciprocating pump, Components and working, Indicator diagram, Centrifugal pump, Impeller, Priming, Minimum starting speed, Specific speed, Characteristic curves,<br>*Hydraulic turbines*: Heads and efficiencies, Classification of turbines, Pelton turbine, Francis turbine, Kaplan turbine, Governing of turbines, Unit quantities, Specific speed, Characteristic curves, Cavitation, Selection of turbines | **10** |

**TEXTBOOKS:**


1. Hydraulics and Fluid Machines, P. N. Modi and S. H. Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publications.
3. Flow in Open Channels, K. Subramanya, Tata McGraw Hills.
4. Hydraulic Machines, Dr. Jagdish Lal, Metropolitan Book Company.
5. Fluid Mechanics, V. L. Streeter and E. B. White, McGraw Hill, New York.
6. Experimental Fluid Mechanics, Vol. 1, G. L. Asawa, Nemchand and Bros, Roorkee.
7. Flow through Open Channels, K.G. Ranga Raju, Tata McGraw Hills.


**REFERENCE BOOKS:**


1. Open Channel Hydraulics, V. T. Chow McGraw Hill.
2. Open Channel Hydraulics, French, McGraw Hill.
3. Fluid Machines through Problems, R. J. Garde, New Age International.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's Assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and Assignment | 40 |
| Teacher's Assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO3 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO4 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO5 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course code:** CE 24204
**Course title:** BUILDING MATERIALS AND CONSTRUCTION
**Pre-requisite(s):** NA
**Co- requisite(s):** NA
**Credits:** 3 L:3 T:0 P:0
**Class schedule per week:** 3
**Class:** B.Tech.
**Semester / Level:** III / 2
**Branch:** CIVIL ENGINEERING
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | To know the various types of building materials used in current construction practices and their associated manufacturing processes and properties (K1). |
| **2.** | To understand the choices designers make in choosing building materials based on |
| **3.** | properties of these materials (K1, K2) |
| **4.** | To get exposed to various quality control aspects of the civil engineering materials by performing different lab test on materials (K1, K2) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to explain the manufacturing process, physical and chemical properties and uses of various building materials (K1). |
| **CO2** | Able to analyze the suitability of different building materials and significance in using those materials in relation with building's function (K1, K2). |
| **CO3** | Able to perform quality control tests on different construction materials (K1, K2). |
| **CO4** | Able to plan and execute construction of various components of substructure and superstructure (K1, K2). |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Building Stones, Bricks**<br>Classification of rocks, Varieties of Indian stones, Quarrying blasting, Dressings of stones, Characteristics of good building stones, uses, Testing and Preservation of stones, Constituents of brick earth and their properties, Manufacture of bricks, clamps & kilns, types of brick, defects in bricks, tests on bricks. | **8** |
| **Module – II: Limes, Cements, Mortar, Timber**<br>Lime – Types, properties and uses. Cement – Composition, Varieties, Properties, Methods of manufacture; Tests on cement. Mortar-Lime mortar, Cement mortar, Surkhi mortar, Mud mortar, Gypsum and Plaster of Paris, Varieties of Indian timber, Characteristics and suitability for different uses, Defects in timber, Diseases and decay in timber, Preservation and Seasoning, Veneers, Fiber boards, Block boards; modern materials like fibre-reinforced plastics and introduction to composites. | **8** |
| **Module – III: Foundation, Masonry**<br>Foundations: functions and different types, basic terminologies associated with stone and brick masonry, types of stone masonry and brick masonry bonds, brick laying, types of walls, load bearing walls, design considerations; cavity walls: general features and construction; partition walls: brick, concrete and glass partitions. | **8** |
| **Module – IV: Concrete Technology, DPC and anti-termite works**<br>Concrete constituents, properties of concrete, batching, mixing, transporting, placing, compacting, curing of concrete; tests for quality control, different concrete mixes and uses; reinforcements in RCC; Design of Concrete Mixes: proportioning of aggregates and methods of mix design.<br>Damp proofing: cause and effects of damping; materials and methods for damp proofing – DPC treatment. Anti-termite treatment. | **8** |
| **Module – V: Plastering and pointing, plumbing types**<br>Types of mortar for plastering, terminology, tools, methods of plastering, defects in plastering; methods of pointing.<br>Plumbing - water supply service connection for buildings, different types of traps, types of drainage pipes and systems of plumbing for wastewater drainage. | **8** |

**TEXTBOOKS:**


1. Duggal S. K. : Building Materials (New Age International Publishers)
2. Punmia B.C., Jain A.K. and Jain A.K.: Building Construction (Laxmi Publications Pvt. Ltd)
3. Arora S.P. and Bindra S.P.: A Text Book of Building Construction (Dhanpat Rai Publications)


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's Assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and Assignment | 40 |
| Teacher's Assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Faculty**
2. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | | | 1 | 2 | 2 | 1 | | | 2 | 3 | 2 | 3 |
| CO2 | 2 | 1 | | | | 2 | 2 | | | 1 | 2 | 3 | 3 | 3 |
| CO3 | | 1 | | | 1 | 2 | | 1 | | 1 | | 3 | 3 | 3 |
| CO4 | 2 | 1 | 2 | 1 | | | 2 | 1 | | 2 | | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2 and CD8 |
| CO2 | CD1, CD2 and CD8 |
| CO3 | CD1, CD2, CD5 and CD8 |
| CO4 | CD1, CD2, CD6, CD7 and CD8 |

**COURSE INFORMATION SHEET**

**Course Code: MT24131**
**Course Title: UHV2: UNDERSTANDING HARMONY**
**Pre-requisite(s): NIL**
**Co- requisite(s): NIL**
**Credits: 3** **(**L: 3 T: 0 P: 0)
**Class schedule per week: 3**
**Class: B. Tech.**
**Semester / Level: THIRD**
**Branch: Biotechnology**
**Name of Teacher:**

**COURSE OBJECTIVES**
This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Develop a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence. |
| **2.** | Understand (or developing clarity) of the harmony in the human being, family, society and nature/existence |
| **3.** | Strengthen of self-reflection |
| **4.** | Develop the commitment and courage to act |

**COURSE OUTCOMES (COs)**
After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | At the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I:**<br>**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:**<br>1.Purpose and motivation for the course, recapitulation from Universal Human Values-I.<br>2.Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.<br>3.Continuous Happiness and Prosperity- A look at basic Human Aspirations.<br>4.Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority.<br>5.Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario<br>6.Method to fulfil the above human aspirations: understanding and living in harmony at various levels.<br>Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co- existence) rather than as arbitrariness in choice based on liking-disliking. | **8** |
| **Module – II:**<br>**Understanding Harmony in the Human Being - Harmony in Myself!**<br>1.Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.<br>2.Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.<br>3.Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).<br>4.Understanding the characteristics and activities of 'I' and harmony in 'I'.<br>5.Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.<br>6.Programs to ensure Sanyam and Health.<br>Include practice sessions to discuss the role others have played in making material goods available tome. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease. | **8** |
| **Module – III:**<br>Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship:<br>1.Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship<br>2.Understanding the meaning of Trust; Difference between intention and competence<br>3.Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship<br>4.Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals<br>5.Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.<br>Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives. | 8 |
| **Module – IV:** | |

| | |
|---|---|
| **Understanding Harmony in the Nature and Existence - Whole existence as Coexistence:**<br>1.Understanding the harmony in the Nature<br>2.Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature.<br>3.Understanding Existence as Co-existence of mutually interacting units in all- pervasive space.<br>4.Holistic perception of harmony at all levels of existence.<br>5.Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc. | 8 |
| **Module – V**<br>**Implications of the above Holistic Understanding of Harmony on Professional Ethics:**<br>**1.**Natural acceptance of human values<br>2.Definitiveness of Ethical Human Conduct<br>3.Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order<br>4.Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.<br>5.Case studies of typical holistic technologies, management models and production systems<br>6.Strategy for transition from the present state to Universal Human Order:<br>a)At the level of individual: as socially and ecologically responsible engineers, technologists and managers<br>b)At the level of society: as mutually enriching institutions and organizations<br>7.Sum up.<br>Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessionse.g. to discuss the conduct as an engineer or scientist etc**.** | 8 |

**TEXTBOOKS:**

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

**REFERENCE BOOKS:**

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's assessment | 05 |

| **Continuous Internal Assessment** | **% Distribution** |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| **Assessment Components** | **CO1** |
|---|---|
| Continuous Internal Assessment | Y |
| Semester End Examination | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |
| **CD4** | Seminar |
| **CD5** | |
| **CD6** | |
| **CD7** | |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | 2 | 1 | 1 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 2 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3, CD4 |

## COURSE INFORMATION SHEET

**Course Code: MA24202**
**Course Title: NUMERICAL METHODS LABORATORY**
**Pre-requisite(s): MA24201 Numerical Methods**
**Co- requisite(s): NA**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: III / 2**
**Branch:** All
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | execute appropriate numerical methods to solve algebraic and transcendental equations correct up to some certain level of significance |
| **2.** | solve linear system of equations using direct and iterative methods |
| **3.** | approximate a function by polynomial using various interpolation techniques along with computation of derivatives and integrals |
| **4.** | compute numerical solutions of initial value problems |
| **5.** | handle numerical problems efficiently through programming languages like C, C++ etc. on computer |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | employ numerical techniques to solve algebraic and transcendental equations |
| **CO2** | analyze and implement numerical methods for solving systems of linear equations |
| **CO3** | use interpolation methods to approximate functions in data analysis and modeling |
| **CO4** | compute derivatives and definite integrals using numerical differentiation and integration methods |
| **CO5** | develop solutions of ordinary differential equations using appropriate numerical schemes |

**SYLLABUS (List of experiments)**

1. Write a program to find a simple root of $f(x) = 0$ using Bisection method. Read the end points of the interval in which the root lies, maximum number of iterations and error tolerance eps.
2. Write a program to find a simple root of $f(x) = 0$ using Regula-Falsi method. Read the end points of the interval in which the root lies, maximum number of iterations and error tolerance eps.
3. Write a program to find a simple root of $f(x) = 0$ using Secant method. Read the end points of the interval in which the root lies, maximum number of iterations and error tolerance eps.
4. Write a program to find a simple root of $f(x) = 0$ using Newton Raphson method. Read any initial approximation, maximum number of iterations and error tolerance eps.
5. Write a program to find the solution of a system of linear equations using Gauss elimination method.
6. Write a program to find the solution of a system of linear equations using Gauss-Jordan method.
7. Write a program to find the solution of a system of linear equations using Jacobi method.
8. Write a program to find the solution of a system of linear equations using Gauss-Seidel method.
9. Write a program to approximate the function using Lagrange interpolation formula.
10. Write a program to approximate the function using Newton divided difference formula.
11. Write a program to approximate the function using Newton's forward and backward interpolation formulae.
12. Write a program to evaluate the integral using Trapezoidal rule.
13. Write a program to evaluate the integral using Simpson's one-third and three-eighth rules.
14. Write a program to solve an IVP, $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$ using Euler method.
15. Write a program to solve an IVP, $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$ using the classical Runge-Kutta fourth order method.

**TEXTBOOKS:**


1. Jain M.K, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age Publications, 2004.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI, Fourth Edition, 2005.
3. Y. Kanetkar, Let Us C, BPB Publications, Fifteenth Edition, 2016.


**REFERENCE BOOKS:**


1. S.C. Chapra and R. P. Canale, Numerical Methods for Engineers, McGraw Hill, Seventh Edition, 2014.
2. R. W. Hamming, Numerical Methods for Scientists and Engineers, Second Edition, Dover Publications Inc. 1987.
3. H. Schildt, C++: The Complete Reference, McGraw-Hill Education, Fourth Edition, 2017.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS) --**

**POS MET THROUGH GAPS IN THE SYLLABUS --**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN ---**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN --**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizzes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | 60 % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |
| **CD4** | Laboratory experiments/teaching aids |
| **CD5** | Industrial/guest lectures |
| **CD6** | Industrial visits/in-plant training |
| **CD7** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 | 3 | 0 | 0 | 1 | 1 | 1 | 2 | | | |
| CO2 | 3 | 3 | 2 | 2 | 3 | 0 | 0 | 1 | 1 | 1 | 2 | | | |
| CO3 | 3 | 2 | 2 | 2 | 3 | 0 | 0 | 1 | 1 | 1 | 2 | | | |
| CO4 | 3 | 2 | 2 | 2 | 3 | 0 | 0 | 1 | 1 | 1 | 2 | | | |
| CO5 | 3 | 3 | 2 | 3 | 3 | 0 | 0 | 1 | 1 | 2 | 3 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD2, CD3 |
| **CO2** | CD2, CD3 |
| **CO3** | CD2, CD3 |
| **CO4** | CD2, CD3 |
| **CO5** | CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE 24205**
**Course Title: CIVIL ENGINEERING DRAWING**
**Pre-requisite(s):**
**Co- requisite(s): CE24204**
**CREDITS: 2 L: 0 T: 0 P: 4**
**Class schedule per week: 4**
**Class: B. Tech**
**Semester / Level: III / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

| | |
|---|---|
| **1.** | To introduce types of drawing and standard practices in drawing different components of the building. |
| **2.** | To introduce the students to draft the plan, elevation, and sectional views of buildings following development and control rules, satisfying orientation and functional requirements. |

### COURSE OUTCOMES

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Apply various types of scales as per the need for preparing various types of drawings. |
| **CO2** | Prepare, read, and interpret, component drawing, building drawings, and layout. |
| **CO3** | Execute and supervise the construction work for buildings based on provided Engineering drawings. |
| **CO4** | Analyze types of staircase, plan and section details of buildings. |
| **CO5** | Prepare detailed drawings of water supply and drainage connections to the buildings. |

**SYLLABUS (List of experiments)**

1. Types of drawing- Index map, key plan, village map, site plan, layout plan with appropriate scale & uses. Sizes of various standard papers.
2. Symbols of Engineering materials, Electrical Installations, Water supply, and Sanitary fixtures.
3. Different masonry bonds.
4. Load-bearing wall and shallow Foundations.
5. Plan, Elevation and Section of the residential building.
6. Types of staircase, Plan and Section details.
7. Detailed drawings of water supply and drainage connections to the building.
    a) The layout of Single Storey Building Drainage System
    b) The layout of Water supply in Single Storey Building
    c) The layout of the Drainage system in Multi storeyed Building
8. Student Activity: Visit a construction site and collect drawings for the project

**TEXTBOOKS:**


1. Building Planning & Drawing – Kumaraswamy N., Kameswara Rao A., Charotar Publishing
2. Civil Engg. Drawing and House Planning – Verma B. P., Khanna Publishers
3. Building Drawing & Detailing – Balagopal & T.S. Prabhu, Spades Publishers
4. Building Planning and Drawing – S.S .Bhavikatti & M.V Chitawadagi, I.K International Publishing House Pvt.Ltd


**REFERENCE BOOKS:**


1. National Building Code, BIS, New Delhi


**Gaps in the syllabus (to meet Industry/Profession requirements) POs met through Gaps in the Syllabus**
**Topics beyond syllabus/Advanced topics/Design**
**POs met through Topics beyond syllabus/Advanced topics/Design**

| **Course Delivery methods** | |
|---|---|
| Lecture by use of boards/LCD projectors/OHP projectors | |
| Tutorials/Assignments | |
| Seminars | |
| Mini projects/Projects | |
| Laboratory experiments/teaching aids | ✓ |
| Industrial/guest lectures | |
| Industrial visits/in-plant training | ✓ |
| Self- learning such as use of NPTEL materials and internets | ✓ |
| Simulation | |

## Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

### Direct Assessment

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Progressive Evaluation Marks | 60 |
| End Examination Marks | 40 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Progressive Evaluation | ✓ | ✓ | ✓ | ✓ | ✓ |
| End Sem Examination | ✓ | ✓ | ✓ | ✓ | ✓ |

### Indirect Assessment –

1. Student feedback on teaching quality and teaching methods adopted
2. Student feedback on course syllabus and course outcome

### Mapping of Course Outcomes onto Program Outcomes and Program Specific Outcomes

| | Program Outcomes | | | | | | | | | | | Program Specific Outcome | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcome | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 1 | 2 | 3 |
| 1 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |
| 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 |
| 5 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 |

| Mapping Between COs and Course Delivery (CD) methods | | | | |
|---|---|---|---|---|
| | | | | |
| CD | Course Delivery methods | | Course Outcome | Course Delivery Method |
| CD1 | Lecture by use of boards/LCD projectors/OHP projectors | | CO1 | CD5, CD8 |
| CD2 | Tutorials/Assignments | | CO2 | CD5, CD8 |
| CD3 | Seminars | | CO3 | CD4, CD5, CD7, CD8 |
| CD4 | Mini projects/Projects | | | |
| CD5 | Laboratory experiments/teaching aids | | | |
| CD6 | Industrial/guest lectures | | | |
| CD7 | Industrial visits/in-plant training | | | |
| CD8 | Self- learning such as use of NPTEL materials and internets | | | |
| CD9 | Simulation | | | |

## COURSE INFORMATION SHEET

**Course Code: CE24206**
**Course Title: FLUID MECHANICS LABORATORY**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: III / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To understand the basic concepts of fluid statics and fluid kinematics. |
| **2.** | To find the coefficient of discharge of various flow measuring devices. |
| **3.** | To study various applications of the basic concepts of fluid dynamics such as Bernoulli's energy equation and impulse momentum equation. |
| **4.** | To study and draw characteristic curves of hydraulic machines like pumps and turbines. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand and perform experiments based on the basic concepts of fluid statics and fluid kinematics. (K1, K2, K3) |
| **CO2** | Able to calibrate various discharge measuring devices and use them for determination of discharge. (K1, K2, K3) |
| **CO3** | Apply the basic concepts of fluid dynamics and understand their applications in real life situations. (K1, K2, K3) |
| **CO4** | Understand the fluid mechanics and working of pumps and draw their characteristic curves. (K1, K2, K3) |
| **CO5** | Understand the fluid mechanics and working of hydraulic turbines and draw their characteristic curves. (K1, K2, K3) |

**SYLLABUS (List of Experiments: A minimum ten experiments may be selected from the list given below)**

1. Hydrostatic force and centre of pressure.
2. Metacentric height of a floating vessel.
3. Verification of Bernoulli's energy equation.
4. Coefficient of discharge of venturimeter, orificemeter, and rotameter.
5. Water surface profile for forced vortex motion.
6. Coefficient of velocity, coefficient of contraction, and coefficient of discharge of an orifice.
7. Coefficient of discharge of a mouthpiece.
8. Coefficient of discharge of a triangular notch.
9. Reynold's experiment.
10. Friction factor for flow through commercial pipes.
11. Impact of jet.
12. Reciprocating pump.
13. Centrifugal pump.
14. Pelton turbine.
15. Francis turbine.
16. Kaplan turbine.

## REFERENCE BOOKS:


1. Hydraulics and Fluid Machines, P. N. Modi and S. H. Seth, Standard Book House.
2. Hydraulic Machines, Dr. Jagdish Lal, Metropolitan Book Company.
3. Fluid Mechanics, V. L. Streeter and E. B. White, McGraw Hill, New York.
4. Experimental Fluid Mechanics, G. L. Asawa, Nemchand and Bros, Roorkee.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab Quizzes | 20 |
| Progressive Viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 50 |
| Lab Quiz | 16.7 |
| Progressive Viva | 33.3 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 1 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 1 | 1 |
| CO2 | 3 | 2 | 2 | 2 | 1 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 2 | 1 |
| CO3 | 3 | 2 | 2 | 2 | 1 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 2 | 1 |
| CO4 | 3 | 2 | 2 | 2 | 1 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 2 | 1 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 2 | 1 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD5, CD8 |
| **CO2** | CD5, CD8 |
| **CO3** | CD5, CD8 |
| **CO4** | CD5, CD8 |
| **CO5** | CD5, CD8 |

## COURSE INFORMATION SHEET

**Course Code: CE24207**
**Course Title: STRUCTURAL ANALYSIS - II**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: IV**
**Branch: CEE**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Develop basic knowledge of structural analysis so that the students can solve real engineering problems. (K1, K2) |
| **2.** | Understand behaviour of different kinds of indeterminate structures subjected to simple and complex mechanical loadings. (K1, K2) |
| **3.** | Analyse and design safe and sound civil engineering structures. (K3, K4) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Evaluate the stability and determinacy of a given structure. (K1, K2, K3) |
| **CO2** | Evaluate safety of a proposed indeterminate structure before construction and manufacturing. (K4) |
| **CO3** | Evaluate the behaviour of indeterminate structures under the action of complex static loads. (K1, K2, K3, K4) |
| **CO4** | Evaluate the behaviour of indeterminate structures using advanced numerical techniques (K1, K2, K3, K4) |
| **CO5** | Evaluate deflections in a given indeterminate structure. (K3, K4) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction**<br>Indeterminate structures: Advantages and disadvantages. Force and displacement method of analysis. Analysis procedure for indeterminate structure. | **8** |
| **Module – II: Force method of analysis for indeterminate structures**<br>Method of consistent deformations/compatibility method: Beams, frames and trusses.<br>Muller-Breslau principle: ILD for reactions, SF and BM for indeterminate beams/continuous beams. | **8** |
| **Module – III: Displacement method of analysis for indeterminate structures**<br>Degrees of freedom. Slope-deflection method: Beams and frames (with or without sway).<br>Moment distribution method: Beams and frames (with or without sway). | **8** |
| **Module – IV: Matrix method of analysis**<br>Introduction: Flexibility and Stiffness matrix method.<br>Truss and beam member: Stiffness matrix; Displacement and force transformation matrix; Global stiffness matrix. | **8** |
| **Module – V: Indeterminate Arches**<br>Analysis of symmetrical 2-hinged and fixed arches. ILD for B.M, S.F. and Normal thrust for parabolic arches | **8** |

**TEXTBOOKS:**

1. Structural Analysis by Hibbeler, R.C. – Pearson Publications.
2. Basic Structural Analysis by Reddy, C.S. – The McGraw Hill Publications.

**REFERENCE BOOKS:**

1. Fundamentals of Structural Analysis – Leet, K.M. – McGraw Hill Publications.
2. Theory of Structures by Timoshenko S. P. & Young.
3. KINNEY: Statically Indeterminate Structures
4. Indeterminate Structural Analysis by C.K. Wang – Tata McGraw Hill Education Private Limited

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | | | | | 2 | 1 | | | 3 | 1 | |
| CO2 | 3 | 3 | 1 | | | | | 2 | 1 | | | 3 | 1 | |
| CO3 | 3 | 3 | 1 | | | | | 2 | 1 | | | 3 | 1 | |
| CO4 | 3 | 3 | 1 | | | | | 2 | 1 | | | 3 | 1 | |
| CO5 | 3 | 3 | 1 | | | | | 2 | 1 | | | 3 | 1 | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24208**
**Course Title: SURVEYING**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 4**
**Class: B.TECH.**
**Semester / Level: IV / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Obtain knowledge about uses and applications of chain and compass survey. (K1, K2) |
| **2.** | Learn about plane table survey, levelling and contouring. (K2, K4) |
| **3.** | Know about theodolite and different types of curves. (K3) |
| **4.** | Learn triangulation, and geodetic levelling. (K2, K4) |
| **5.** | Learn modern surveying instruments and astronomy. (K2, K4) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Perform chain and compass survey. (K1, K2) |
| **CO2** | Carry out plane table survey, levelling and contouring. (K2, K4) |
| **CO3** | Measurement of angles with theodolite and Set different types of curves in the field. (K3) |
| **CO4** | Perform triangulation survey and geodetic levelling. (K2, K4) |
| **CO5** | Handle modern instruments like Total station, Auto level, GPS and explain basic astronomical terms. (K2, K4) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Chain and Compass Survey**<br>Introduction, Principle of survey, Errors and Obstacles in chain survey; Bearings, Traversing, Local attraction, Magnetic declination. | **8** |
| **Module – II: Plane Table Survey, Levelling and Contouring**<br>Methods of plane table survey, Principle of Levelling, Curvature and Refraction corrections, Reciprocal levelling, Contouring. | **8** |
| **Module – III: Theodolite, Curves and Curve Setting**<br>Measurement of angles with theodolite, Types of curves, Simple curves – Chain & Tape methods, Rankine's method' Obstacles in curve setting, Compound curve, Reverse curve, Introduction to Transition curve and Vertical curve. | **8** |
| **Module – IV: Triangulation and Geodetic Levelling**<br>Scope and classification of triangulation, Satellite station; Corrections to geodetic levelling, Single angle and reciprocal observations. | **8** |
| **Module – V: Introduction to Modern surveying equipments and Astronomy**<br>Total station, Auto level, GPS; Introduction to astronomy and different astronomical terms. | **8** |

**TEXTBOOKS:**


1. Punmia, B.C., Jain, A.K., Jain, A.K. "Surveying" – Vol. 1 and 2, Laxmi Publications (P) Ltd.
2. Kanetkar, T.P., Kulkarni S.V. "Surveying and Levelling." – Part 1 and 2, Pune Vidyarthi Griha Prakashan.


**REFERENCE BOOKS:**


1. Duggal, S.K. "Surveying" – Vol. 1 and 2, The McGraw-Hill Companies, New Delhi.
2. Arora, K.R. "Surveying" – Vol. 1 and 2, Standard Book House, New Delhi.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 1 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 1 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 1 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2, CD3, CD5, CD8 |
| CO2 | CD1, CD2, CD3, CD5, CD8 |
| CO3 | CD1, CD2, CD3, CD4, CD5, CD8 |
| CO4 | CD1, CD2, CD3, CD5, CD6, CD8 |
| CO5 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |

## COURSE INFORMATION SHEET

**Course Code: CE24209**
**Course Title: CONSTRUCTION ENGINEERING AND MANAGEMENT**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: IV / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Obtain knowledge about basics of construction project management and ethical conduct for engineers. |
| **2.** | Learn about construction economics. |
| **3.** | Know about construction planning. |
| **4.** | Learn construction contracts, and construction quality management. |
| **5.** | Learn construction equipment management |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Explain about construction project management and its relevance as well as ethical conduct of engineers. (K3) |
| **CO2** | Work out economics of the construction project. (K3,K4,K5) |
| **CO3** | Work with techniques like PERT and CPM. (K3,K4,K5) |
| **CO4** | Prepare contract documents, carry out quality control of the project. (K3,K4) |
| **CO5** | Solve problems involving construction equipment management. K3 |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction**<br>Phases of a construction project, Construction project management and its relevance, Stakeholders of a construction project, Forms of business organizations, Different organizational structures, Important traits of a project coordinator, Ethical conduct for engineers. | **8** |
| **Module – II: Construction Economics**<br>Economic decision making, Time value of money, Cash-flow diagrams, Using interest tables, Present worth comparison, Future worth comparison, Annual cost and Worth comparison, Rate of return method, Effect of taxation on comparison of alternatives, Effect of inflation on cash flow. | **8** |
| **Module – III: Construction Planning**<br>Types of project plans- Time/ Manpower/ Material/ Construction equipment/ Finance plans, Work-Breakdown structure, Event and activity, Dummy activity, Network, Precedence, Network logic, Duration of an activity, Start and Finish times of activity, Forward and backward pass, Float/ Slack time, Bar charts, PERT, CPM, Ladder network, Precedence network, Line-of-Balance. | **8** |
| **Module – IV: Construction Contract, Construction Quality Management**<br>Contract document – Contract drawings, Specifications, General / Special conditions of contract, Bill of quantities; Classification of contracts - Separated/ Management/ Integrated/ Discretionary contracts; Bidding process – Pre- qualification, Notice inviting tender, Bid submission, Letter of intent, Work order, Agreement; Subcontracting. Construction quality, Inspection, Quality control and Quality Assurance in projects. | **8** |
| **Module – V: Construction Equipment Management**<br>Classification of construction equipment, Factors behind the selection of construction equipment, Earthwork equipment, Concreting equipment, Hoisting equipment, Equipment Acquisition, Depreciation. | **8** |

**TEXTBOOKS:**

1. Construction Project Management – Theory and Practice – Kumar Neeraj Jha, Pearson
2. Project Planning and Control with PERT and CPM – B.C. Punmia & K.K. Khandelwal, Laxmi Publications (P) Ltd.

**REFERENCE BOOKS:**

1. Construction Project Management – Planning, Scheduling and Controlling – K.K. Chitkara, McGraw Hill Education (India) Private Limited

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Seminars/Assignments |
| **CD3** | Laboratory experiments/teaching aids |
| **CD4** | Industrial/guest lectures |
| **CD5** | Industrial visits/in-plant training |
| **CD6** | Self- learning such as use of NPTEL materials and internets |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internet |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 0 | 1 | 0 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 0 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 2 | 3 | 0 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO5 | 2 | 2 | 3 | 2 | 3 | 2 | 0 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO2 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO3 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO4 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO5 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |

## COURSE INFORMATION SHEET

**Course Code: CE24210**
**Course Title: EARTHQUAKE ENGINEERING AND DISASTER MANAGEMENT**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 2** L: 2 T: 0 P: 0
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: IV**
**Branch: CEE**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Obtain knowledge about uses and applications of chain and compass survey. (K1, K2) |
| **2.** | Learn about plane table survey, levelling and contouring. (K2, K4) |
| **3.** | Know about theodolite and different types of curves. (K3) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | To develop dynamic equations of motion and perform analysis for dynamic systems. (K1, K2, K3, K4) |
| **CO2** | To apply the basic principles for seismic design and construction of structures. (K3) |
| **CO3** | Apply the concepts of Earthquake Resistant Design to real life structures. (K1, K3) |
| **CO4** | Understand the concepts of disaster management. (K1, K2) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I**<br>Concepts and definitions: disaster, disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation.<br>Plate Tectonics and related Hazards, Earthquakes and their causes, Measurement of Earthquakes. | **8** |
| **Module – II**<br>Equations of Motion for SDOF and MDOF Systems; Undamped Free Vibration of SDOF and MDOF Systems, Mode Shapes and Frequencies of MDOF System | **8** |
| **Module – III**<br>Concept of earthquake Resistant design, design philosophy, Four virtues of EQRD: Stiffness, Strength, ductility and Configurations, Introduction to Capacity design concepts. | **8** |
| **Module – IV**<br>Natural disasters, manmade disasters, hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility. | **8** |
| **Module – V**<br>Disaster Preparedness, monitoring of phenomena triggering a disaster, Evaluation of risk. | **8** |

**TEXTBOOKS:**


1. Pankaj Agarwal and Manish Shrikhande, 'Earthquake Resistant Design of Structures', PHI, 2008
2. S.K.Duggal; Earthquake resistance design of structures; Oxford University Press, New Delhi.
3. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies”, New Royal book Company.
4. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
5. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
6. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of HomeAffairs).


**REFERENCE BOOKS:**


1. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication
2. Ellis L. Krinitzsky, J.M. Gould and Peter H. Edinger, 'Fundamentals of Earthquake Resistant Construction', John Wiley, 1993
3. Newmark N.M. and Rosenblueth E., 'Fundamentals of Earthquake Engg.,' Prentice Hall, 1971.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | | | | | 2 | 1 | | 1 | 3 | | |
| CO2 | 3 | 3 | 1 | | | | | 2 | 1 | | 1 | 3 | 2 | |
| CO3 | 3 | 3 | 1 | | | | | 2 | 1 | | 1 | 3 | | 3 |
| CO4 | 3 | 3 | 1 | | | | | 2 | 1 | | 1 | 3 | | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET (PE1)

**Course Code: CE24251**
**Course Title: ADVANCED SOLID MECHANICS**
**Pre-requisite(s): CE24201, CE24202, CE24207**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VI**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Apply the concepts of elasticity and plasticity to analyse the engineering problems |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Interpret the theory of elasticity including strain/displacement and Hooke's law relationships. |
| **CO2** | Analyse principal stresses and strains using theories of failure. |
| **CO3** | Analyse the two-dimensional problems using Airy's stress function. |
| **CO4** | Explain linearly elastic bodies behaviour using Hooke's law. |
| **CO5** | Asses torsional stresses developed in thin walled sections. |
| **CO6** | Apply various failure criteria for general stress states at points |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction**<br>Displacement, Strain and Stress Fields, Constitutive Relations, Cartesian Tensors and Equations of Elasticity. Elementary Concept of Strain, Stain at a Point, Principal Strains and Principal Axes, Compatibility Conditions, Stress at a Point, Stress Components on an Arbitrary Plane, Differential Equations of Equilibrium. | **8** |
| **Module – II: Equations of Elasticity**<br>Equations of Equilibrium, Stress- Strain relations, Strain Displacement and Compatibility Relations, Boundary Value Problems. | **8** |
| **Module – III: Two-Dimensional Problems of Elasticity**<br>Plane Stress and Plane Strain Problems, Airy's sstress Function, Two-Dimensional Problems in Polar Coordinates. | **8** |
| **Module – IV: Torsion of Prismatic Bars**<br>Saint Venant's Method, Prandtl's Membrane Analogy, Torsion of Rectangular Bar, Torsion of Thin Tubes. | **8** |
| **Module – V: Theories of Failure or Yield Criteria**<br>Maximum principal stress theory, Maximum shear stress theory, Maximum elastic strain theory, Significance of the various theories of failure, Use of factor of safety in design. | **8** |

**TEXTBOOKS:**


1. Advanced Mechanics of Solids, Srinath L.S., Tata McGraw Hill,2000.
2. Elements of Strength of Materials, D.H. Young, S.P. Timoshenko East West Press Pvt. Ltd.
3. Theory of Elasticity, Timoshenko S. and Goodier J. N., McGraw Hill, 1961.
4. Solid Mechanics, Kazimi S. M. A., Tata McGraw Hill,1994.
5. Theory of Elasticity, Sadhu Singh, Khanna Publishers, 2003.
6. Engineering Mechanics of Solids by Egor P. Popov, Pearson India


**REFERENCE BOOKS:**


1. Elasticity, Sadd M.H., Elsevier, 2005.
2. Engineering Solid Mechanics, Ragab A.R., Bayoumi S.E., CRC Press,1999.
3. Computational Elasticity, Ameen M., Narosa,2005


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 | CO6 |
|---|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 2 |
| CO2 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| CO3 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 2 |
| CO4 | 3 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 2 |
| CO5 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |
| CO6 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |
| **CO6** | CD1, CD2, CD3 |

**COURSE INFORMATION SHEET(PE1)**

**Course Code: CE24252**
**Course Title: CONCRETE TECHNOLOGY**
**Pre-requisite(s):**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: / 4**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To provide a comprehensive understanding of concrete technology, covering the properties, testing, and design of concrete materials, fresh and hardened concrete behaviour, mix design methodologies, and non-destructive testing techniques for quality assessment. |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Recall the chemical composition, manufacturing processes, and types of cement, as well as the properties and roles of concrete ingredients such as aggregates, water, and admixtures. |
| **CO2** | Explain the factors affecting workability, strength, and durability of concrete, and interpret the relationships between compressive strength, tensile strength, and modulus of elasticity in hardened concrete. |
| **CO3** | Apply the principles of concrete mix design as per IS 10262-2019 to determine the proportions of ingredients for specific exposure conditions and strength requirements. |
| **CO4** | Know the principles and applications of non-destructive testing methods, such as ultrasonic pulse velocity and rebound hammer tests, for assessing the quality of concrete structures. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Concrete ingredients**<br>Cement- chemical composition, manufacture of OPC by wet and dry process, hydration of cement, types of cement. Testing of cement. Fine aggregate- grading analysis, specific gravity, bulking, moisture content, deleterious materials. Coarse aggregate- Importance of size, shape and texture. Grading of aggregates. Fineness modulus. Water- qualities of water. Use of sea water for mixing concrete. Admixtures – chemical admixtures- Plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures- Fly ash, silica fumes and rice husk ash. | **8** |
| **Module – II: Fresh Concrete**<br>Workability – factors affecting workability, Measurement of workability – slump, compaction factor, vee-bee and flow tests. Segregation and bleeding. Process of manufacturing of concrete – Batching, Mixing, transporting, Placing and compaction. Curing – methods of curing- Water curing, membrane curing, steam curing. Accelerated curing; Ready Mix Concrete. | **8** |
| **Module – III: Hardened concrete**<br>Factors affecting strength, w/c ratio, gel-space ratio. Maturity concept Effect of aggregate properties, Relations between compressive strength, tensile strength and bond strength and modulus of rupture. Elasticity – Relation between modulus of elasticity and strength, Factors affecting modulus of elasticity, Poison's ratio. Creep – measurement of creep, factors affecting creep, effect of creep Shrinkage of concrete- plastic shrinkage and drying shrinkage, factors affecting shrinkage, moisture movement. Durability – definition and significance of durability. Permeability. Sulphate attack, chloride attack, carbonation, freezing and thawing. | **8** |
| **Module – IV: Concrete Mix Design**<br>Concept of Mix design, Variables in proportioning and exposure conditions. Procedure of mix design as per IS 10262-2009. Numerical examples of Mix design | **8** |
| **Module – V: Non-Destructive Testing of Concrete**<br>Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity – Principles, applications and limitations. | **8** |

**TEXTBOOKS:**


1. Properties of Concrete, Neville, A.M., (2011), Pearson Education Ltd., England.
2. Concrete Technology (Theory and Practice), Shetty, M.S. (1982), S. Chand and company, New Delhi.
3. Concrete Technology, Gambhir, M.L. (2004), Tata McGraw-Hill Education, New Delhi


**REFERENCE BOOKS:**


1. Concrete Technology, Neville, A.M. and Brooks J.J. (2010), Prentice Hall, England.
2. Concrete Manual, Gambhir, M.L. (1992), Dhanpat Rai& Sons, New Delhi.
3. IS: 10262-2019: Indian Standard Concrete Mix Proportioning-Guidelines, BIS, New Delhi.
4. SP 23 (1982), Handbook on Concrete Mixes, BIS, New Delhi.
5. Manual of Concrete Practice (2015), ACI, USA.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 |
|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |
| **CD4** | Laboratory Demonstration |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 2 |
| CO2 | 3 | 2 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 2 |
| CO3 | 3 | 3 | 3 | 0 | 2 | 2 | 0 | 0 | 0 | 2 | 0 | 3 | 2 | 3 |
| CO4 | 3 | 2 | 0 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD3, CD4 |
| **CO2** | CD1, CD2, CD3, CD4 |
| **CO3** | CD1, CD3, CD4 |
| **CO4** | CD1, CD2, CD3, CD4 |

## COURSE INFORMATION SHEET (PE1)

**Course Code: CE24253**
**Course Title: OPEN CHANNEL HYDRAULICS**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: IV / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To understand the basic concepts of the movement of water in open channels. |
| **2.** | To identify the characteristics of the flow and distinguish different kinds of flow in open channels. |
| **3.** | To develop necessary knowledge, skills and techniques for analysis of practical channel flow problems. |
| **4.** | To analyse the hydrodynamic aspects of water flow in natural or artificial channels. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand and analyse basics of open channel flows. (K1, K2, K3) |
| **CO2** | Understand and analyse uniform flow in channels. (K1, K2, K3) |
| **CO3** | Understand and analyse gradually varied flow in channels. (K1, K2, K3) |
| **CO4** | Understand and investigate hydraulic jumps and surges. (K1, K2, K3) |
| **CO5** | Understand and analyse unsteady flow in channels. (K1, K2, K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction**<br>Open channel flow, Geometrical parameters of a channel, Classification of open channels, Classification of open channel flow, Velocity distribution, Resistance relationships, Energy depth relationships, Specific energy and specific force, Normal and critical depths, Pressure, velocity and discharge measurements. | **8** |
| **Module – II: Uniform Flow**<br>Continuity equation, Energy and momentum equation, Characteristics of uniform flow, Chezy's formula, Manning's formula, Factors affecting manning's roughness coefficient, Computation of uniform flow, Most efficient channel section. | **8** |
| **Module – III: Non-Uniform Flow in Open Channel**<br>Specific energy curve, Discharge curve, Specific force curve, Alternate depths, Critical flow, Critical depth, Measurement of discharge and velocity.<br>*Gradually varied flow:* Equation of gradually varied flow, Classification of channel bottom slopes, Classification of surface profiles, Characteristics of surface profiles, Computation of water surface profiles by graphical, numerical and analytical methods, Direct step method, Standard step method, Graphical integration method and direct integration method. | **8** |
| **Module – IV: Hydraulic Jump, Surges and Water Waves**<br>Elements and characteristics of hydraulic jump, Classical hydraulic jump, Length, height and location of jump, Types of hydraulic jump, Applications and use of hydraulic jump, Energy dissipation, Evaluation of the jump elements in rectangular and nonrectangular channels, Open channel surge, Positive and negative surges, Celerity of gravity wave, Deep and shallow water waves, Hydraulic jump in channel transitions, Control of hydraulic jump, Momentum principle and its applications. | **8** |
| **Module – V: Unsteady Flows**<br>Saint Venant's equations, Basics of Finite Difference Method, Solution of Saint Venant's equations using method of characteristics and finite difference schemes, Dam break problem, Hydraulic flood routing. | **8** |

**TEXTBOOKS:**


1. Open Channel Flow by K. Subramanya, Tata McGraw Hill.
2. Open Channel Flows by M. H. Choudhary, Prentice-Hall.
3. Open Channel Hydraulics by Ven Te Chow, Tata McGraw Hill.


**REFERENCE BOOKS:**


1. Flow through Open Channels by K. G. Ranga Raju, Tata McGraw Hill.
2. The Hydraulics of Open Channel Flow: An Introduction by H. Chanson, Elsevier.
3. Open Channel Hydraulics by R. H. French, McGraw Hill.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's Assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and Assignment | 40 |
| Teacher's Assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course code: CE 24211**
**Course title: STRUCTURAL ENGINEERING LABORATORY I**
**Pre-requisite(s):**
**Co-requisite(s):**
**Credits: 1 L: 0 T: 0 P: 2**
**Class schedule per week: 2**
**Class: B. Tech**
**Semester / Level: IV / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To give the basic understanding of structural member behavior under the action of loads. |
| **2.** | To verify theoretical formulas of linear elastic structural elements by conducting experiments. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Evaluate the behavior of different structures when loaded with various kinds of loading conditions |
| **CO2** | Correlate the theoretical and experiment values on structural behavior. |
| **CO3** | Solve a real-life structures project to satisfy functional and strength requirements. |

**SYLLABUS (List of experiments)**

1. To verify the Maxwell-Bett's Law.
2. To determine the flexural rigidity of the beam and its comparison with the theoretical value.
3. To determine the deflection in a pin-jointed truss and its verification with the theoretical results.
4. To study the behavior of different types of columns and find Euler's buckling load for each case.
5. To study the two hinged arches for the horizontal displacement of the roller end for a given system of loading and to compare the same with those obtained analytically.
6. To study the behavior of a portal frame under different end conditions.
7. To verify the Muller-Breslau theorem by using Begg's deformator set.
8. To verify the moment area theorem regarding the slopes and deflections of the beam.
9. To determine the moment required to produce a given rotation (rotational stiffness) at one end of the beam when the other end is pinned.
10. To determine the deflection and unsymmetrical bending of a cantilever beam Experimentally and to compare the same with those obtained theoretically.
11. Virtual Labs - http://bsa-iiith.vlabs.ac.in/

**TEXTBOOKS:**

1. Laboratory Manual for Civil Engineering Students (In S.I. units) by K.K. Pant – KATSON Books publication

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

| | |
|---|---|
| Course Delivery methods | |
| Lecture by use of boards/LCD projectors/OHP projectors | |
| Tutorials/Assignments | ✓ |
| Seminars | |
| Mini projects/Projects | |
| Laboratory experiments/teaching aids | ✓ |
| Industrial/guest lectures | |
| Industrial visits/in-plant training | |
| Self- learning such as use of NPTEL materials and internet | |
| Simulation | ✓ |

**Course Outcome (CO) Attainment Assessment tools & Evaluation procedure**

**Direct Assessment**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Progressive Evaluation Marks | **60** |
| End Examination Marks | **40** |

| Assessment Components | CO1 | CO2 | CO3 |
|---|---|---|---|
| Progressive Evaluation Marks | ✓ | ✓ | ✓ |
| End Examination Marks | ✓ | ✓ | ✓ |

**Indirect Assessment**

1. Student feedback on teaching quality and teaching methods adopted
2. Student feedback on course syllabus and course outcome

**Mapping of Course Outcomes onto Program Outcomes and Program Specific Outcomes**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 | 2 | 1 | | | | | 2 | 1 | | |
| CO2 | 3 | 2 | 3 | 3 | 2 | 1 | | 1 | | | 2 | 3 | 2 | |
| CO3 | 3 | 3 | 3 | 3 | 2 | 2 | | 2 | | | 1 | 2 | 2 | 3 |

**Mapping Between COs and Course Delivery (CD) methods**

| CD | Course Delivery methods | Course Outcome | Course Delivery Method |
|---|---|---|---|
| CD1 | Lecture by use of boards/LCD projectors/OHP projectors | CO1 | CD5, CD9 |
| CD2 | Tutorials/Assignments | CO2 | CD5, CD9 |
| CD3 | Seminars | CO3 | CD5, CD9 |
| CD4 | Mini projects/Projects | | |
| CD5 | Laboratory experiments/teaching aids | | |
| CD6 | Industrial/guest lectures | | |
| CD7 | Industrial visits/in-plant training | | |
| CD8 | Self- learning such as use of NPTEL materials and internet | | |
| CD9 | Simulation | | |

## COURSE INFORMATION SHEET

**Course code: CE24212**
**Course title: SURVEYING FIELDWORK**
**Pre-requisite(s): CE24152 SURVEYING**
**Co- requisite(s): NA**
**Credits: 2** L: 0 T: 0 P: 4
**Class schedule per week: 4**
**Class: B. Tech**
**Semester / Level: IV/ 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | Execute chain and compass survey. |
| **2.** | Perform plane table surveying. |
| **3.** | Carry out levelling works and take measurements by theodolite. |
| **4.** | Set out different types of curves. |
| **5.** | Learn about modern surveying instruments. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Perform chain and compass survey. |
| **CO2** | Perform plane table surveying. |
| **CO3** | Carry out levelling work and take measurement of angles with theodolite. |
| **CO4** | Set different types of curves in the field. |
| **CO5** | Handle modern instruments like Total Station, Auto Level and Digital Theodolite. |

**SYLLABUS (List of experiments)**

1. Perform survey for an area using chain and compass
2. Perform survey for an area using plane table.
3. Carry out profile leveling and cross-sectioning work along a road.
4. Measurement of horizontal and vertical angles with a theodolite.
5. Set out horizontal curves on the field.
6. Perform traversing using Total Station.
7. Handling Digital Theodolites and AutoLevels.

**TEXTBOOKS:**


1. Punmia, B.C., Jain, A.K., Jain, A.K. "Surveying" – Vol. 1 and 2, Laxmi Publications (P) Ltd.
2. Kanetkar, T.P., Kulkarni S.V. "Surveying and Levelling." – Part 1 and 2, Pune Vidyarthi Griha Prakashan.


**REFERENCE BOOKS:**


1. Duggal, S.K. "Surveying" – Vol. 1 and 2, Tata McGraw-Hill Companies, New Delhi.
2. Arora, K.R. "Surveying" – Vol. 1 and 2, Standard Book House, New Delhi.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student feedback on teaching quality and teaching methods adopted**
2. **Student feedback on course syllabus and course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 1 | 3 | 3 | 2 | 2 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD6, CD8 |
| **CO2** | CD1, CD2, CD6, CD8 |
| **CO3** | CD1, CD2, CD6, CD8 |
| **CO4** | CD1, CD2, CD6, CD8 |
| **CO5** | CD1, CD2, CD6, CD8 |

## COURSE INFORMATION SHEET

**Course Code: CE24213**
**Course Title: SPECIFICATIONS, ESTIMATION AND COSTING**
**Pre-requisite(s):**
**Co- requisite(s):**
**Credits: 2** L: 1 T: 0 P: 2
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: IV/II**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | Understand the importance of estimation in civil engineering works and the different types of estimations and perform approximate estimation calculations. |
| **2.** | Understand the methodology for performing detailed estimations for building constructions. |
| **3.** | Understand the method for calculating reinforcement steel required in RCC works. |
| **4.** | Understand how to analyse rates of different items of work. |
| **5.** | Learn about writing specifications for different items of work. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Perform approximate estimate for a building to be constructed. |
| **CO2** | Perform detailed estimate for a building to be constructed. |
| **CO3** | Calculate amount of reinforcement required in RCC works in a building construction. |
| **CO4** | Perform rate analysis for various items of work. |
| **CO5** | Fix specifications (and workmanship) required for the execution of different items of work. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I**<br>Estimation Fundamentals Importance of estimation, different types of estimates; Revised estimate, Supplementary estimate, how to prepare detailed estimate; abstract of estimate; contingencies; work-charged establishment; Tools & plants; market rate; lump-sum item, schedule of rates; substituted item, other definitions; general and detailed specifications. Importance of approximate estimate; methods of approximate estimation; approximate cost for water supply, sanitary and electrification works. | **8** |
| **Module – II**<br>Detailed Estimation of Buildings General items of work for building estimates; principal units for various items of work; limits of measurement and degree of accuracy in estimation; method/mode of measurement for different items of works commonly encountered in building construction; detailed estimates of a single roomed and a two roomed single storey residential building; estimation of an underground tank; symmetrical and unsymmetrical boundary walls; principle of estimate for a two-roomed building having different crosssections to that of the main wall; principle of estimate of a single-roomed building with verandah dwarf wall and pillars having different cross-sections and when the same footing joins with several footings of the main wall. | **8** |
| **Module – III**<br>RCC works and bar bending schedule Measurement of materials; reinforcement; MS and TOR steel; binding wires; developmental length; end anchorage; hook and bend allowance; estimation of reinforcement bars in slabs, beams, columns, lintel and footing. | **8** |
| **Module – IV**<br>Analysis of Rates What is analysis of rates and how it is to be prepared; quantify of materials per unit rate of work; estimating labour; calculating quantity of materials required for different items of work; rate of materials and labour; material and other cost considerations. Market rates; Schedule of Rates. Rate analysis for different items of work commonly done in building construction. | **8** |
| **Module – V**<br>Specification Purpose, necessity of specification; how to write specifications; types of specifications; standard specification; special specifications; brief and detailed specifications and workmanship for common items of work in building construction. | **8** |

**REFERENCE MATERIALS:**


1. Chakraborty M., "Estimating costing and valuation in Civil Engg., Principle and applications (Authors Publication, Kolkata).
2. B.N. Dutta “Estimating & Costing in Civil Engineering,” UBS Publishers & Distributors Pvt. Ltd. New Delhi.
3. CPWD Works Manual 2014 published under the authority of Director General CPWD.
4. CPWD Specifications 2009 published by Director General of Works, CPWD.
5. CPWD DSR 2016 published by Director General of Works, CPWD.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors. |
| **CD2** | Tutorials/Assignments. |
| **CD3** | Report writing, viva-voce |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 |
| CO2 | 2 | 3 | 3 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 1 |
| CO3 | 2 | 2 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 1 |
| CO4 | 2 | 2 | 2 | 1 | 3 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | 1 |
| CO5 | 1 | 1 | 2 | 0 | 1 | 2 | 3 | 0 | 1 | 0 | 0 | 1 | 2 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

# COURSE INFORMATION SHEET

**Course Code: CE24214**
**Course Title: SOLID MECHANICS LABORATORY**
**Pre-requisite(s): CE24201**
**Co- requisite(s):**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: IV / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

## COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To develop practical understanding of stress, strain, and material properties through laboratory testing |
| **2.** | To enable students to experimentally evaluate the mechanical behaviour of structural elements under tension, compression, bending, torsion, and buckling. |
| **3.** | To familiarize students with material testing equipment and standard test procedures (IS codes) |
| **4.** | To strengthen analytical and problem-solving skills by correlating theoretical concepts with experimental outcomes. |
| **5.** | Develop engineering judgment, reporting skills, and teamwork in conducting experiments. |

## COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Conduct tensile and compression tests to determine mechanical properties of ductile and brittle materials. |
| **CO2** | Perform bending and deflection experiments on beams to evaluate flexural behaviour and stiffness. |
| **CO3** | Determine impact strength and hardness of engineering materials and relate to material toughness and strength. |
| **CO4** | Perform torsion tests to determine modulus of rigidity and torsional behaviour of structural elements. |
| **CO5** | Evaluate buckling behaviour of columns under different end conditions and compare with theoretical predictions. |

**SYLLABUS (List of experiments)**

1. Tensile Test on Mild Steel
2. Compression Test on Brittle Material
3. Bending Test on Beams
4. Impact Test (Izod / Charpy)
5. Hardness Test (Brinell / Rockwell / Vickers)
6. Torsion Test on Mild Steel
7. Deflection of Beams (Simply Supported/ Cantilever)
8. Column Buckling Test (Euler's Theory – Various End Conditions)

**REFERENCE MATERIALS:**

1. Lab manuals (available on department website)

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizzes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Laboratory demonstrations by faculty. |
| **CD2** | Hands-on experimental performance in groups. |
| **CD3** | Data recording, analysis, Report writing, viva-voce |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |
| CO3 | 3 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 2 |
| CO4 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24301**
**Course Title: STRUCTURAL DESIGN – I**
**Pre-requisite(s): CE24201, CE24202**
**Co- requisite(s): NA**
**Credits: 4** L: 4 T: 0 P: 0
**Class schedule per week: 4**
**Class: B.Tech.**
**Semester / Level: V / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Equip students with the fundamental principles and design methodologies of Reinforced Concrete Structures using the Limit State Design approach as per standard codes, ensuring safety, serviceability, and structural efficiency. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Explain the principles of Limit State Design, including design loads, material properties, stress block parameters, and codal safety requirements. |
| **CO2** | Design a simple reinforced concrete structural element following codal provisions. |
| **CO3** | Recall and interpret key provisions of IS 456:2000 relevant to Limit State Design. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction to Limit State Design of RCC**<br>Design Loads, Materials for Reinforced Concrete and Code requirements, Factor of Safety, Characteristic and design loads, Characteristic and design strength, Design Philosophy, Principles of limit states, Stress block parameters for limit state of collapse. | **8** |
| **Module – II: Design of Beams**<br>Design of beams for rectangular and flanged sections for moment and shears, Reinforcement requirements Anchorages of bars, check for development length, Design of RC members for combined bending shear and torsion | **14** |
| **Module – III: Design of Slabs**<br>General consideration of design of slabs, rectangular slabs spanning one direction, rectangular slabs spanning in two directions for various boundary conditions. Circular slab; Slab type staircase. | **10** |
| **Module – IV: Design of Columns**<br>General consideration of design of column, Columns with uni-axial and bi-axial bending, use of design charts. | **10** |
| **Module – V: Design of Footings**<br>Loads on footing, Design basis for limit state method, Design of wall footing, Design of isolated rectangular footing for axial load and uniaxial moment, design of pedestal. | **12** |

**TEXTBOOKS:**


1. Subramanian,N.,"Design of Reinforced Concrete Structures",Oxford University Press, New Delhi, 2013.
2. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete",Laxmi Publication Pvt. Ltd., New Delhi, 2007.
3. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
4. Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.


**REFERENCE BOOKS:**


1. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000
2. SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 |
|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y |
| Semester End Examination | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 0 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| CO2 | 3 | 3 | 3 | 0 | 2 | 2 | 1 | 0 | 0 | 2 | 0 | 3 | 2 | 3 |
| CO3 | 3 | 2 | 2 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24302**
**Course Title: WATER RESOURCES ENGINEERING**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: V / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To acquire the knowledge of hydrology that deals with the occurrence, distribution and movement of water on the earth. |
| **2.** | To understand the concepts of surface water and groundwater hydrology. |
| **3.** | To know about water distribution systems and their designing aspects. |
| **4.** | To analyse and design the dams and reservoirs. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand the hydrologic cycle and investigate various processes of surface water hydrology. (K1, K2, K3) |
| **CO2** | Understand and analyse the flood routing and ground water hydrology. (K1, K2, K3) |
| **CO3** | Understand the basics of irrigation engineering and design the alluvial canal. (K1, K2, K3) |
| **CO4** | Understand and design various irrigation structures. (K1, K2, K3) |
| **CO5** | Analyse and design various types of dams and reservoirs. (K1, K2, K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Hydrology**<br>*Engineering hydrology*: Hydrologic cycle, Water budget equation, World water inventory, Precipitation, Forms of precipitation, Measurement of precipitation, Rainfall data, Hyetograph, Mean precipitation over an area, Losses from precipitation, Initial losses, Evapotranspiration, Measurement of evapotranspiration, Blaney Criddle method, Infiltration, Horton's equation, Infiltration index, Runoff, Direct runoff, hydrograph and stream characteristics, Rainfall runoff modelling, Flood hydrograph, Separation of base flow, Unit hydrograph, S-curve | **8** |
| **Module – II: Hydrology (Continued)**<br>*Floods and flood routing*: Floods, Estimation of flood discharge, Flood routing, Hydrologic flood routing, Storage routing using modified Pul's method, Channel routing using Muskingham method, Hydraulic flood routing<br>*Groundwater hydrology*: Saturated and unsaturated groundwater, Aquifers, Unconfined and confined aquifers, Steady radial flow to a well in an unconfined aquifer, Steady radial flow to a well in a confined aquifer, Open well, Yield of a well, Recuperation test | **8** |
| **Module – III: Irrigation Engineering**<br>*Irrigation*: Necessity of irrigation, Advantages and disadvantages of irrigation, Classification of irrigation, Methods of irrigation, Soil water, depth of water and frequency of irrigation, Duty and delta, Factors affecting duty, Consumptive use of water, Irrigation requirements<br>*Canals*: Classification of canals, Alluvial canal, Design of alluvial canal, Kennedy's method, Lacey's method, Sediment transport theory | **8** |
| **Module – IV: Irrigation Engineering (Continued)**<br>*Diversion head work*: Component parts, Weir and barrage, Types of weirs, Causes of failure of weirs, Design of impervious floor, Bligh's creep theory<br>*Cross drainage work*: Necessity of cross drainage work, Types of cross drainage works, Aqueduct, Syphon aqueduct, Superpassage, Syphon, Level crossing, Canal inlet, Classification of aqueduct<br>*Canal fall and regulator*: Canal fall, Necessity of canal fall, Types of falls, Canal regulators, Distributary head regulator, Cross regulator<br>*Canal outlet and escape*: Canal outlet, Types of outlets, non-modular outlet, Semi-module, Rigid outlet, Flexibility, Proportionality, Setting, Sensitivity, Canal escape | **8** |
| **Module – V: Dam and Reservoir**<br>*Dam and reservoir*: Multi-purpose projects, Storage zones of reservoir, Reservoir yield, Rule curve, Storage capacity determination, Reservoir sedimentation<br>*Earth dam*: Types of earth dams, Design criteria, Dam section, Slope protection, Phreatic line in earth dam, Casagrande's method, Flownet, Seepage in earth dam<br>*Gravity dam*: Selection of dam site, Forces acting on gravity dam, Combination of forces, Modes of failure of gravity dam, Safety criteria, Principal stress and shear stress, Elementary profile of a gravity dam, Low and high gravity dam, Practical profile of a gravity dam<br>*Arch dam*: Types of arch dams, Constant radius arch dam, Variable radius arch dam, Constant angle arch dam, Forces acting on arch dam, Design of arch dam | **8** |

**TEXTBOOKS:**

1. Irrigation and Water Power Engineering, B.C. Punmia, Pande B.B. Lal, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.
2. Engineering Hydrology, K. Subramanya, Tata McGraw Hill.
3. Applied Hydrology, K. N. Muthreja, Tata Mc-Graw Hill.
4. Water Resources Engineering through Objective Questions, K. Subramanya, Tata McGraw Hill.
5. Irrigation Engineering, G. L. Asawa, Wiley Eastern.

**REFERENCE BOOKS:**

1. Water Resources Engineering, L. W. Mays, Wiley.
2. Irrigation, J. D. Zimmerman, John Wiley & Sons.
3. Engineering Hydrology, C. S. P. Ojha, R. Berndtsson and P. Bhunya, Oxford.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's Assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and Assignment | 40 |
| Teacher's Assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO3 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24303**
**Course Title: GEOTECHNICAL ENGINEERING**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: V**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To understand the index properties of soil, its relationships, its determination and classification of soil |
| **2.** | To know the behaviour of soils when exposed to water by studying permeability, seepage, compaction and consolidation parameters |
| **3.** | To estimate the shear strength parameters under the application of load for different conditions |
| **4.** | To determine the bearing capacity of soil by various theories |
| **5.** | To have knowledge of various types of foundation and the factors governing the choice of a suitable type of foundation for specific projects. |

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Classify soil from its index properties. (K1, K2, K3) |
| **CO2** | Solve practical problems related to permeability and seepage, evaluate settlement problems due to consolidation and appreciate the importance of soil water interaction. (K1, K2, K3, K4) |
| **CO3** | Compute soil shear strength parameters for different field conditions. (K1, K2, K3) |
| **CO4** | Estimate bearing capacity of foundations. (K1, K2, K3) |
| **CO5** | Select suitable foundation types as per requirement & perform basic analysis for foundation systems including understanding their limitations together with proportioning different shallow foundations & estimate pile load carrying capacity. (K1, K2, K3, K4) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Fundamentals of Soil Mechanics**<br>Introduction: Three-phase system : – soil solids, water and air; Basic definitions and functional relationships : -Specific gravity; Void ratio; Porosity; water content; Unit Weights & Density : -bulk, dry, saturated, submerged and natural; Degree of saturation & Density index ; Structure of soil; soil texture:- Size, range and shapes of individual soil particles; field identification of soils, Particles size distribution: Sieve analysis; distribution curve characteristics; grain size analysis for fine-grained and mixed soils; use of hydrometer; Consistency limits and indices; Activity and Sensitivity of clays. Classification of Soils: based on soil type; by origin; by structure; Textural, Unified and Indian Standard Classifications | **8** |
| **Module – II: Soil Moisture Relationships**<br>Capillarity in soils; Free and adsorbed water; Permeability of soils: Darcy's Law; Determination of coefficient of permeability by constant head & falling head tests, Permeability of stratified soil deposits. Factors affecting permeability; Seepage Analysis: Head, Gradient & Potential, Seepage pressure. Two dimensional flow -Laplace equation; Phreatic line in Earth dams; Graphical method of flow net construction: for flow below sheet piles, earth dams with or without core / filter; Seepage discharge across hydraulic structures; Flow net – electrical analogy; Pore water pressure and the concept of effective stress; Quick sand condition, Difference between Compaction and Consolidation; Compaction tests : Standard and Modified Proctor ; Factors affecting compaction; Field compaction; One-dimensional consolidation –spring analogy; Terzaghi's theory of one-dimensional consolidation; Consolidation of undisturbed & remoulded soils; Laboratory consolidation test –analysis and results; Coefficient of volume change, Coefficient of consolidation, Compression index, Degree of consolidation; Secondary consolidation | **8** |
| **Module – III: Shear Strength**<br>Measurement of shear strength –Unconfined strength test; Direct shear tests; Vane shear test and Triaxial tests –strain-controlled tests; Concepts of both Unconsolidated and Consolidated specimens subjected to shear without drainage (with or without pore water pressure measurement); drained shear; Mohr strength envelopes for Total and Effective stresses; Mohr-Coulomb failure theory | **8** |
| **Module – IV: Bearing Capacity**<br>Terminology: Ultimate and Safe Bearing Capacities; Allowable Bearing Pressure Gross and Net Bearing Capacities; Net Soil pressure for a specified settlement; Bearing capacity from equations of Terzaghi, Skempton, and Meyerhoff; I. S. Code of Practice; Bearing capacity from N-values; Effect of ground water table, Plate Load test: Procedure& Limitations, determination of permissible bearing capacity for footings in sand and clay soils, Eccentrically loaded footings – useful width concept | **8** |
| **Module – V: Shallow Foundations and Pile Foundations**<br>Type of foundations: Isolated and combined footings; Rafts foundations Proportioning of footings for even settlement, Types of piles; Pile construction; Load carrying capacity of piles : Dynamic and static formulae; Group action and efficiency; Under-reamed piles; Negative skin friction – cause and prevention of its effect on piles; factor of safety of pile subjected to negative skin friction, Pile load tests | **8** |

**TEXTBOOKS:**

1. Soil Mechanics and Foundations by Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain
2. Geotechnical Engineering by C. Venkataramaiah
3. Soil Mechanics and Foundation Engineering by Santhosh Kumar Garg

**REFERENCE BOOKS:**

1. Textbook of Soil Mechanics by V.N.S.Murthy
2. Basic & Applied Soil Mechanics by Ranjan Gopal and A. S. R. Rao

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**
**NA**

**POS MET THROUGH GAPS IN THE SYLLABUS**
**NA**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**
**Design of Foundations, Retaining walls ,Report writing**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**
**PO8 & PO9**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24304**
**Course Title: ENVIRONMENTAL ENGINEERING**
**Pre-requisite(s): None**
**Co- requisite(s): None**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: V**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Have knowledge about the importance of water quality and quantity and to study about various population forecasting methods |
| **2.** | Study about the different water treatment process |
| **3.** | Design the various components of water supply system |
| **4.** | Know about the various aspects of sewage, sewers and design of sewerage systems |
| **5.** | Study about different sewage treatment processes and sludge management |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to understand the importance of water quality and estimate the quantity of water as per demands and population. ($K_1$, $K_2$, $K_3$) |
| **CO2** | Able to know about various water treatment processes ($K_1$, $K_2$) |
| **CO3** | Know how to design the various components of water supply system ($K_1$, $K_2$, $K_3$, $K_4$) |
| **CO4** | Have knowledge about sewage, sewers, sewerage system and sewer appurtenances($K_1$,$K_2$) |
| **CO5** | Have knowledge about various sewage treatment process and sludge management($K_1$,$K_2$) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Water**<br>Sources of water, water quality requirement for different applications, water quality standards, water quality indices, water demand, population forecasting methods. | **8** |
| **Module – II: Water Treatment Processes**<br>Aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes. | **8** |
| **Module – III: Water Supply Systems**<br>Components of water supply system, conveyance of water, distribution system, water supply appurtenances, service reservoirs and design. | **8** |
| **Module – IV: Sewage**<br>Need for conveyance and treatment of sewage, domestic wastewater and storm water estimation, conveyance of sewage - sewers, shapes design parameters, operation and maintenance of sewers, sewage pumping, sewer appurtenances, design of sewerage systems. | **8** |
| **Module – V: Sewage treatment**<br>Physico-chemical and biological treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, sewage sludge management | **8** |

**TEXTBOOKS:**

1. Water Supply Engineering: Environmental Engineering - Vol. I, S.K. Garg
2. Sewage Disposal and Air Pollution Engineering: Environmental Engineering - Vol. II, S.K. Garg.
3. Introduction to Environmental Engineering and Science, G.M. Masters & Wendell Ela.
4. Environmental Engineering, Peavy, H., Rowe, D.R, Tchobanoglous, G

**REFERENCE BOOKS:**

1. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
2. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.
3. Metcalfe and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse.
4. Water and Wastewater Engineering – designs, principle and practice, Mackenzie L. Davis.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**
**Real- time problem and case studies**

**POS MET THROUGH GAPS IN THE SYLLABUS**
**PO7&PO9**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 0 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 0 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 0 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 0 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 0 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24305**
**Course Title: TRANSPORTATION ENGINEERING**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.TECH.**
**Semester / Level: V / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | To understand the fundamentals of highway planning, highway alignment and concepts of geometric design of highways (K1, K2, K3, K4, K6). |
| **2.** | To analyse traffic flow fundamentals and plan traffic management (K2, K4). |
| **3.** | To design flexible and rigid pavements and execute construction and maintenance of highways (K2, K4, K6). |
| **4.** | To understand the various components of railway and fundamentals of railway engineering (K1, K2, K3) |
| **5.** | To study the concepts of geometric design of railway track and design of turn out, cross-overs and crossings (K4) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to execute highway planning, alignment and design highway geometrics (K1, K2, K3, K4, K5, K6). |
| **CO2** | Able to understand traffic flow fundamentals and plan traffic management and control (K2, K4). |
| **CO3** | Able to design flexible and rigid pavements and apply quality control in construction / maintenance works (K2, K4, K6). |
| **CO4** | Able to understand the various components in railway engineering and its maintenance (K1, K2, K3). |
| **CO5** | Able to design curves, crossings and turn-overs (K4). |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Highway Planning, Highway Alignment and Geometric Design of Highways**<br>Road pattern, Fundamental Principles of Highway Alignment, Factors controlling the selection of alignment, Engineering Surveys for a Highway Project; Road Cross-sectional Elements: Width of Carriageway, Formation Width, Right of Way, Camber, Shoulder, Kerb, Road Margins, Design Speed, Sight Distances, Design of Horizontal curves, Super elevation, Extra widening on Horizontal curves, Transition curves, Set back distance at curves, Gradient, Design of Vertical curves – Summit and Valley curves | **8** |
| **Module – II: Traffic Engineering**<br>Traffic Volume and Speed Studies, peak hour factor, Travel Time and Delay Studies, O-D studies, Statistical analysis of traffic data, Traffic flow elements and their inter-relationship, Traffic Capacity and LOS concept, PCU concept, Traffic Control Devices, Parking Studies, Accident studies, Intersections — At grade and Grade Separated Intersections and channelization, Traffic Control Devices, Traffic Signs, Traffic Signal Systems (Trail Cycle Method and Webster's Method), Traffic Islands, Road Markings; Trip generation, Trip distribution and Modal Split. | **8** |
| **Module – III: Pavement Design and Construction**<br>Types of Pavements, Flexible and Rigid pavement, Pavement composition, Stresses in flexible pavements, concept of ESWL, EAL, VDF, Flexible Pavement Design as per IRC, Stresses in Concrete Pavements, Modulus of subgrade reaction, Design of rigid pavements as per IRC; Desirable properties and quality control tests of highway materials, bituminous mix design; constructions of cement concrete pavement and their joints (brief); and overlay design by IRC method | **8** |
| **Module – IV: Fundamentals of Railway Engineering**<br>Common terminologies, Permanent way, Gauge, Stresses in Railway Track, Traction and Tractive Resistances, Coning of Wheels, Function of Rails, Type of rail sections, wear on rails, rail failures, Rail flaw detection, Creep of rails, Rail Joints, Function of sleepers, Types of sleepers, sleeper density, Ballast, Rail fixtures and fastenings, Formation and subgrade, Failures in rail embankment and measures, Location surveys and alignment, Signaling and interlocking. | **8** |
| **Module – V: Geometric Design of Railway Tracks, Points and Crossings and Junctions**<br>Cross-sectional Elements of a railway track, Horizontal curves, Super elevation or Cant, Equilibrium Cant, Cant deficiency, Cant excess, Negative superelevation, Gradients, Vertical curves, Turnouts, Points and switches, Crossings, Type of Crossings. | **8** |

**TEXTBOOKS:**


1. Khanna S. K., Justo C. E. G., and Veeraraghavan A.: Highway Engineering (Nem Chand & Bros.)
2. Garber N. J. and Hoel L.: Traffic & Highway Engineering (Cengage Learning)
3. Chandra S. and Agrawal M.M. : Railway Engineering (Oxford University Press)
4. Saxena S.C. and Arora S.P.: A Text Book of Railway Engineering (DhanpatRai Publications)


**REFERENCE BOOKS:**


1. Yoder, E. J., Witczak, M.W.: Principles of Pavement Design (Wiley)
2. Ministry of Road Transport and Highways (5th Rev): Specifications for Road and Bridge Works (Indian Road Congress)

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO1 0** | **PO1 1** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | **2** | **2** | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 1 | 2 | 1 | **2** | **3** | **2** | 2 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 2 | **2** | **3** | **2** | 1 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 3 | **2** | 2 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 2 | **2** | 3 | **2** | 1 | 2 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2 and CD8 |
| CO2 | CD1, CD2 and CD8 |
| CO3 | CD1, CD2, CD4, CD5 |
| CO4 | CD8 |
| CO5 | CD1, CD2 and CD8 |

## COURSE INFORMATION SHEET

**Course Code: CE24306**
**Course Title: WATER RESOURCES ENGINEERING LABORATORY**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: V/ 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To study flow over notches, weirs, and spillways and compare it for various shapes of these flow measuring devices and structures. |
| **2.** | To study and investigate the flow in open channels. |
| **3.** | To apply the concepts of hydrology in solving real life problems. |
| **4.** | To analyse and design hydraulic structures. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand and compare the flow over various discharge measuring devices and structures. (K1, K2, K3) |
| **CO2** | Apply the basic concepts of fluid dynamics in solving the real life problems. (K1, K2, K3) |
| **CO3** | Understand and apply the basic concepts of hydrology in solving real life problems. (K1, K2, K3) |
| **CO4** | Understand and analyse the groundwater flow and its analogy. (K1, K2, K3) |
| **CO5** | Analyse and design gravity dams and other hydraulic structures. (K1, K2, K3) |

**SYLLABUS (List of Experiments: A minimum ten experiments may be selected from the list given below)**

1. Comparison of coefficient of discharge for various shapes of notches.
2. Comparison of coefficient of discharge for various shapes of weirs.
3. Flow over a model of spillway.
4. Losses in commercial pipes and pipe fittings.
5. Roughness coefficients of channel.
6. Hydraulic jump in rectangular channel.
7. Mean precipitation over an area by Thiessen polygon method.
8. Unit hydrograph and S-curve.
9. Flow through model of an earth dam.
10. Hele-Shaw apparatus.
11. Analysis of forces on a gravity dam.
12. Design of a vertical drop weir.
13. Design of a canal fall.
14. Design of canal regulators.
15. Design of syphon aqueduct.

**REFERENCE MATERIALS:**


1. Hydraulics and Fluid Machines, P. N. Modi and S. H. Seth, Standard Book House.
2. Flow in Open Channels, K. Subramanya, Tata McGraw Hills.
3. Engineering Hydrology, K. Subramanya, Tata McGraw Hill.
4. Irrigation and Water Power Engineering, B.C. Punmia, Pande B.B. Lal, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.
5. Experimental Fluid Mechanics, G. L. Asawa, Nemchand and Bros, Roorkee.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab Quizzes | 20 |
| Progressive Viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 50 |
| Lab Quiz | 16.7 |
| Progressive Viva | 33.3 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 1 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 1 | 1 |
| CO2 | 3 | 2 | 2 | 2 | 1 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 2 | 1 |
| CO3 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 3 | 2 | 0 | 0 | 3 | 2 | 2 |
| CO4 | 3 | 3 | 2 | 3 | 2 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 1 | 1 |
| CO5 | 3 | 3 | 3 | 2 | 1 | 1 | 0 | 3 | 2 | 0 | 0 | 3 | 3 | 2 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD5, CD8 |
| **CO2** | CD5, CD8 |
| **CO3** | CD5, CD8 |
| **CO4** | CD5, CD8 |
| **CO5** | CD5, CD8 |

## COURSE INFORMATION SHEET

**Course Code: CE24307**
**Course Title: ENVIRONMENTAL ENGINEERING LABORATORY**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: I**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To describe the concept of water quality with reference to different standards (K1, K2) |
| **2.** | To apply different procedures for physico-chemical analysis of water (K3) |
| **3.** | To interpret and write water and wastewater quality analysis report (K2, K3) |
| **4.** | To assess optimum dosing of chemicals for water treatment (K4) |
| **5.** | To assess bacteriological quality of water (K4) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Explain the importance of water quality and various standards (K1, K2) |
| **CO2** | Choose different procedures for physico-chemical analysis of water samples (K3) |
| **CO3** | Prepare report on water and wastewater quality (K2, K3) |
| **CO4** | Illustrate the process of optimizing chemical dosing for water treatment (K4) |
| **CO5** | Outline the testing of bacteriological quality of water (K4) |

**SYLLABUS (List of experiments)**

1. Determination of pH, EC and turbidity of water
2. Determination of total solids, total dissolved solids and total suspended solids of water
3. Determination of acidity, alkalinity and total hardness of water
4. Determination of dissolved oxygen (DO) and BOD of water and wastewater
5. Determination of COD of water and wastewater
6. Determination of chloride and residual chlorine of water
7. Determination of nitrate, phosphate and sulphate in water
8. Determination of fluoride in water
9. Chemicals dose optimisation for water treatment
10. Coliform count of water and wastewater samples by the MPN method

**REFERENCE MATERIALS:**


1. Lab manuals (available on department website)
2. Standard Methods of Testing of Water and Wastewater" Use by APHA, AWWA, AND WPCF (USA)
3. Chemistry for Environmental Engineering, Clair N. Sawyer, Perry Mccarty, Gene F. Parkin, McGraw Hill Inc. New York, USA


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizzes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Introductory lecture by use of boards/LCD projectors |
| **CD2** | Laboratory experiments/ teaching aid |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 3 | 3 | 0 | 3 | 0 | 1 | 1 | 0 | 1 | 3 | 0 | 3 |
| CO2 | 2 | 1 | 3 | 3 | 0 | 3 | 0 | 1 | 1 | 0 | 1 | 3 | 0 | 3 |
| CO3 | 2 | 1 | 3 | 3 | 0 | 3 | 0 | 1 | 2 | 0 | 1 | 3 | 0 | 3 |
| CO4 | 2 | 1 | 3 | 3 | 2 | 3 | 0 | 1 | 1 | 0 | 1 | 3 | 0 | 3 |
| CO5 | 2 | 1 | 3 | 3 | 0 | 3 | 0 | 1 | 1 | 0 | 1 | 3 | 0 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE 24308**
**Course Title: STRUCTURAL DESIGN II**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 4 L:4 T:0 P:0**
**Class schedule per week: 4**
**Class: B.Tech.**
**Semester / Level: VI / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | This course enables the students to develop an understanding of structural steel properties, design approaches, and loading standards, apply IS 800:2007 provisions for designing structural elements and their connections, and enhance analytical and problem-solving skills for real-world steel structure applications. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Apply fundamental concepts of structural steel properties, design approaches, and loading standards to analyze and assess lateral loads based on IS codes. (K1, K2, K3) |
| **CO3** | Design structural connections using bolts and welds, considering both direct and eccentric loading, ensuring compliance with relevant IS standards.(K3, K4) |
| **CO2** | Utilize IS 800:2007 provisions to design various structural steel elements, including tension members, compression members, beams, and their connections, ensuring compliance with codal requirements. (K3, K4) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Structural Steel and Design Approaches**<br>Engineering properties and characteristics of structural steel, Types of sections, Rolling process – necessity and importance. Loads and loading standards, assessment of lateral loads as per IS codes. Introduction to Plastic analysis, Methods of design – working stress, LRFD and Limit state design. | **10** |
| **Module – II: Connections**<br>Bolted connections - Design of bolted connections subjected to direct and eccentric loadings. Welded connections - Design of welded connections subjected to direct and eccentric loadings. | **10** |
| **Module – III: Design of Tension Members**<br>Types of tension members, sectional areas, types of failure, design strength, design of tension members, lug angles and splices. | **10** |
| **Module – IV: Compression Members and foundation design**<br>Types of section, section classification, column formulae, buckling classification. Design strength of simple members and struts, Design of built up and compound members including splicing, lacing and battening, Design of column bases and foundation. | **10** |
| **Module – V: Design of Flexural Members**<br>Concept of lateral restraint, laterally supported and unsupported beams, section classification, Elastic and plastic sections modulus, Determination plastic section modulus of sections, IS criteria for design, Design of simple and plated beams | **10** |

**TEXTBOOKS:**


1. Design of Steel Structures, N. Subramanyam, Oxford University Press, New Delhi, India, 2008
2. Limit State Design of Steel Structures, S. K. Duggal, Tata McGraw Hill Education Private Limited, New Delhi, India, 2015
3. Design of Steel Structures, P. Dayarathnam, Prentice Hall India, New Delhi, India, 2011


**REFERENCE BOOKS:**


1. IS : 800 – 2007 Code of Practice for General Construction in Steel
2. SP : 6(1) – 1964 Handbook for Structural Engineers : I. Structural Steel Sections
3. Teaching Resources for Structural Steel Design – Vol. I & II, INSDAG, Kolkatta.
4. Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., Design of Steel Structures, 3rd edition, McGraw-Hill Publications.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Continuous Internal Assessment | 25 |
| Mid Sem Exam | 25 |
| Semester End Examination | 50 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Quiz | 10 |
| Assignment | 10 |
| Teachers Assesment | 5 |

| Assessment Components | CO1 | CO2 | CO3 |
|---|---|---|---|
| Continuous Internal Assessment | ✓ | ✓ | ✓ |
| Mid Sem Exam | ✓ | ✓ | |
| Semester End Examination | ✓ | ✓ | ✓ |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Faculty**
2. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO 11 | PS O1 | PS O2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 1 | **1** | 2 | | 2 | | 2 | **1** | 3 | | |
| CO2 | 3 | 3 | 3 | 1 | **2** | 3 | | 3 | | 1 | | 3 | | 3 |
| CO3 | 3 | 3 | 3 | 1 | **2** | 3 | | 3 | | 1 | **1** | 3 | | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD8 |
| CO2 | CD1, CD2, CD4, CD8 |
| CO3 | CD1, CD2, CD4, CD8 |

## COURSE INFORMATION SHEET (PE2)

**Course Code: CE 24351**
**Course Title: ADVANCED STRUCTURAL ANALYSIS**
**Pre-requisite(s): CE24202, CE24207**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VI / 4**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Develop basic knowledge of structural analysis so that the students can solve real engineering problems. (K1, K2) |
| **2.** | Understand behaviour of different kinds of framed structures subjected to simple and complex mechanical loadings. (K1, K2) |
| **3.** | Analyse and design safe and sound civil engineering structures. (K3, K4) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Evaluate the stability and determinacy of a given structure. (K1, K2, K3) |
| **CO2** | Evaluate safety of a proposed framed structure before construction and manufacturing.(K4) |
| **CO3** | Evaluate the behaviour of framed structures under the action of complex static loads.(K1, K2, K3, K4) |
| **CO4** | Evaluate the behaviour of framed structures using advanced numerical techniques.(K1, K2, K3, K4) |
| **CO5** | Evaluate deflections in framed structure. (K3, K4) |

K1- Remember; K2- Understand; K3- Apply; K4- Analyse; K5- Evaluate; K6- Create

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction**<br>Static and Kinematic Indeterminacy, Stability of Structures, Flexibility and Stiffness Matrix Methods. Matrix Algebra and Gauss Jordan Elimination Method. | **8** |
| **Module – II: Matrix Method of Analysis**<br>Coordinate Systems; Degree of freedom; Displacement and Force Transformation Matrices | **8** |
| **Module – III: Stiffness Matrix Method for Trusses**<br>Member stiffness relations: local and global. Structural stiffness relation. Analysis of trusses. | **8** |
| **Module – IV: Stiffness Matrix Method for Beams**<br>Conventional and reduced Beam Element Stiffness relations (4 and 2 DOF); Structural stiffness relation. Analysis of beams and continuous beams. | **8** |
| **Module – V: Stiffness Matrix Method for Plane Frames**<br>Beam Element Stiffness relations (6 DOF): local and global; Structural stiffness relation. Analysis of plane frames. | **8** |

**TEXTBOOKS:**


1. Devdas Menon, "Advanced Structural Analysis", Narosa Publishing House, 2009.
2. Asslam Kassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co., USA, 1999.
3. Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach", Sixth Edition, 2007, Chapman & Hall.


**REFERENCE BOOKS:**


1. Matrix analysis of framed structures, Weaver and Gere.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Continuous Internal Assessment | 25 |
| Mid Sem Examination Marks | 25 |
| End Sem Examination Marks | 50 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Quiz | 10 |
| Assignment | 10 |
| Teacher Assessment | 5 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mid Sem Exam | ✓ | ✓ | | | |
| Semester End Examination | ✓ | ✓ | ✓ | ✓ | ✓ |

**INDIRECT ASSESSMENT**

1. **Student feedback on teaching quality and teaching methods adopted**
2. **Student feedback on course syllabus and course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | 2 | | | | | | | 3 | 1 | |
| CO2 | 3 | 2 | 3 | 2 | 2 | | | | | | **1** | 3 | 1 | |
| CO3 | 3 | 2 | 3 | 2 | 2 | | | | | | **1** | 3 | 1 | |
| CO4 | 3 | 2 | 3 | 2 | 2 | | | | | | **1** | 3 | 1 | |
| CO5 | 3 | 2 | 3 | 2 | 2 | | | | | | | 3 | 1 | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2, CD8 |
| CO2 | CD1, CD4, CD8 |
| CO3 | CD1, CD2, CD8 |
| CO4 | CD1, CD2, CD8 |
| CO5 | CD1, CD2, CD8 |

## COURSE INFORMATION SHEET (PE2)

**Course Code: CE24352**
**Course Title: FINITE ELEMENT METHOD**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VI**
**Branch: CEE**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To understand the fundamental concepts of finite element approximation for solid mechanics problems |
| **2.** | To understand the basic function approximation techniques commonly used for finite element simulations |
| **3.** | To apply the finite element formulation for solving bar problems |
| **4.** | To solve tensile bar, column, 2D truss problems using finite element method |
| **5.** | To solve deflection of 2D beams using finite element method |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand the fundamental concepts of finite element method, and elasticity (K1, K2) |
| **CO2** | Understand different functional approximation techniques using finite element formulation (K1, K2) |
| **CO3** | Apply the knowledge of FEM to solve problems of displacement of bar elements (K1, K2) |
| **CO4** | Apply FEM to solve tension bars, columns, 2D truss structures (K2, K3) |
| **CO5** | Apply FEM to solve simple beam deflection problems (K2, K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction to the Stiffness Method**<br>General description and analysis procedure; Basic equations in elasticity, Linear constitutive Laws; Concept of element and node, Element aspect ratio, Nodal degree of freedom, Coordinate systems, Generalized coordinate form of displacement, Convergence requirements. Matrix Displacement Formulation: Matrix displacement equation, Stiffness matrix and its properties, Stiffness matrices for bar element, truss element, beam element; Use of symmetry and partitioning of matrix | **8** |
| **Module – II: Variational formulation and Shape function**<br>General variational method in elasticity, Potential energy in elastic bodies, Principle of minimum potential energy, Rayleigh-Ritz method. Polynomial shape functions, Shape functions in Cartesian coordinates and Natural co-ordinates, Shape functions using Lagrange polynomials, Shape functions for serendipity family elements | **8** |
| **Module – III: Strain Displacement Matrix and Stiffness Equation Assembly**<br>Strain displacement matrices for bar element, CST element, beam element; Stiffness matrix for CST element for direct approach, Iso-parametric formulations, Jacobian matrix. | **8** |
| **Module – IV: Analysis of Bars and Trusses**<br>Analysis of tension bars/columns. Two dimensional trusses, Calculation of reactions. | **8** |
| **Module – V: Analysis of Beams and Rigid Frames**<br>Beam analysis, Moment curvature relation, Strain energy, Analysis of two-dimensional rigid frames. | **8** |

**TEXTBOOKS:**


1. An Introduction to the Finite Element, J. N. Reddy, McGraw-Hill, Inc.
2. Fundamentals of Finite Element Analysis, David V. Hutton, McGraw-Hill Inc.
3. Finite Element Modelling for Stress Analysis, Robert D. Cook, John Wiley & Sons, Inc.


**REFERENCE BOOKS:**


1. Finite Element Analysis, S. S. Bhavikatti, New Age International Publishers
2. The Finite Element Method for Solid and Structural Mechanics, O. C. Zienkiewicz & R. L. Taylor, Butterworth-Heinemann
3. Finite Element Procedures, Klaus-Jurgen Bathe, Prentice-hall of India Pvt Ltd.
4. The Finite Element Method: Linear Static and Dynamic Finite Element Analysis, Thomas J. R. Huges, Dover Publications Inc.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | | | | | 1 | 1 | | | 2 | | |
| CO2 | 3 | 3 | 1 | | | | | | 1 | | | | | |
| CO3 | 3 | 3 | 1 | | | | | | | | | | | |
| CO4 | 3 | 3 | 1 | | | | | 2 | 1 | | | | | 3 |
| CO5 | 3 | 3 | 1 | | | | | 2 | 1 | | | | | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET(PE2)

**Course Code: CE24353**
**Course Title: STRCUTURAL DYNAMICS**
**Pre-requisite(s): CE24201, CE24202, CE24207**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VI**
**Branch: CEE**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To study dynamic performance of a structure with idealization of structure as single degree of freedom, multiple degree of freedom system and to determine the response to free and forced vibrations. (K2, K3, K4, K5) |
| **2.** | To analyse structural behaviour subjected to earthquake loading. (K3, K4) |

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to calculate response of SDOF and MDOF systems. (K2, K3, K4) |
| **CO2** | Able to find out mode shape, frequencies and amplitude for motion of two/three DOF systems. (K2, K3, K4) |
| **CO3** | Apply the knowledge of FEM to solve problems of displacement of bar elements (K1, K2) |
| **CO4** | Able to analyse structure for earthquake forces according to IS code provisions. (K2, K3, K4) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I**<br>Introduction: Overview of Structural Dynamics, Single Degree of Freedom Systems – Analysis of Free Vibrations – undamped and damped systems, estimation of damping by logarithmic decrement method. | **8** |
| **Module – II**<br>Formulation of equation of motion for generalized SDOF dynamic problems using virtual work method, Response of SDOF systems to Harmonic, Periodic, Impulse Loads | **8** |
| **Module – III**<br>Formulation of equation of motion for two/three DOF systems, finding mode shapes and frequencies by solving the determinantal equation and iterative techniques, use of sweeping matrices for obtaining higher modes, Modal superposition. | **8** |
| **Module – IV**<br>Response of single and multiple DOFS systems to Earthquake Loading using Time-Stepping Methods based on Forward Cauchy Euler, Backward Cauchy Euler, Central Difference Method, Newmark-Beta Method and Trapezoidal Rule, Accuracy, stability of numerical methods. | **8** |
| **Module – V**<br>Earthquake response analysis of multi-DOF systems subjected to earthquake ground motion, Concept of modal mass and mode participation factors, Response Spectrum Analysis, Introduction to IS code provisions regarding earthquake. | **8** |

**TEXTBOOKS:**


1. Chopra, A.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", Second Edition, Pearson Education, 2003.
2. Patrick Paultre, "Dynamics of Structures", John Willey & Sons, 2008.
3. Paz, M., "Structural Dynamics – Theory & Computation", CSB Publishers & Distributors, Shahdara, Delhi, 1985


**REFERENCE BOOKS:**


1. Ray W. Clough &Penzien, "Dynamics of Structures", McGraw Hill, 1993.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 |
|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **3** | **3** | **1** | | | **1** | | | | | | **2** | | |
| CO2 | **3** | **3** | **1** | | | **1** | | | | | | **2** | | **3** |
| CO3 | **3** | **3** | **1** | | | **1** | | | | | | **2** | | |
| CO4 | **3** | **3** | **1** | | | **1** | | **2** | | | | **2** | | **3** |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET (PE3)

**Course Code: CE24354**
**Course Title: TRANSPORTATION PLANNING**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.TECH.**
**Semester / Level: VI / 4**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Analysis and Planning of various transportation planning process in urban context |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to understand the urban activity systems, types and classification of urban road system. |
| **CO2** | Able to analyze and modelling of urban goods transportation system. |
| **CO3** | Able to implement planning processes of urban transportation system. |
| **CO4** | Assess the applicability of various transportation survey for planning process. |
| **CO5** | Able to understand the various land use models for transportation system. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction**<br>Transportation in cities, Future developments, Urban structure, Urban activity systems, Classification of roads, Types of road system | **8** |
| **Module – II: Urban goods movements**<br>Classification of urban goods movements, Analysis of goods movements, Modelling demand for urban goods transport | **8** |
| **Module – III: Urban transportation system planning process:**<br>Trip generation analysis, Mode choice modelling, Trip distribution, Traffic assignment | **8** |
| **Module – IV: Transportation survey**<br>Introduction, Types of movement, Types of survey, Cordon line survey | **8** |
| **Module – V: Transport related land use models**<br>Introduction, Types of models, Components of transportation | **8** |

**TEXTBOOKS:**


1. Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna publishers, 1999
2. Papacostas, C. S. , Prevedouros, P. D., Transportation Engineering and Planning, PHI publication, 2015


**REFERENCE BOOKS:**


1. Ponnuswamy, S., Victor, J., Urban Transportation: Planning, Operation and Management, McGraw Hill Publisher, 2012
2. Khisty, C. J., Lall, B.K., An Introduction to Transportation Engineering, Pearson Publications, 2017


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mid Sem Exam | ✓ | ✓ | ✓ | | |
| Semester End Examination | ✓ | ✓ | ✓ | ✓ | ✓ |

**INDIRECT ASSESSMENT**

**1. Student feedback on course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 2 | 2 | 3 | 2 | 1 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 2 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2 and CD8 |
| CO2 | CD1, CD2 and CD8 |
| CO3 | CD1, CD2, CD4, CD5 and CD8 |
| CO4 | CD1, CD2 and CD8 |
| CO5 | CD1, CD2 and CD8 |

**COURSE INFORMATION SHEET (PE3)**

**Course Code: CE24355**
**Course Title: TRAFFIC ENGINEERING AND MANAGEMENT**
**Pre-requisite(s): CE24305**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.TECH.**
**Semester / Level: VI / 4**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | To provide the techniques of traffic engineering and management encompassing a comprehensive state-of-art in the field. |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to understand the traffic flow parameters, gap acceptance behavior and traffic measurement procedures. (K2, K3) |
| **CO2** | Able to analyze and modelling of traffic flow in microscopic, macroscopic and Mesoscopic way. (K2, K3) |
| **CO3** | Able to analyze uninterrupted flow and traffic intersection control. (K3) |
| **CO4** | Assess the applicability of congestion, queue and toll system of traffic management system. (K3, K4) |
| **CO5** | Able to apply the intelligent transportation system in the current scenario of transportation problem. (K2, K3, K4) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Fundamentals of traffic flow**<br>Traffic flow elements, Time-space diagram, Flow-density relationship, Gap and gap acceptance, Traffic measurement procedures | **8** |
| **Module – II: Traffic flow modelling**<br>Microscopic traffic flow modelling, Macroscopic traffic flow modelling and Mesoscopic traffic flow modelling | **8** |
| **Module – III: Uninterrupted flow and Traffic intersection control**<br>Capacity and LOS analysis, Urban streets, Multilane highways, Freeway operations, Uncontrolled intersection, Grade separated intersection | **8** |
| **Module – IV: Specialized traffic studies**<br>Fuel consumption and emission studies, Congestion studies, Queuing studies and Toll operation | **8** |
| **Module – V: Intelligent transportation system**<br>Introduction, Advanced ITS, Application of ITS | **8** |

**TEXTBOOKS:**


1. Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna publishers, 1999
2. Flaherty C.A., Transport Planning and Traffic Engineering, Butterworth-Heineman, 2006


**REFERENCE BOOKS:**


1. Slin, M., Guest, P. and Matthews, P., Traffic Engineering Design : Principles and Practice, 2nd Ed., Butterworth-Heinenmann , 2006
2. McShane, William R. and Roess, Roger, P., Traffic Engineering, Prentice Hall, 1990


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mid Sem Exam | ✓ | ✓ | ✓ | | |
| Semester End Examination | ✓ | ✓ | ✓ | ✓ | ✓ |

**INDIRECT ASSESSMENT**

**1. Student feedback on course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 1 | 2 | 1 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1 CD2, CD8 |
| CO2 | CD1 CD2, CD8 |
| CO3 | CD1 CD2, CD8 |
| CO4 | CD1 CD2, CD8 |
| CO5 | CD1 CD2, CD8 |

**COURSE INFORMATION SHEET (PE3)**

**Course Code: CE24356**
**Course Title: HARBOUR AND AIRPORT ENGINEERING**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VI**
**Branch: All**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To have basic knowledge on ports, harbour and study about the meteorological factors which affect a port/harbour. |
| **2.** | To know about the various structures of a harbour/port, its maintenance and to have an idea about navigational aids. |
| **3.** | To study docks, lock gates, their different types and knowledge about airport planning and obstructions. |
| **4.** | To have basic knowledge on various components of airport engineering like runway, taxiway, aprons, control tower, terminal building, aircraft parking system |
| **5.** | To study terminal building, air traffic control and visual aids for landing and different landing systems |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to understand the functions of various structures in a port/ harbor and the effect of meteorological factors on the design of a port/harbor (K1, K2) |
| **CO2** | Have an idea about dredging and navigational aids which help a ship to take berth in a port and the function of docks and lock gates. (K1, K2, K3) |
| **CO3** | Have knowledge on planning, classification, obstructions and different components of airport (K1, K2) |
| **CO4** | Able to design runways and taxiways and study different aircraft parking and airport layouts (K1, K2, K3, K4) |
| **CO5** | Have knowledge of different landing aids and landing systems (K1, K2, K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: : Introduction - Ports and Harbours**<br>History and development of water transportation; Types of water transportation; Advantages and disadvantage; Classification; Differences between port and harbour and their requirements; Site selection; Essential features of a good harbour- size, depth, turning basin, harbour entrances, Natural phenomena –Tides, Wind and Waves, Littoral drift | **8** |
| **Module – II: Components of a harbour, Navigational aids**<br>Harbour works – Breakwaters, Wharves, Piers, Jetties, Quays, Berthing structures –Dolphins, Trestles, Moles, Mooring accessories. Apron; Transit sheds; Warehouses, Dredging –Different types and their operation. Navigational aids –Necessity, different types and requirements | **8** |
| **Module – III: Docks, Introduction to Airways**<br>Types –Wet docks, Tidal basins, Repair docks, Dry docks, Floating docks, Marine railway; Locks and lock gates; Introduction –History & development of air transport, Advantages and disadvantages Airport Planning –Regional planning, Factors affecting site selection, Surveys; Airport classification. Airport obstructions –Zoning laws, Classification of obstructions, Imaginary surfaces, Approach zone, Turning zone | **8** |
| **Module – IV: : Runway**<br>Orientation –Wind rose diagram, Basic runway length, Corrections for elevation, temperature and gradient, Geometric design, Cruising speed, Air speed, Beaufort scale, Different types of runways, Taxiway and its design, Airport capacity, Loading Apron, Holding Apron. | **8** |
| **Module – V: Terminals, Air Traffic Control and Visual Aids.**<br>Terminal area –Functions, Apron, Hangar, Aircraft parking system, Airport layouts; Landing aids- Airport markings and lights; Landing systems – Visual Landing system and Instrument landing system | **8** |

**TEXTBOOKS:**

1. S.C. Rangwala: Airport Engineering
2. Srinivasan R: Harbour, Dock & Tunnel Engineering

**REFERENCE BOOKS:**

1. Bindra S.P.: A Course in Docks & Harbour Engineering
2. Oza H.P.: Dock & Harbour Engineering
3. Vaswani N. K.: Airport Engineering
4. Khanna S.K. &Arora M.G.: Airport Planning & Design
5. Subhash C. Saxena: Airport Engineering Planning and Design

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**Assignments or Case Studies**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**PO8 & PO9**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**
**NA**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 0 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 0 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 0 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 0 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 0 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET (PE4)

**Course code: CE 24357**
**Course title: AIR POLLUTION AND CONTROL**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3 L:3 T:0 P:0**
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: 6th Semester / 4**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To understanding the basic notions of air pollution. (K2) |
| **2.** | To plan air pollution sampling and monitoring in industry. (K3) |
| **3.** | To describe the role of meteorology in air pollutant dispersal. ( K2) |
| **4.** | To identify appropriate air pollution control devices. (K3) |
| **5.** | To interpret the causes of vehicular pollution and devise control methods. (K4) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to identify air pollution problems and interpret air quality data and design an air pollution sampling and monitoring plan. (K3) |
| **CO2** | Able to analyze various meteorological condition and their effects in air pollutant |
| **CO3** | Dispersal and understand the basic air pollution modelling. (K2) |
| **CO4** | Able to identify control equipment usage for air pollution control and develop a suitable monitoring plan. (K3) |
| **CO5** | Able to understand the causes of vehicular emission and the need for technological advancement for control. (K2) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I:** Introduction to air pollution and pollutants<br>Sources of ambient and indoor air pollution; types of air pollutants, fate of air pollutants, effects of air pollution on regional and global scale. | **8** |
| **Module – II:** Sampling and Monitoring of Air Pollutants<br>Objectives, ambient air sampling methods and devices, stack monitoring, and air pollution standards and indices. | **8** |
| **Module – III:** Factors affecting dispersion of air pollutants<br>Temperature lapse rates and atmospheric stability, inversions, wind profiles, wind velocity and turbulence, plume behaviour, estimation of plume rise, dispersion equations, box model, gaussian plume model. | 6 |
| **Module – IV:** Control technologies for control of air pollution<br>Control methods for air pollution, factors affecting selection of control equipment, working principle, design, operational considerations, process control and monitoring of particulate matter and gaseous pollutant control equipment, legislations, policies and guidelines for air pollution control. | 9 |
| **Module – V:** Control of vehicular emissions<br>Internal combustion engines, technological improvements of engines for reduction of vehicular emissions, after exhaust treatments, alternative transportation fuels, emission measurement and testing, regulation to control vehicular emission. | 9 |

**TEXTBOOKS:**

1. Environmental Engineering- Peavy & Rowe. Prentice Hall Pub.
2. Air Pollution Control – Rao and Rao
3. Environmental Pollution and Control – C.S. Rao

**REFERENCE BOOKS:**

1. Noel de Nevers, Air Pollution Control Engineering, Mc Graw Hill, New York.
2. Arthur C. Stern, Air Pollution (Vol.I – Vol.VIII), Academic Press
3. Introduction to Environmental Engineering and Science, Gilbert M Masters
4. CPCB manual for Guidelines for ambient air quality monitoring. Published By: Dr. B. Sengupta, Member Secretary, Central Pollution Control Board

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS) : NA**

**POS MET THROUGH GAPS IN THE SYLLABUS: NA**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN: NA**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN: NA**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **1** | **3** | **0** | **3** | **0** | **3** | **0** | **1** | **3** | **0** | **1** | 2 | **0** | **0** |
| CO2 | **2** | **3** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | 1 | **0** | **0** |
| CO3 | **2** | **2** | **3** | **3** | **1** | **0** | **0** | **0** | **0** | **0** | **1** | 3 | **0** | 1 |
| CO4 | **1** | **1** | **3** | **0** | **3** | **1** | **0** | **0** | **0** | **0** | **1** | 3 | **0** | 1 |
| CO5 | **2** | **1** | **2** | **0** | **3** | **0** | **0** | **0** | **0** | **0** | **1** | 2 | **0** | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2 |
| **CO2** | CD1, CD2 |
| **CO3** | CD1, CD2 |
| **CO4** | CD1, CD2 |
| **CO5** | CD1, CD2 |

**COURSE INFORMATION SHEET (PE4)**

**Course Code: CE24358**
**Course Title: SOLID WASTE MANAGEMENT**
**Pre-requisite(s): ENVIRONMENTAL SCIENCE**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.TECH.**
**Semester / Level: VI / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | To make students aware and gain knowledge about basic processes involved in solid waste management. |
| **2.** | To understand and analyse the components of solid waste management (SWM) |
| **3.** | To understand the mechanism of recycling waste and energy recovery processes |
| **4.** | To design and suggest best remediation measure for SWM |
| **5.** | To review, judge, and design the best solutions for municipalities, industries and others |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understanding and analysing the components of a solid waste management system (K2). |
| **CO2** | Understanding and designing municipal solid waste collection, transfer and transport systems (K3). |
| **CO3** | Examine and recommend treatment options and operations for material, resource, and energy recovery facilities. (K3). |
| **CO4** | Design and operation of a municipal solid waste landfill (K4). |
| **CO5** | Understanding and recommending technologies for hazardous and biomedical waste management and handling. (K3). |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Fundamentals of Solid Waste Management and ISWM system**<br>Sources and types of Municipal Solid Waste, waste generation rates, factors affecting generation, composition, characteristics, functional elements of solid waste management, Municipal Solid Waste Rules, concept of ISWM system, effects of improper disposal of solid waste. | **8** |
| **Module – II: Waste collection, transportation and processing**<br>Methods of collection of municipal solid wastes, collection vehicles, primary and secondary collection, manpower, collection routes, vehicle routing, transfer station – location and operation.Waste processing, component separation and volume reduction, various processing technologies, biological and chemical conversion methods, resource and energy recovery, and thermal processing methods | **8** |
| **Module – III: Treatment and disposal**<br>Composting, bio methanation, incinerator, pyrolysis, landfill, leachate management and gas control; Environmental monitoring systems for landfill sites, resource recovery. | **8** |
| **Module – IV: Radioactive and biomedical waste management**<br>sources, classification, health and safety aspects, management of radioactive wastes; Biomedical wastes: sources and categories of biomedical wastes, segregation and color coding, treatment and disposal of biomedical wastes, biomedical wastes management and handling rules | **8** |
| **Module – V: Hazardous waste management**<br>Sources and characteristics, Classification, health and environmental impacts. Safe storage, transport and treatment of hazardous waste, Hazardous waste management, handling and transboundary movement rules. | **8** |

**TEXTBOOKS:**


1. Tchobanoglous G., Theisen H., Vigil S.: Integrated Solid Waste Management Engineering Principles and Management Issues. Mc-Graw Hill
2. Khan Iqbal H., Ahsan, N.: Textbook of Solid Waste Management. CBS Publisher and Distributors (P) Ltd.
3. Bhatia S.C.: Handbook of Industrial Pollution & Control Vol. 1 (CBS Publishers)
4. G M Masters and Wendell P Ela, introduction to environmental engineering and science, Pearson


**REFERENCE BOOKS:**


1. CPHEEO, Ministry of Urban Development: Manual on Municipal Solid Waste Management 2016
2. CPHEEO, Ministry of Urban Development: Manual on Municipal Solid Waste Management 2000

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem exam | 25 |
| Semester End Exam | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's Assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | ✓ | ✓ | ✓ | ✓ | |
| Semester End Examination | ✓ | ✓ | ✓ | ✓ | ✓ |

**INDIRECT ASSESSMENT**

1. **Student feedback on teaching quality and teaching methods adopted**
2. **Student feedback on course syllabus and course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 0 | 0 | 0 | 2 | 2 | 3 | 0 | 0 | 0 | 2 | 0 | 2 | 3 |
| CO2 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 0 | 0 | 1 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 1 | 2 | 2 | 2 | 3 | 3 | 0 | 0 | 1 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 0 | 3 | 3 | 0 | 0 | 1 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 0 | 0 | 0 | 2 | 2 | 2 | 2 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| CO1 | CD1 CD2, CD6, CD8 |
| CO2 | CD1 CD2, CD6, CD8 |
| CO3 | CD1 CD2, CD6, CD8 |
| CO4 | CD1 CD2, CD6, CD8 |
| CO5 | CD1 CD2, CD6, CD8 |

**COURSE INFORMATION SHEET (PE4)**

**Course Code: CE24359**
**Course Title: ENVIRONMENTAL IMPACT ASSESSMENT**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VI / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Understand the internationally viable protocols |
| **2.** | Identify the salient features of Indian laws |
| **3.** | Understand the concepts of impact assessment |
| **4.** | Understand and apply the industrial project clearance process |
| **5.** | Understand ISO standards and EMP preparation |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Identify and analyze the international sustainable development initiatives and reports |
| **CO2** | Understand and apply the features of laws related to environmental protection and pollution control |
| **CO3** | Understand and apply the process of Environmental Impact Assessment |
| **CO4** | Analyze and document environmental projects and prepare a management plan |
| **CO5** | Understand and apply the concepts of environmental audits |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: International Conventions**<br>COP, sustainable development initiatives, Montreal Protocol, Millennium Development goals, IPCC reports. | **8** |
| **Module – II: Laws and Protocol**<br>Salient features of Acts pertaining to protection of Air, Water, Wildlife, Forest, and Environment in India, EIA Notification | **8** |
| **Module – III: Concepts of EIA**<br>Framework for environmental impact assessment. Environmental clearance, EIA process: Screening, Scoping and baseline studies, Impact Assessment Methods, Public hearing, Mitigation. | **8** |
| **Module – IV: Aspects, Impacts and Man**<br>Aspect, Impact and Review of DPRs and Industrial Case studies | **8** |
| **Module – V: DPR Preparation and Audit**<br>DPR preparation, Concepts of Environmental auditing, ecolabels and life cycle assessment | **8** |

**TEXTBOOKS:**


1. Environmental Impact Assessment: Larry Canter. McGraw Hill Publication.
2. Disaster Management- Edited by R. B. Singh. Rawat Publications. India.
3. Environmental Impact Assessment- A. K. Shrivastava. APH Pub. India.
4. Environmental Impact Assessment. Theory and Practice. Anji Reddy Mareddy, 1st Edition, eBook ISBN: 9780128112380, Paperback ISBN: 9780128111390, Butterworth-Heinemann.
5. Environmental Audit: A.K.Shrivastava. APH pub Corp. New Delhi.
6. ISO 14000: Environmental Management 1st Edition, David L. Goetsch , Stanley Davis. ISBN-13: 978-0130812360. Jenson Books Inc


**REFERENCE BOOKS:**


1. Finite Methods of Environmental Impact Assessment, Graham Wood,Riki Therivel. ISBN-13: 978-1138647671. Routledge; 4 editions.
2. Climate Change 2014 – Impacts, Adaptation and Vulnerability: Part A: Global and Sectoral Aspects. Working Group II Contribution to the IPCC Fifth Assessment Report. Volume 1. Global and Sectoral Aspects. Intergovernmental Panel on Climate Change. December 2014, ISBN: 9781107641655
3. Climate Change 2014 – Impacts, Adaptation and Vulnerability: Part B: Regional Aspects Working Group II Contribution to the IPCC Fifth Assessment Report. Volume 2. Intergovernmental Panel on Climate Change, December 2014, ISBN: 9781107683860.
4. Global Green standards: ISO 14000 and Sustainable Development. IISD pub. Minitoba.
5. ISO 14000 Answer Book: Environmental Management for the World Market (Wiley Quality Management) 1st Edition. by Dennis R. Sasseville W. Gary Wilson, Robert W. Lawson . ISBN-13: 978-0471179337. John Wiley and sons. Canada.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as the use of NPTEL materials and the internet |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 1 | 3 | | | 3 | | 3 | 3 | | 3 | 1 | | 1 |
| CO2 | | 1 | 3 | | | 3 | 3 | 3 | | | 3 | 1 | | 3 |
| CO3 | | 1 | 3 | | | 3 | | 3 | | | 3 | 1 | | 1 |
| CO4 | | 1 | 3 | | | 3 | | 3 | 3 | 3 | 3 | 1 | | 1 |
| CO5 | | 1 | 3 | | | 3 | | 3 | | 1 | 3 | 1 | | 1 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1 CD2, CD3 |
| **CO2** | CD1 CD2, CD3 |
| **CO3** | CD1 CD2, CD3 |
| **CO4** | CD1 CD2, CD3 |
| **CO5** | CD1 CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24309**
**Course Title: STRUCTURAL ENGINEERING LABORATORY II**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 2** L: 0 T: 0 P: 2
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VII**
**Branch: CEE**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Perform laboratory tests to determine the properties of materials used to make concrete |
| **2.** | Perform laboratory tests to determine the properties of fresh and hardened concrete |
| **3.** | Perform non-destructive laboratory tests on hardened concrete |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Conduct the regular test on assessing quality of materials used to make concrete |
| **CO2** | Conduct tests to ascertain the desired properties of fresh and hardened concrete required for the concrete structure. |
| **CO3** | Conduct non-destructive tests and assess the properties of hardened concrete. |

**SYLLABUS (List of experiments)**

**A. Test on Cement**
1. Determination of fineness of cement.
2. Determination of specific gravity of cement.
3. Consistency test on cement.
4. Determination of setting times of cement.
5. Determination of soundness of cement.
6. Determination of compressive strength of cement

**B. Test on aggregates**
1. Sieve analysis of the coarse and fine aggregates
2. Specific gravity and water absorption of fine and coarse aggregates
3. Bulking of sand

**C. Test on bricks**
1. Water Absorption, specific gravity and compressive strength of brick

**D. Test on fresh concrete**
1. Slump cone test
2. Compaction factor

**E. Test on hardened concrete**
1. Compressive strength
2. Flexural strength
3. Split tensile strength

**F. Non-Destructive Test**
1. Ultrasonic Pulse Velocity Test
2. Rebound Hammer

**TEXTBOOKS:**

1. Concrete Technology: Theory and Practice, M. L. Gambhir, Pearson India

**REFERENCE BOOKS:**

1. Concrete Technology, A. M. Neville and J. J. Brooks, Pearson India

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Laboratory demonstrations by faculty. |
| **CD2** | Hands-on experimental performance in groups. |
| **CD3** | Data recording, analysis, Report writing, viva-voce. |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **2** | **3** | **1** | | | **1** | | **2** | **2** | | | | **3** | **3** |
| CO2 | **2** | **3** | **1** | | | **1** | | **2** | **2** | | | | **3** | **3** |
| CO3 | **2** | **3** | **1** | | | **1** | | **2** | **2** | | | | **3** | **3** |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

# COURSE INFORMATION SHEET

**Course Code: CE24310**
**Course Title: COMPUTER AIDED ANALYSIS AND DESIGN**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 0 T: 0 P: 3
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: V**
**Branch: CEE**
**Name of Teacher:**

## COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To introduce to the students about the software tools useful for Civil Engineering |
| **2.** | To make students aware of software which can be implemented for solving Civil Engineering problems |

## COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Identify and formulate Civil Engineering problems using STAAD software necessary for engineering practice. |
| **CO2** | Use the latest software to solve the Civil Engineering problems with the aid of technological skills |

**SYLLABUS**

Use of latest software packages with pre-processors and post-processor facility for analysis and design of Civil Engineering problems.

**REFERENCE BOOKS:**

1. STAAD Manual

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Laboratory experiments/teaching aids |
| **CD2** | Lecture with LCD Projectors |
| **CD3** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 1 | | | 1 | | 2 | 2 | | | | 3 | 3 |
| CO2 | 2 | 3 | 1 | | | 1 | | 2 | 2 | | | | 3 | 3 |
| CO3 | 2 | 3 | 1 | | | 1 | | 2 | 2 | | | | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24311**
**Course Title: GEOTECHNICAL ENGINEERING LABORATORY**
**Pre-requisite(s): CE24303 Geotechnical Engineering**
**Co- requisite(s):**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: VI**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | Perform Moisture content, Specific gravity and Atterberg limits tests. |
| **2.** | Perform Grain size distribution, and Permeability tests |
| **3.** | Perform Standard Proctor test and Unconfined compression test |
| **4.** | Perform Direct Shear, Vane Shear and Triaxial tests |
| **5.** | Perform Sand replacement method and Core cutter method for field density |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Determine Moisture content, Specific gravity, and Atterberg limits tests of given soil sample |
| **CO2** | Determine Grain size analysis and Permeability of given soil sample |
| **CO3** | Determine OMC and MDD and Unconfined compressive strength of given soil sample |
| **CO4** | Determine Cohesion and Angle of Internal Friction of different types of soil |
| **CO5** | Determine the density of soil in the field |

**SYLLABUS (List of experiments)**

1. Determination of moisture content and specific gravity
2. Determination of Atterberg limits
3. Determination of Grain size distribution
4. Proctor Compaction test
5. Unconfined compression test
6. Triaxial test
7. Vane shear test
8. Direct shear test
9. Sand replacement and Core cutter test
10. Permeability test (constant and variable head

**REFERENCE MATERIALS:**

1. Lab manuals (available on department website)

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

NA

**POS MET THROUGH GAPS IN THE SYLLABUS**

NA

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

NA

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

NA

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Introductory lecture by use of boards/LCD projectors |
| **CD2** | Laboratory experiments/ teaching aid |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET

**Course Code: CE24312**
**Course Title: TRANSPORTATION ENGINEERING LABORATORY**
**Pre-requisite(s): CE24305**
**Co- requisite(s): NA**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B. TECH.**
**Semester / Level: VI/ 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | To conduct shape test and impact value of road aggregates |
| **2.** | To conduct Los Angeles abrasion test on road aggregates |
| **3.** | Determine the properties of bitumen and the resistance of bituminous mix |
| **4.** | To assess the structural integrity of a pavement |
| **5.** | To conduct traffic volume study and spot speed study |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | To determine the combined flakiness and elongation Index of road aggregates and also estimate the aggregate impact value. |
| **CO2** | To determine the abrasion value of aggregate sample by conducting Los Angeles abrasion test. |
| **CO3** | Determine viscosity, ductility, flash and fire point, penetration value, softening point and<br>specific gravity and also to calculate the strength of bituminous mix. |
| **CO4** | To evaluate load carrying capability of highways |
| **CO5** | Analyse the different variables and factors and distribution of traffic for the design of highway system |

**SYLLABUS (List of experiments)**

1. Test on aggregate: Aggregate shape test
2. Test on aggregate: Aggregate impact value test
3. Test on aggregate: Los Angeles abrasion test
4. Determination of specific gravity and softening point of bitumen
5. Determination of viscosity of bitumen
6. Determination of ductility of bitumen
7. Determination of flash and fire point of bitumen
8. Determination of penetration value of bitumen
9. Marshall apparatus
10. To conduct falling weight deflectometer (FWD) test on a road
11. Traffic volume study and Spot speed study

**TEXTBOOKS:**


1. Khanna, S.K., Justo C.E.G., and Veeraraghavan.: Highway Engineering, Nem Chand and Bros.
2. Chakroborty, P. and A. Das Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd, New Delhi, India, 2005.
3. Ministry of Road Transport and Highways ( 5th Rev): Specifications for Road and Bridge Works (Indian Roads Congress)
4. IRC Codes of Practices


**REFERENCE BOOKS:**


1. Garber N.J and Hoel L : Traffic and Highway Engineering ( Cengage Learning)
2. Pignataro LJ. Traffic Engineering: Theory and Practice; Prentice hall
3. All laboratory tests are as per IS, ASTM, AASHTO, TRL, IRC, BS procedures specifications and guidelines.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Introductory lecture by use of boards/LCD projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 1 | 3 | 3 | 2 | 2 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD5, CD6, CD7, CD8 |
| **CO2** | CD5, CD6, CD7, CD8 |
| **CO3** | CD5, CD6, CD7, CD8 |
| **CO4** | CD5, CD6, CD7, CD8 |
| **CO5** | CD5, CD6, CD7, CD8 |

## COURSE INFORMATION SHEET (PE5)

**Course Code: CE 24451**
**Course Title: PRE-STRESSED CONCRETE**
**Pre-requisite(s): CE242021, CE24301**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VII / 4**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Develop basic knowledge of pre stressed concrete so that the students can solve real engineering problems. (K1, K2) |
| **2.** | Understand behaviour of pre stressed concrete structures subjected to simple and complex mechanical loadings. (K1, K2) |
| **3.** | Analyse and design safe and sound pre stressed concrete civil engineering structures. (K3, K4) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Evaluate the feasibility of using pre stressed concrete for a given structure. (K1, K2) |
| **CO2** | Evaluation or analysis of the members for different loading conditions. (K1, K2, K3) |
| **CO3** | Evaluate the losses in pre stressed concrete. (K1, K2, K3) |
| **CO4** | Design the pre stressed member for solving real problems.(K1, K2, K3, K4) |
| **CO5** | Evaluate serviceability of a given pre stressed concrete structure. (K2, K3, K4) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction to Prestressed Concrete**<br>Brief History, Advantages of Prestressing, Limitations of Prestressing, Types of Prestressing, Prestressing Systems and Devices, Properties of Hardened Concrete and Prestressing Steel. | **8** |
| **Module – II: Analysis of Members**<br>Analysis of Members Under Axial Load, Analysis of Member Under Flexure, Cracking moment, Kern point, Pressure line, Analysis for Shear and Torsion | **8** |
| **Module – III: Losses in Prestress**<br>Elastic Shortening, Friction, Anchorage Slip, Creep of Concrete, Shrinkage of Concrete, Relaxation of Steel. | **8** |
| **Module – IV: Topographical Disasters**<br>**Module IV: Design of Members**<br>Design for Axial Tension, Design for Flexure, Design for Shear and Torsion. | **8** |
| **Module – V: Calculations of Deflection and Crack Width**<br>Deflection due to Gravity Loads and Prestressing Force, Limits of Deflection, Limits of crack width and its calculation. | **8** |

**TEXTBOOKS:**


1. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 1981.
2. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House, 1955.


**REFERENCE BOOKS:**


1. Limited State Design of Prestressed Concrete, Guyan Y., Applied Science Publishers, 1972.
2. IS 1343- Code of Practice for Prestressed Concrete.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **3** | **2** | **3** | **2** | **2** | **1** | | | | | **1** | **3** | **1** | **3** |
| CO2 | **3** | **2** | **3** | **2** | **2** | **1** | | | | | **2** | **3** | **1** | **3** |
| CO3 | 3 | 2 | 3 | 2 | **2** | 1 | | | | | **1** | 3 | **1** | 3 |
| CO4 | 3 | 2 | 3 | 2 | **2** | 2 | | | | | **1** | 3 | **1** | 3 |
| CO5 | 3 | 2 | 3 | 2 | **2** | 2 | | | | | **1** | 3 | **1** | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD8 |
| CO2 | CD1, CD2,CD4,CD8 |
| CO3 | CD1, CD2, CD4, CD8 |
| CO4 | CD1, CD8 |
| CO5 | CD1, CD8 |

## COURSE INFORMATION SHEET (PE5)

**Course Code: CE24452**
**Course Title: ADVANCED CONCRETE STRUCTURES DESIGN**
**Pre-requisite(s): CE24301**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Apply knowledge of limit state design method in addressing design problems of concrete structures. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Design RCC elements such as slender columns, water tanks, staircases, retaining walls, and foundation as per Indian standards. |
| **CO2** | Design special structures such as Deep beams, Corbels, and Grid floors. |
| **CO3** | Interpret and draw a RCC detailing drawing of concrete structures as per the Design |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Staircase and Flat slab design**<br>General design features of commonly used stair slabs, Design of flat slabs according to IS method | **8** |
| **Module – II: Retaining walls**<br>Forces on retaining wall, stability requirement, Design of retaining wall | **8** |
| **Module – III: Design of special RC elements**<br>Design of slender columns, Design of corbels, Deep-beams and grid floors | **8** |
| **Module – IV: Water tanks**<br>Tanks resting on the ground, Overhead water tank, Joints in the water tank | **8** |
| **Module – V: Design of Footing**<br>Isolated footing subjected to eccentric loading, Combined footing, Raft foundation | **8** |

**TEXTBOOKS:**


1. Subramanian,N.,"Design of Reinforced Concrete Structures",Oxford University Press, New Delhi, 2013.
2. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete",Laxmi Publication Pvt. Ltd., New Delhi, 2007.
3. Varghese, P.C., "Advanced Reinforced Concrete Design", Prentice Hall of India, Pvt. Ltd., New Delhi, 2005.
4. Gambhir.M.L., "Design of Reinforced Concrete structures", Prentice Hall of India Private Limited, New Delhi, 2008.


**REFERENCE BOOKS:**


1. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000
2. SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 |
|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y |
| Semester End Examination | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 0 | 2 | 2 | 0 | 0 | 0 | 2 | 0 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 0 | 2 | 2 | 0 | 0 | 0 | 2 | 0 | 3 | 2 | 3 |
| CO3 | 3 | 2 | 3 | 0 | 2 | 0 | 0 | 0 | 1 | 2 | 0 | 3 | 2 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET (PE5)

**Course Code: CE24453**
**Course Title: ADVANCE STEEL STRCUTRE DESIGN**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VII**
**Branch: CEE**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To equip students with the knowledge and skills for designing steel structures, including connections, industrial buildings, plate girders, gantry girders, cold-formed steel sections, and towers, while applying codal provisions and practical design methodologies. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Explain different types of steel connections, including bolted and welded connections, and analyze their structural behavior under various loading conditions. |
| **CO2** | Design industrial building components, plate girders, and gantry girders considering load combinations, codal provisions, and practical constraints. |
| **CO3** | Apply design principles to cold-formed steel structures and tower structures, accounting for local buckling effects, combined loading, and foundation considerations. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Connections**<br>Classification of connections, semi-rigid and rigid connections, framed and seated connections, moment-resistant connections, along with an introduction to bolted and welded connections. | **8** |
| **Module – II: Industrial Buildings**<br>Various components of industrial buildings, considerations for loads and load combinations, different types of roof systems, design aspects of purlins and roof trusses, and an overview of industrial building frames with emphasis on lateral load resistance. | **8** |
| **Module – III: Plate Girders and Gantry Girders**<br>Design principles of riveted and welded plate girders, selection and curtailment of flange plates, functional requirements and design of stiffeners, significance of splices, and the structural design of gantry girders considering their practical applications. | **8** |
| **Module – IV: Cold-Formed Steel Structures**<br>Fundamental concepts and applications of cold-formed steel sections, advantages over conventional hot-rolled sections, influence of local buckling and strategies for its mitigation, structural design considerations for beams, columns, and tension members, assessment of combined bending and compression effects, and an introduction to empirical and codal design methods. | **8** |
| **Module – V: Towers and Masts**<br>Overview of different types of towers and their configurations, essential load considerations based on codal provisions, analysis and design methodologies, structural aspects of latticed towers and monopoles, and an in-depth discussion on foundation design and load transfer mechanisms for tower structures. | **8** |

**TEXTBOOKS:**


1. N. Subrhamanyan, “Design of Steel Structures”, Oxford Publication.
2. M. L. Gambhir, "Fundamentals of structural steel design", Mc Graw Hill
3. Ram Chandra, “Design of Steel Structures (Vol. - I & II)” , Standard Book House, New Delhi
4. S.K. Duggal, “Design of Steel Structure”, Tata Mc Graw Hill.
5. P. Dayarathnam , “Design of Steel Structures”, Wheeler.


**REFERENCE BOOKS:**


1. C.G. Salmon and J.E. Johnson, “Steel Structures: Design and Behaviour”, Harper and Row, New York


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | | | 1 | | 2 | 2 | | | 3 | | |
| CO2 | 3 | 3 | 1 | | | 1 | | 2 | 2 | | | 3 | 3 | 3 |
| CO3 | 3 | 3 | 1 | | | 1 | | 2 | 2 | | | 3 | | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET (PE6)

**Course Code: CE24454**
**Course Title: ADVANCED SURVEYING**
**Pre-requisite(s): CE24208**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: 7 / 4**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To learn calculation of area and volume by different methods (K1, K2, K3). |
| **2.** | To learn the principles of tacheometric surveying (K1, K2, K3) |
| **3.** | To get the knowledge of photogrammetric surveying (K1, K2, K3). |
| **4.** | To know about the applications of remote sensing and Electro-magnetic distance measurement in surveying (K1, K2, K3). |
| **5.** | To learn the uses of GIS and GPS (K1, K2, K3). |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to calculate the area and volume by different methods (K1, K2, K3). |
| **CO2** | Able to perform tacheometric surveying (K1, K2, K3). |
| **CO3** | Capable of conducting photogrammetric surveying (K1, K2, K3). |
| **CO4** | Able to use remote sensing and Electro-magnetic distance measurement instruments as a tool in civil engineering applications (K1, K2, K3) |
| **CO5** | Able to apply GIS and GPS in the field of civil engineering (K1, K2, K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Calculation of Area and Volume**<br>Areas computed by sub-division into triangles, areas from offsets to a base line, offsets at regular intervals, area by double meridian distances, area by co-ordinates, area computed from map measurements, planimeter. Measurement of volume from cross-sections, Prismoidal formula, Trapezoidal formula, prismoidal correction, curvature correction. Volume from spot levels, Volume from contour plan. | |
| **Module – II: Tacheometric Surveying**<br>Instruments involved, types of telescopes and stadia diaphragm, tacheometric constant; anallactic Lens, different systems of tacheometric measurements; Subtense Bar; field work in tacheometry. | |
| **Module – III: Photogrammetric Surveying**<br>Introduction, Definitions and nomenclatures, Photographic measurements, Aerial camera, Vertical photograph, Tilted photograph, Tilt and Relief, Parallax, Rectification and enlargements of photographs, Mosaics. | |
| **Module – IV: Remote Sensing and Electro-magnetic distance measurement**<br>Electromagnetic spectrum, Interaction of electromagnetic energy with matter, Remote-sensing sensor systems, Platforms, Ideal and Real remote-sensing systems, Applications of remote sensing, Land use/ Land cover analysis, Introduction of EDM, Electromagnetic waves, Modulation, Types of EDM instruments, The geodimeter, The tellurometer, Wild 'distomats'. | |
| **Module – V: GIS and GPS**<br>Data for GIS, Capabilities/ Functionalities of GIS, Map overlay analysis, Data quality, Sources of Errors in GIS, Applications of GIS; Satellite constellation, Operational control segment, Equipment segment, Determining satellite-to-user range, Calculation of user position, accuracy, Uses and applications of GPS. | |

**TEXTBOOKS:**

1. Punmia, B.C., Jain, A.K., Jain, A.K. "Surveying" – Vol. 1 and 2, Laxmi Publications (P) Ltd.
2. Duggal, S.K. "Surveying" – Vol. 1 and 2, McGraw-Hill Education (India) Pvt. Ltd.

**REFERENCE BOOKS:**

1. Subramanian, R. "Surveying and Levelling" – Oxford University Press, New Delhi

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | | | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 1 | 1 | 1 | 3 | 2 | 2 | 1 | 1 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 1 | 3 | 1 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 1 | 3 | 1 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2 and CD8 |
| **CO2** | CD1, CD2 and CD8 |
| **CO3** | CD1, CD2, and CD8 |
| **CO4** | CD1, CD2, and CD8 |
| **CO5** | CD1, CD2 and CD8 |

## COURSE INFORMATION SHEET (PE6)

**Course Code: CE24455**
**Course Title: ADVANCED SOIL MECHANICS**
**Pre-requisite(s): CE24303**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VII / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | To familiarize with the procedures involved in a geotechnical site investigation. |
| **2.** | To estimate stress distribution & settlement in soil media. |
| **3.** | To understand the earth pressure theory. |
| **4.** | To study stability of slopes. |
| **5.** | To study methods of stabilization of soil. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Perform soil investigation for common civil engineering works. (K3) |
| **CO2** | Determine stress distributions in soils & estimate different types of settlement. (K3 K4,K5) |
| **CO3** | Calculate earth pressure for the design of earth retaining Structures. (K3.K4,K5) |
| **CO4** | Perform stability analysis of slopes. (K3,K4) |
| **CO5** | Perform stabilization of soils (K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Site Investigation and subsoil exploration:** Methods of soil exploration; Planning a subsoil exploration: Number of boreholes and depths of exploration for various types of works; Field Tests: Standard penetration test; Dynamic and Static cone penetration tests; Vane shear test; Geophysical Exploration; Soil samplers & collection of soil samples | **8** |
| **Module – II: Stress Distribution in Soil Media and Settlement** Stress Distribution: Boussinesq's and Westergaard's equations, Pressure distribution diagram, Newmark's influence chart; Contact pressure below foundations –Steinbrenner's coefficients; Settlement of foundations : Elastic, Consolidation and Creep settlements; Total and Differential settlements; Rate of settlement, I. S. Code limitations for different structures Settlement calculation from consolidation characteristics and using N-values 8 Lectures | **8** |
| **Module – III: Earth Pressure Theory** Plastic equilibrium in soil – active & passive cases. Active earth pressure –Rankine's Theory; Active & passive earth pressure of cohesive & cohesion-less soil; Rankine's active thrust by trial wedge; Coulomb's wedge theory – Rebhann's construction & Culmann's construction | **8** |
| **Module – IV: Stability of Slopes** Stability analysis of finite & infinite slopes; Types of slope failures; Methods of analysis for slope stability –method of slices; Bishop's simplified method; Friction circle method; Stability Number; Stability of slopes of Earth dams | **8** |
| **Module – V: Stabilization of Soils** Mechanical stabilization, Cement stabilization, Lime stabilization, Bitumen stabilization, Chemical stabilization, Stabilization by Heating, Electrical stabilization | **8** |

**TEXTBOOKS:**

1. Soil Mechanics and Foundations by Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain
2. Geotechnical Engineering by C. Venkataramaiah

**REFERENCE BOOKS:**

1. Soil Mechanics and Foundation Engineering – V.N.S. Murthy

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Continuous Internal Assessment | 25 |
| Mid Sem Exam | 25 |
| Semester End Examination | 50 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Quiz | 10 |
| Assignment | 10 |
| Teachers Assesment | 5 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | ✓ | ✓ | ✓ | ✓ | ✓ |
| Semester End Examination | ✓ | ✓ | ✓ | ✓ | ✓ |

**INDIRECT ASSESSMENT**

**1. Student feedback on course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 1 | 1 | 0 | 2 | 1 | 0 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 1 | 1 | 0 | 2 | 1 | 0 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 1 | 0 | 2 | 1 | 0 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 1 | 1 | 0 | 2 | 1 | 0 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 1 | 1 | 0 | 2 | 1 | 0 | 3 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO2 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO3 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO4 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO5 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |

## COURSE INFORMATION SHEET (PE6)

**Course Code: CE 24456**
**Course Title: FOUNDATION ENGINEERING**
**Pre-requisite(s): CE24303**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VII / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | To understand the methodology of selecting type of foundation under different criteria. |
| **2.** | To know how to design combined footings and raft footings |
| **3.** | To study design methods of Well foundations, Coffer dams, Pier Foundations. |
| **4.** | To understand the concept of machine foundations. |
| **5.** | To know the methodology of constructing foundations on expansive soils. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Select the foundation types in different soil conditions. (K3, K4) |
| **CO2** | Design Combined footings and Raft footings (K3,K4,K5) |
| **CO3** | Construct well foundations, coffer dams, pier foundations. (K3, K4) |
| **CO4** | Design machine foundations. (K3, K4, K5) |
| **CO5** | Construct foundations on expansive soils (K4, K5) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Basic foundation design parameters**<br>Choice of foundation type and preliminary selection, Proportioning sizes of footings and choice of column loads, Footings subjected to moments – eccentric loading, Useful width concept; Inclined loading; Footings on slope. | **8** |
| **Module – II: Combined footings and Raft footings**<br>Types of combined footings – Rectangular combined footing, Trapezoidal combined footing, Strap, or cantilever footing. Advantages of combined footings. Bearing capacity of rafts on clay and sands. Design of Raft foundations – conventional method and elastic method (soil line method). Floating raft | **8** |
| **Module – III: Well foundations, Coffer dams and Pier foundations**<br>Types of well foundations, Components of well foundations, sinking of well foundations, Allowable bearing pressure, Analysis based on bulkhead concept. Cofferdams – types and uses, Stability and design of cofferdams. Pier foundation and its types and uses. | **8** |
| **Module – IV: Machine Foundations**<br>Classification of machines, Types of machine foundations, Requirements of machine foundations, Damping, Free vibration, Forced vibration, Resonant frequency, Dynamic soil properties, Design of machine foundations. | **8** |
| **Module – V: Foundations on expansive soils**<br>General characteristics of expansive soils, Clay mineralogy and mechanism of swelling, swelling potential, swelling pressure, Free swell, Evaluation of swelling potential, Estimating the magnitude of swelling, Design of foundations in swelling soils, Elimination of swelling. | **8** |

**TEXTBOOKS:**

1. Soil Mechanics and Foundations by Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain
2. Geotechnical Engineering by C. Venkataramaiah

**REFERENCE BOOKS:**

1. Advanced Foundation Engineering – V.N.S. Murthy

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Continuous Internal Assessment | 25 |
| Mid Sem Exam | 25 |
| Semester End Examination | 50 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Quiz | 10 |
| Assignment | 10 |
| Teachers Assesment | 5 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | ✓ | ✓ | ✓ | ✓ | ✓ |
| Semester End Examination | ✓ | ✓ | ✓ | ✓ | ✓ |

**INDIRECT ASSESSMENT**

1. **Student feedback on course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 2 | 0 | 2 | 1 | 0 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 1 | 1 | 0 | 1 | 1 | 0 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 1 | 1 | 0 | 1 | 1 | 0 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 1 | 1 | 0 | 1 | 1 | 0 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 1 | 1 | 0 | 1 | 1 | 0 | 3 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO2 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO3 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO4 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |
| CO5 | CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8 |

## COURSE INFORMATION SHEET (PE7)

**Course Code: CE 24457**
**Course Title: REMOTE SENSING IN CIVIL ENGINEERING**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VII / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | To develop basic understanding of remote sensing |
| **2.** | To interpret and develop understandings on satellite image interpretation |
| **3.** | To assess the application of RS technologies in Civil engineering |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand working principles of remote sensing, history of satellite development. |
| **CO2** | Procurement of India and global satellite data. |
| **CO3** | Interpret satellite images, verify and derive conclusions. |
| **CO4** | Apply processing tools to classify land use and land cover. |
| **CO5** | Integrate the applications of Air borne platforms. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Principles of Remote Sensing**<br>Definition and Historical overview, Image Procurement, Electromagnetic spectrum, Atmospheric Windows, Physics of Remote Sensing, Spectral Signatures, Spectral Response pattern of soil, Vegetation & water. | **8** |
| **Module – II: Satellite, Sensors and Image Interpretation**<br>Imaging & non-imaging sensors, Active & passive sensors, High- and Low-resolution sensors, Sensor Resolutions, Indian and Global Satellites, Fundamentals of Image Interpretation Techniques. Applications of different sensors. | **8** |
| **Module – III: Image Processing**<br>Contrast Enhancement, Filtering, Band Ratio and Indices. Supervised Classification and Unsupervised Clustering. Applications of processing tools. | **8** |
| **Module – IV: Platforms and Aerial Vehicles**<br>Aerial Photography, platforms, UAVs and their applications in environmental management and Biodiversity conservation. | **8** |
| **Module – V: Applications in Civil Engineering**<br>Applications of Remote Sensing in transportation, urban planning, water resource, and soil studies. | **8** |

**TEXTBOOKS:**


1. Jensen, J.R., (2006) "Remote Sensing of the Environment – An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi.
2. Jensen, J.R., (1996) Introductory Digital Image Processing A remote sensing perspective. Prentice Hall Series in GIS , USA
3. Lillesand, Thomas M. and Kiefer, Ralph, W., (2007) "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York


**REFERENCE BOOKS:**


1. Sabins, F.F. Jr., (2007). 'Remote Sensing – Principles and Interpretation", W.H. Freeman & Co.
2. Reeves, Robert G. (1991), "Manual of Remote Sensing, Vol. I, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia, USA


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student feedback on course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| CO2 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0 |
| CO3 | 0 | 2 | 1 | 3 | 3 | 3 | 0 | 1 | 2 | 1 | 0 | 2 | 2 | 0 |
| CO4 | 2 | 2 | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 0 |
| CO5 | 2 | 1 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 1 | 0 | 3 | 2 | 0 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2 |
| CO2 | CD1, CD2 |
| CO3 | CD1, CD2 |
| CO4 | CD1, CD2 |
| CO5 | CD1, CD2 |

## COURSE INFORMATION SHEET (PE7)

**Course Code: CE24458**
**Course Title: GROUNDWATER ENGINEERING**
**Pre-requisite(s): CE24203**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VII / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To understand concepts of hydrogeology and groundwater flow. |
| **2.** | To measure and improve the quality of groundwater. |
| **3.** | To investigate the availability of groundwater resources. |
| **4.** | To design groundwater flow models. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand the aquifer parameters for estimation of groundwater resources at different geological conditions. (K1, K2) |
| **CO2** | Understand well hydraulics and analyse the flow. (K1, K2, K3) |
| **CO3** | Model the groundwater flow and design the artificial groundwater recharge. (K1, K2, K3) |
| **CO4** | Investigate the ground water resources using different techniques. (K1, K2, K3) |
| **CO5** | Measure and analyse the groundwater quality & develop pollution control measures. (K1, K2, K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Hydrogeology**<br>Introduction: Groundwater development in India, Conjunctive use of groundwater, Groundwater in the hydrologic cycle, Vertical distribution of Groundwater, Geologic formations of aquifers, Types of aquifers, Storage Coefficient. Groundwater Movement: Darcy's law, Permeability, Hydraulic Conductivity, Anisotropic Aquifers, Groundwater Flow rates and flow directions, General flow equations. | **8** |
| **Module – II: Well Hydraulics**<br>Steady unidirectional flow, Steady radial flow in a well, Well in a uniform flow, Unsteady radial flow in confined and unconfined aquifers, Well flow near aquifer boundaries, Characteristic well losses, Specific capacity, Recharge methods, Artificial recharge, Water spreading, Wastewater Recharge, Recharge mounds. | **8** |
| **Module – III: Groundwater Modelling Techniques**<br>Groundwater models, porous media models, Analog models, Electrical analog models, Digital computer models**.** | **8** |
| **Module – IV: Groundwater Geophysical Investigations**<br>Surface geophysical techniques, Electrical resistivity, Seismic refraction and reflection, Remote Sensing application. | **8** |
| **Module – V: Groundwater Quality**<br>Water sampling, Groundwater quality standards, Potable water standards of WHO, Geotechnical survey of groundwater for various requirements. | **8** |

**TEXTBOOKS:**


1. Ground water Hydrology, D. K. Todd, John Wiley & Sons.
2. Groundwater Hydrology – D.K. Todd & L.W. Mays, John Wiley & Sons.
3. Ground Water, H. M. Raghunath, New Age International (P) Limited, Publishers.
4. Groundwater Hydrology, H. Bowner, McGraw Hill.
5. Applied Hydrogeology, C.W. Fetter, Pearson Education Limited.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's Assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and Assignment | 40 |
| Teacher's Assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 1 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

**COURSE INFORMATION SHEET (PE7)**

**Course Code: CE24459**
**Course Title: DESIGN OF HYDRAULIC STRUCTURES**
**Pre-requisite(s): CE24203**
**Co- requisite(s): NA**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VII / 3**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To know about different types of hydraulic structures. |
| **2.** | To analyse the forces acting on the hydraulic structures. |
| **3.** | To design hydraulic structures. |
| **4.** | To ensure fulfilment of societal requirements and environmental sustainability while designing the hydraulic structures. |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Acquire knowledge of various types of dams and analyse forces acting on gravity dam. (K1, K2, K3) |
| **CO2** | Analyse the forces acting on a hydraulic structure, causes of their failure and their remedial measures. (K1, K2, K3) |
| **CO3** | Analyse the requirement and design of a canal fall and regulator. (K1, K2, K3) |
| **CO4** | Analyse and design cross-drainage works. (K1, K2, K3) |
| **CO5** | Design and investigate various types of canal outlets and escapes. (K1, K2, K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Gravity Dams**<br>Types of dams, Forces acting on a gravity dam, Modes of failure, Stability requirements, Principal and shear stress, Elementary Profile of a Gravity Dam, High and low gravity dams, Design of gravity dams. | **8** |
| **Module – II: Diversion Headworks**<br>Component of diversion headworks, Causes of failure of weirs and their remedies, Design of impervious floor, Design of vertical drop weir. | **8** |
| **Module – III: Canal Falls and Canal Regulators**<br>Necessity of canal falls, Classification of falls, Cistern design, Design of Sarda type falls, Head regulators and cross regulators, Design of cross regulators and distributary head regulators | **8** |
| **Module – IV: Cross Drainage Works**<br>Types of cross drainage works, Selection of suitable type of cross drainage works, Classification of aqueducts and syphon aqueducts, design of cross drainage works. | **8** |
| **Module – V: Canal Outlets and Escapes**<br>Types of canal outlets, Non-modular outlets, Flexible module, Rigid module, Canal escape. | **8** |

**TEXTBOOKS:**


1. Irrigation and Water Power Engineering by B.C. Punmia, Pande B.B. Lal, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.
2. Irrigation Engineering and Hydraulic Structures by S. K. Garg, Khanna Publishers.
3. Irrigation and Water Resource Engineering by G.L. Asawa, New Age Publishers


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| Quiz | 10 |
| Assignment | 10 |
| Teacher's Assessment | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and Assignment | 40 |
| Teacher's Assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 3 | 2 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

# COURSE INFORMATION SHEET

**Course Code: MT24204**
**Course Title: CONSTITUTION OF INDIA**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 1** L: 02 T: 0 P: 0
**Class schedule per week: 2**
**Class: Bachelor of Technology**
**Semester / Level: VI/4**
**Branch:**
**Name of Teacher: Dr Anand Kumar**

## COURSE OBJECTIVES

This course aims to impart to students:

| | |
|---|---|
| **1.** | To describe the importance and role of Constitution of India |
| **2.** | To explain the provisions related to Social Problems and Issues in Constitution |
| **3.** | To explain the significance of the Constitution for maintaining social unity and integrity |
| **4.** | To describe the process for formulating and designing public policies in accordance with constitutional provisions |

## COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Outline the need and importance of the Indian Constitution |
| **CO2** | Explain the fundamental rights and duties of citizens of India |
| **CO3** | Relate appropriate Constitutional Provisions with relevant social issues |
| **CO4** | Describe the role of different departments of government |
| **CO5** | Describe the Government policies and programs designed for the society at large |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I**<br>Introduction to the Constitution of India, Salient Features of the Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy. | **9** |
| **Module – II**<br>Union and State Executives: President and Prime Minister, Council of Ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha. Governor: Role and Position, Chief Ministers and Council of Ministers. | **9** |
| **Module – III**<br>The Indian Judicial System - The Supreme Court and The High Court's - composition, Jurisdiction and functions, The Role of the Judiciary. | **9** |
| **Module – IV**<br>Local Government- District's Administration: Role and Importance, The Panchayatas - Gram Sabha, Constitution and Composition of Panchayatas,Constitution and Composition of Municipalities | **9** |
| **Module – V**<br>Miscellaneous- Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women. | **4** |

**TEXTBOOKS:**


1. The Constitution of India by "Ministry of Law India" Kindle Edition
2. Constitutional History of India by Prof.M.V.PYLEE-S.Chand Publishing
3. Indian Administration by Avasti and Avasti-Lakshmi Narain Agarwal Educational Publishers.2017 edition.
4. Introduction to the Constitution of India by D DBasu by Lexis Nexis: 20th edition.
5. Constitution of India V.N.Shukla's EBC Explorer Edition 13th,2017


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| End Semester Examination | 50 |
| Quiz (s) | 20 |
| Assignment | 5 |
| Mid-Semester Exam | 25 |
| | |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Quiz (s) | 20 |
| Assignment | 5 |
| Mid-Semester Exam | 25 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | 2 | 2 | 2 | 2 | |
| Semester End Examination | 2 | 2 | 2 | 2 | 2 |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lecture using boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/Teaching aids |
| **CD6** | Industrial/Guest lectures |
| **CD7** | Industrial visits/In-plant training |
| **CD8** | Self, learning such as the use of NPTEL materials and the internet simulation |
| **CD9** | Tutorials/Assignments |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **2** | **2** | **1** | **2** | **1** | **2** | **2** | **2** | **2** | **1** | **2** |
| CO2 | **2** | **2** | **1** | **2** | **2** | **2** | **2** | **2** | **1** | **2** | **2** |
| CO3 | **2** | **2** | **1** | **2** | **1** | **2** | **2** | **2** | **2** | **1** | **1** |
| CO4 | **2** | **2** | **1** | **2** | **2** | **2** | **2** | **2** | **2** | **1** | **1** |
| CO5 | **2** | **2** | **1** | **2** | **1** | **2** | **2** | **2** | **2** | **3** | **3** |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | Lecture using boards/LCD projectors/OHP projectors |
| **CO2** | Lecture using boards/LCD projectors/OHP projectors |
| **CO3** | Lecture using boards/LCD projectors/OHP projectors |
| **CO4** | Tutorials/Assignments |
| **CO5** | Seminars |

## COURSE INFORMATION SHEET

**Course Code: CE24402**
**Course Title: REMOTE SENSING AND GIS LABORATORY**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: I**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | To describe the concept of remote sensing and GIS (K2) |
| **2.** | To understand the mechanism of image interpretation (K2) |
| **3.** | To interpret and identity features of a satellite data (K4) |
| **4.** | To assess the applicability of tools for civil engineering purpose (K5) |
| **5.** | To perform and analyse tools for environmental management (K5) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Explain the concepts of remote sensing and GIS (K2) |
| **CO2** | Compare different features on a satellite image using multiple image interpretation techniques. (K4) |
| **CO3** | Identify and apply software tools for civil and urban development (K5) |
| **CO4** | Identify and apply software tools for environmental sustainability (K5) |
| **CO5** | Prepare informative maps for multiple purposes (K5) |

### SYLLABUS (List of experiments)

1. Introduction to Concepts of Remote Sensing, GIS and GPS
2. Introduction to various sensors, satellite and Softwares related to Remote Sensing, & GIS
3. Satellite Image Interpretation of known locations and ground verification
4. Satellite Image Interpretation of unknown locations
5. To create an Area on interest using subset and mosaic tools.
6. To Perform Supervised classification to prepare a LULC Map
7. To Perform UnSupervised classification to prepare a LULC Map
8. To apply Indices for urban and environmental analysis
9. To create point, line and polygon features for Map Generation
10. To add and create attributes for analysing data sets in Arc GIS platform
11. To apply buffering techniques for Urban and Environmental Analysis
12. To apply interpolation techniques for Urban and Environmental Analysis
13. To prepare maps using all map components.

### REFERENCE MATERIALS:

1. Lab manuals

### GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)

### POS MET THROUGH GAPS IN THE SYLLABUS

### TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Introductory lecture by use of boards/LCD projectors |
| **CD2** | Laboratory experiments/ teaching aid |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **3** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **1** | **0** |
| CO2 | **2** | **3** | **0** | **1** | **2** | **2** | **1** | **2** | **0** | **0** | **0** | **1** | **1** | **0** |
| CO3 | **2** | **3** | **3** | **3** | **2** | **2** | **0** | **0** | **1** | **1** | **1** | **1** | **2** | **1** |
| CO4 | **2** | **3** | **2** | **1** | **2** | **2** | **0** | **1** | **1** | **0** | **1** | **2** | **2** | **0** |
| CO5 | **2** | **2** | **3** | **3** | **2** | **2** | **2** | **1** | **2** | **2** | **1** | **1** | **1** | **0** |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2 |
| **CO2** | CD1, CD2 |
| **CO3** | CD1, CD2 |
| **CO4** | CD1, CD2 |
| **CO5** | CD1, CD2 |

## COURSE INFORMATION SHEET

**Course Code: CE24403**
**Course Title: Advanced Instrumentation Laboratory**
**Pre-requisite(s): CE24303 Geotechnical Engineering, CE24202 Structural Analysis I, CE24201 Solid Mechanics, CE 24305 Transportation Engineering**
**Co- requisite(s): CE Concrete Technology, CE 24301 Structural Design I, CE 24438 Traffic Engineering**
**Credits: 1** L: 0 T: 0 P: 2
**Class schedule per week: 2**
**Class: B.Tech.**
**Semester / Level: IV**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course enables the students to:

| | |
|---|---|
| **1.** | Study the Settlement characteristics and liquefaction characteristics |
| **2.** | To measure the stiffness of the selected pavements and to determine the speed distribution of a traffic stream at a specific location |
| **3.** | Investigate the behaviour of structural members |
| **4.** | Familiarize students with advanced instruments for material characterization. |
| **5.** | Analyze microstructure, particle size, and elemental composition of civil engineering materials. |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Determine the settlement due to loading and liquefaction potential. |
| **CO2** | Able to analyze the strength of pavement surface and to determine safe design speeds for horizontal and vertical curves. |
| **CO3** | Understand the strength characteristics of RC and Steel structural members |
| **CO4** | Analyze material properties using advanced characterization techniques |
| **CO5** | Apply SEM, LPSA, XRF, and XRD for research and industrial problems |

### SYLLABUS (List of experiments)

14. Consolidation Test
15. Cyclic Triaxial Test
16. Light Weight Deflectometer
17. Spot speed measurement
18. Flexural testing of Reinforced Concrete Beams
19. Strength characteristics of RC and steel Members
20. To study the microstructure using Scanning Electron Microscopy (SEM)
21. Particle size distribution by Laser Particle Size Analyzer (LPSA)
22. To determine the elemental composition using X-Ray Fluorescence (XRF)
23. Powder XRD

### REFERENCE MATERIALS:


2. Lab manuals (available on department website)
3. Goldstein, J. I., et al. *Scanning Electron Microscopy and X-Ray Microanalysis.* Springer, 2018.
4. Allen, T. *Particle Size Measurement: Powder Sampling and Particle Size Measurement.* Springer,

1997.
5. Beckhoff, B., et al. *Handbook of Practical X-Ray Fluorescence Analysis.* Springer, 2007.
6. Cullity, B. D., & Stock, S. R. *Elements of X-Ray Diffraction.* Pearson, 2014.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**
NA
**POS MET THROUGH GAPS IN THE SYLLABUS**
NA
**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**
NA
**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**
NA
**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**
**2. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Introductory lecture by use of boards/LCD projectors |
| **CD2** | Laboratory experiments/ teaching aid |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 1 | 1 | 3 | 1 | 0 | 0 | 1 | 0 | 1 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 1 | 3 | 1 | 0 | 0 | 1 | 0 | 1 | 3 | 3 | 3 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET (OE1)

**Course Code: CE 24291**
**Course Title: BUILDING CONSTRUCTION**
**Pre-requisite(s): NA**
**Co- requisite(s): NA**
**Credits: 3** L:3 T:0 P:0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: IV / 2**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | To understand the various steps involved in construction of a building foundation (K1, K2) |
| **2.** | To know the components of masonry works and their construction process (K1). |
| **3.** | To know about the different temporary structures erected in building construction and understand their uses (K1, K2) |
| **4.** | To know about the different roof and floor types and their construction methodology (K1) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to explain the various steps involved in construction of a building foundation (K1, K2). |
| **CO2** | Able to plan and execute masonry work (K1). |
| **CO3** | To identify the different types of temporary structures required in construction and explain their uses (K1, K2). |
| **CO4** | Able to select the suitability of a floor/roof type and execute its construction (K1). |
| **CO5** | Able to plan and execute wall-finishing works (K1). |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Foundation construction**<br>Site investigation, Foundation system, earthwork & excavation, keeping excavation dry. | **8** |
| **Module – II: Masonry materials and construction**<br>Materials for stone and brick masonry, Types of stone masonry, principle to be observed in construction of stone masonry, joints in stone masonry, bonds in brick masonry, principle to be observed in construction of brick masonry, defects in brick masonry, concrete block masonry. | **8** |
| **Module – III: Temporary Structures**<br>Classification of temporary structures, scaffolding, centering and shuttering, underpinning, shoring. | **8** |
| **Module – IV: Roofs and floors**<br>Features of good roof, Classification of roofs, Roof covering for pitched roofs, flat roofs, surface drainage of flat roofs, repair of leaky roofs.<br>Sub-floor, finishing, Types of floors, construction of floors. | **8** |
| **Module – V: Wall finishing**<br>Plastering, Method of plastering, common defects of plaster-causes and remedies, pointing, white washing, colour washing, distemper, cement paint. | **8** |

**TEXTBOOKS:**

1. A Text Book of Building Construction and Construction Materials, G.S Birdie, T.D. Ahuja. Dhanpat Rai Publishing Company (P) Ltd.
2. Building Construction, S S Bhavikatti. Vikas Publishing House.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 | CO6 |
|---|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student feedback on course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | | 1 | 1 | | | | 2 | 2 | | | |
| CO2 | 2 | 1 | 1 | | 2 | 1 | | | | 2 | 2 | | | |
| CO3 | 2 | | 1 | 2 | 1 | | | | | 1 | 2 | | | |
| CO4 | 2 | 1 | 1 | | | 1 | | | | 2 | 2 | | | |
| CO5 | 2 | | | | 2 | | 1 | | | 2 | 2 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD2 and CD8 |
| CO2 | CD1, CD2 and CD8 |
| CO3 | CD1, CD2, CD5 |
| CO4 | CD8 |

## COURSE INFORMATION SHEET (OE2)

**Course Code: CE24391**
**Course Title: ENVIRONMENTAL MANAGEMENT**
**Pre-requisite(s):**
**Co- requisite(s):**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: V/3**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | To develop basic knowledge and understanding of principles of environment and its application. |
| **2.** | To identify and understand the structure and composition of the environment and its management. |
| **3.** | To analyse, how the environment is getting contaminated and probable control mechanisms for them. |
| **4.** | To generate awareness about management laws and regulation in india so that they become a sensitive citizen towards the changing environment |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Able to explain the structure and function of ecosystems and their importance in the holistic environment. |
| **CO2** | Able to identify the sources, causes, impacts and control of air pollution. |
| **CO3** | Able to distinguish and analyse the various types of water pollution happening in the environment and understand about their effects and potential control mechanisms. |
| **CO4** | Able to judge the importance of soil, causes of contamination and need of energy and waste management. |
| **CO5** | Able to predict the sources of radiation hazards and pros and cons of noise pollution |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module-1: Environment and its components**<br>Definition and components of Environment, Structure and Function of Environment, Levels of Organization in environment, Energy flow in environment, Food chain and Trophic level, Biogeochemical Cycles, Atmosphere: Composition and structure, terrestrial radiation, heat balance. | **8** |
| **Module-2: Water and soil management**<br>Water in biosphere, Surface and groundwater, Water management, Rain water harvesting, Water shed management. Lithosphere: landforms and types, Soil as basic natural resource- Definition and Composition, Formation of Soil, Properties of soil, Soil erosion- Causes, Effects and Control measures. Aquaculture- Inland water resources and their economic potential with respect to fisheries. | **8** |
| **Module-3: Environmental pollution and its impact**<br>Air Pollution: Definition, Sources of air pollution. Air pollutants (CO, CO2, SO2, NOx, Hydrocarbons & aerosols). Green House Effect, acid rain, Ozone layer depletion and Smog. Water Pollution: Definition and sources of water pollution. Specific phenomena related with water pollution- Algal bloom, Eutrophication, Biomagnifications/ Bioaccumulation. Land/ Soil Pollution: Definition, Sources of land/ soil pollution, Specific phenomena related with land/ soil pollution, Noise Pollution: Definition, Measurement of noise and its intensity. Types and classification of waste: Air, Liquid and Solid. | 8 |
| **Module-4: EIA and Environmental Laws**<br>Environmental Acts, Rules and Notifications. a) Water (Prevention & Control of Pollution) Act and the corresponding Rule, b) Water (Prevention & Control of Pollution) Act and the corresponding Rule, c) Air (Prevention & Control of Pollution) Act and the corresponding Rule d) Environment (Protection) Act and Rule. Concept of Sustainable Development, EIA: Steps in EIA, ISO 9000 and ISO 14000, Environmental Audit. Forest: Forest types, role of forest, Forest Management and Wildlife conservation. | 8 |
| **Module-5: Energy Management**<br>Conventional sources of energy: Coal, Oil and Natural gas, Thermal power, Firewood, Hydropower, Nuclear power. Non- Conventional Sources of Energy: Solar energy, Wind energy, Ocean/ Tidal energy, geothermal energy, Biomass based energy, Dendrothermal energy, Energy from urban waste, Bagasse based energy. Energy from refuse, recycling of waste materials. Forest: Forest types, role of forest, Forest Management and Wildlife conservation. | 8 |

**TEXTBOOKS:**


1. A, K. De. (3rd Ed). 2008. Environmental Chemistry. New Age Publications India Ltd.
2. R. Rajagopalan. 2016. Environmental Studies: From Crisis to Future by, 3rd edition, Oxford University Press.
3. Eugene P. Odum. 1971. Fundamentals of Ecology (3rd ed.) -. WB Sunders Company, Philadelphia.
4. C. N. Sawyer, P. L. McCarty and G. F. Parkin. 2002. Chemistry for Environmental Engineering and Science. John Henry Press.
5. S.C. Santra. 2011. Environmental Science. New Central Book Agency.

**REFERENCE BOOKS:**


1. D.W. Conell. Basic Concepts of Environmental Chemistry, CRC Press.
2. Peavy, H.S, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International
3. G.M. Masters & Wendell Ela. 1991. Introduction to Environmental Engineering and Science, PHI Publishers.


**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 0 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 2 | | | |
| CO2 | 2 | 2 | 2 | 2 | 1 | 3 | 2 | 0 | 0 | 0 | 2 | | | |
| CO3 | 2 | 2 | 2 | 2 | 1 | 3 | 2 | 0 | 0 | 0 | 2 | | | |
| CO4 | 2 | 2 | 2 | 1 | 1 | 3 | 2 | 0 | 0 | 1 | 2 | | | |
| CO5 | 2 | 2 | 1 | 1 | 0 | 3 | 2 | 0 | 0 | 0 | 2 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

## COURSE INFORMATION SHEET (OE3)

**Course code:** CE 24392
**Course title:** DISASTER MANAGEMENT
**Pre-requisite(s):** NA
**Co- requisite(s):** NA
**Credits:** 3 **L:3 T:0 P:0**
**Class schedule per week:** 3
**Class:** B.Tech.
**Semester / Level:** VI / 3
**Branch:** ALL
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students to:

| | |
|---|---|
| **1.** | Understand the disaster phenomenon and their implications in real life. (K1) |
| **2.** | Acquire knowledge of various risk reduction measures to reduce the impact of disasters. (K2) |
| **3.** | Know various structural and non-structural measures to prevent or mitigate impact of disasters. (K3) |
| **4.** | Aware of the various institutions, organizations or bodies which manage disaster occurrences. ( K3) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Understand natural hazards and the disaster phenomenon along with their practical implications. ( K2) |
| **CO2** | Know various disaster risk reduction techniques and disaster management processes. (K2) |
| **CO3** | Understand the various meteorological disaster phenomena and know their preventive and remedial measures to reduce their impact in human lives. (K2) |
| **CO4** | Become aware of various topographical disaster phenomena, their effects and possible preventive or mitigative measures. (K3) |
| **CO5** | Create awareness among people and society regarding various biological and environmental disasters. (K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction**<br>Hazards and disasters, Distinction between hazard and disaster, History of disasters, Major trend, Characteristics and damage potential, Hazard assessment, Vulnerabily, Vulnerability assessment, Classification of disasters, Types of disasters, Natural and man-made disasters, Causes, effects and practical examples of the disasters, Response time, Frequency. | **8** |
| **Module – II: Disaster Risk Reduction and Management**<br>Risk Management: Risk, Risk assessment, Risk management, Risk reduction, Crisis Management, Disaster management: Principle, Planning, Awareness, Prediction and forewarning, Disaster Management cycle, Pre- and post-management stage, Preparedness, Mitigation, Response, Recovery, Rehabilitation, Capacity building, Community capacity building, Disaster management in India, Institutional Organizations: Disaster management act, National policy, Institutional framework, National and international organizations, NDMA, Responsibilities of NDMA, Nodal agencies, Disaster management strategies. | **8** |
| **Module – III: Meteorological Disasters**<br>Floods: Flood hazard and disaster, Flood hazards in India, Types of floods, Causes, and effects, Flood management, Flood control and mitigation, Forecast and early warning.<br>Drought: Concept of drought, Impacts of drought, Consequences of drought, Types of droughts, Drought profile, Drought hazards in India, Drought management, Drought risk reduction, Drought prediction and monitoring, Mitigation and prevention.<br>Tsunami: Tsunami wave characteristics, Tsunami Formation and evolution, Causes and effects, Identification and mapping, Protection, Warning system, Indian Ocean tsunami, pre- and post- management of tsunami.<br>Cyclone: Characteristics, Occurrences, Distribution, Effects, Classification, Tropical cyclones, Cyclone reduction and management, Preparedness, mitigation, and prevention. | **8** |
| **Module – IV: Topographical Disasters**<br>Earthquake: Earthquake hazards/disasters, Earthquake characteristics, Plate tectonics, Causes of earthquakes, Distribution of earthquakes, Hazardous effects of earthquakes, Earthquake hazards in India, Epicenter, Hypocenter, Magnitude and intensity, Earthquake waves, Seismic zoning of India, Earthquake disaster reduction, Preparedness and mitigation, Rehabilitation, reconstruction, and recovery.<br>Volcanoes: Volcanic hazard, Distribution, Causes and effects, Environmental impact, Risk and vulnerability, Management of volcanic disaster, Warning and prediction, Preparedness and mitigation, Rescue, and relief.<br>Landslides: Meanings and concepts, Causes, and effects, Types, Vulnerability and risk, Signs and early warning systems, Preparedness, prevention and mitigation. | **8** |
| **Module – V: Biological and Environmental Disasters**<br>Biological Disasters: Biological hazards, Pathogen, Human, animal and plant epidemics, Mitigation and management, Safety and precautionary measures, Protection and control.<br>Global Warming: Evidence of global warming, Ozone depletion, Greenhouse effects, Effects of global warming, Global warming and climate change, Mitigation and Remedial Measures, Environmental laws.<br>Fire: Terminologies, Fire triangles, Fire resistance, Fire endurance, Fire detection and alarms, Fire safety, Prevention and mitigation measures. | **8** |

**TEXTBOOKS:**

1. Disaster Science and Management, T. Bhattacharya, Tata McGraw Hill.
2. Disaster Management, M. Pandey, Wiley India Pvt. Ltd.
3. Natural Hazard and Disaster Management, S. C. Chakraborty.
4. Fire Safety in Building, V. K. Jain.

**REFERENCE BOOKS:**

1. Manual on Disaster Management, National Disaster Management, Agency Govt. of India.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Quiz | 10 |
| Assignment | 10 |
| Teacher's Assessment | 05 |
| Mid Sem exam | 25 |
| Semester End Exam | 50 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | 10 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | ✓ | ✓ | ✓ | ✓ | |
| Semester End Examination | ✓ | ✓ | ✓ | ✓ | ✓ |

**INDIRECT ASSESSMENT**

**1. Student feedback on course outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Seminars |
| **CD4** | Mini projects/Projects |
| **CD5** | Laboratory experiments/teaching aids |
| **CD6** | Industrial/guest lectures |
| **CD7** | Industrial visits/in-plant training |
| **CD8** | Self- learning such as use of NPTEL materials and internets |
| **CD9** | Simulation |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 0 | 0 | 2 | 1 | | | |
| CO2 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 0 | 0 | 2 | 1 | | | |
| CO3 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | 0 | 0 | 2 | 1 | | | |
| CO4 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | 0 | 0 | 2 | 1 | | | |
| CO5 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | 0 | 0 | 2 | 1 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| CO1 | CD1, CD5, CD8 |
| CO2 | CD1, CD5, CD8 |
| CO3 | CD1, CD2, CD4, CD5, CD8 |
| CO4 | CD1, CD2, CD4, CD5, CD8 |
| CO5 | CD1, CD2, CD4, CD5, CD8 |

## COURSE INFORMATION SHEET (OE 4)

**Course Code: CE24491**
**Course Title: CONSTRUCTION MANAGEMENT**
**Pre-requisite(s):**
**Co- requisite(s):**
**Credits: 3** L: 3 T: 0 P: 0
**Class schedule per week: 3**
**Class: B.Tech.**
**Semester / Level: VII/3**
**Branch: All**
**Name of Teacher:**

### COURSE OBJECTIVES

This course envisions to impart to students:

| | |
|---|---|
| **1.** | Learn about basics of construction projects and its management. (K1, K2) |
| **2.** | Learn about construction economics. (K2, K4) |
| **3.** | Know about construction materials management. (K3) |
| **4.** | Learn about construction quality management. (K3) |
| **5.** | Learn construction safety management. (K3) |

### COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Explain about construction project management and its relevance as well as ethical conduct of engineers. (K1, K2) |
| **CO2** | Work out economics of the construction project. (K2, K4) |
| **CO3** | Manage procurement of construction materials and inventory. (K3) |
| **CO4** | Implement quality control/ management technique during constructions. (K3) |
| **CO5** | Implement safety management and form safety policies in construction projects. (K3) |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Introduction:**<br>Indian construction industry, Construction project management and its relevance, Stakeholders of a construction project, Project organization. | 8 |
| **Module – II: Construction Economics:**<br>Introduction. Economic decision making. Cash-flow diagrams. Present worth comparison, Future worth comparison, Annual cost and worth comparison, Rate of return method. Project cost estimation- preliminary and revised estimates. | 8 |
| **Module – III: Construction Material Management:**<br>Material procurement process, Materials management functions – planning, procurement, custody, materials accounting, transportation, inventory monitoring and control, materials codification, source development, disposal. Inventory management – inventory related cost, functions of inventory, inventory policies, selective inventory control, inventory models. | 8 |
| **Module – IV: Construction Quality Management:**<br>Description of quality, Evolution of quality, Inspection and quality control. Total quality management, ISO standards, Audit, Construction productivity, Typical causes of low labour productivity. | 8 |
| **Module – V: Construction Safety Management:**<br>Evolution of safety, Health and safety act and regulations, Roles of safety personnel, Causes of accidents, Principles of safety, Safety and health management system – Safety policy and organization, Budget, Education and Training, Safety manual, Safety committee, Accident reporting, investigation and report keeping, Worker's health facilities. | 8 |

**TEXTBOOKS:**

1. Construction Project Management – Theory and Practice – Kumar Neeraj Jha, Pearson
2. Construction Project Management – Planning, Scheduling and Controlling – K.K. Chitkara, McGraw Hill Education (India) Private Limited

**REFERENCE BOOKS:**

1. Construction Management and Machinery – B.L. Gupta & Amit Gupta, Standard Publishers Distributors.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Mid Sem Examination | 25 |
| End Sem Examination | 50 |
| **Quiz** | 10 |
| **Assignment** | 10 |
| **Teacher's assessment** | 05 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Mid Sem Examination | 50 |
| Quiz and assignment | 40 |
| Teacher's assessment | **10** |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Lectures by use of boards/LCD projectors/OHP projectors |
| **CD2** | Tutorials/Assignments |
| **CD3** | Self- learning such as use of NPTEL materials and internets |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 0 | 0 | 0 | 2 | 3 | 1 | 1 | 2 | 2 | | | |
| CO2 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | | | |
| CO3 | 1 | 1 | 2 | 0 | 2 | 0 | 0 | 1 | 0 | 3 | 1 | | | |
| CO4 | 2 | 2 | 3 | 2 | 2 | 0 | 0 | 1 | 0 | 2 | 1 | | | |
| CO5 | 2 | 2 | 2 | 1 | 1 | 3 | 2 | 1 | 0 | 2 | 2 | | | |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

**COURSE INFORMATION SHEET (VOC1)**

**Course Code: CE24151**
**Course Title: BUILDING DRAWING**
**Pre-requisite(s):**
**Co- requisite(s): CE24204**
**Credits: 3** L: 1 T: 0 P: 4
**Class schedule per week: 5**
**Class: B. Tech**
**Semester / Level: I / 1**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students:

| | |
|---|---|
| 1. | To introduce types of drawing and standard practices in drawing different components of the building. |
| 2. | To introduce the students to draft the plan, elevation, and sectional views of buildings. |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Apply various types of scales as per the need for preparing various types of drawings. |
| **CO2** | Prepare plan, elevation and section of the residential building. |
| **CO3** | Study about different masonry bonds. |
| **CO4** | Analyze types of staircase, plan and section details of buildings. |
| **CO5** | Prepare detailed drawings of water supply and drainage connections to the buildings. |

**SYLLABUS (List of experiments)**

1. Types of drawing- Index map, key plan, village map, site plan, layout plan with appropriate scale & uses. Sizes of various standard papers.
2. Different masonry bonds.
3. Plan, Elevation and Section of the residential building.
4. Types of staircase, Plan and Section details.
5. Detailed drawings of water supply and drainage connections to the building.
    a) The layout of Single Storey Building Drainage System
    b) The layout of Water supply in Single Storey Building
    c) The layout of the Drainage system in Multi storeyed Building
6. Student Activity: Visit a construction site and collect drawings for the project

**TEXTBOOKS:**

1. Building Planning & Drawing – Kumaraswamy N., Kameswara Rao A., Charotar Publishing
2. Civil Engg. Drawing and House Planning – Verma B. P., Khanna Publishers
3. Building Drawing & Detailing – Balagopal & T.S. Prabhu, Spades Publishers
4. Building Planning and Drawing – S.S .Bhavikatti & M.V Chitawadagi, I.K International Publishing House Pvt.Ltd

**REFERENCE BOOKS:**

1. National Building Code, BIS, New Delhi

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

| **Course Delivery methods** | |
|---|---|
| Lecture by use of boards/LCD projectors/OHP projectors | |
| Tutorials/Assignments | |
| Seminars | |
| Mini projects/Projects | |
| Laboratory experiments/teaching aids | ✓ |
| Industrial/guest lectures | |
| Industrial visits/in-plant training | ✓ |
| Self- learning such as use of NPTEL materials and internets | ✓ |
| Simulation | |

**Course Outcome (CO) Attainment Assessment tools & Evaluation procedure**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**Mapping of Course Outcomes onto Program Outcomes and Program Specific Outcomes**

| | Program Outcomes | | | | | | | | | | | Program Specific Outcome | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcome** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **1** | **2** | **3** |
| **1** | 3 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 |
| **2** | 3 | 1 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 1 |
| **3** | 2 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 1 |
| **4** | 2 | 2 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 1 |
| **5** | 2 | 1 | 3 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 2 |

| Mapping Between COs and Course Delivery (CD) methods | | | | |
|---|---|---|---|---|
| | | | | |
| **CD** | **Course Delivery methods** | | **Course Outcome** | **Course Delivery Method** |
| CD1 | Lecture by use of boards/LCD projectors/OHP projectors | | CO1 | CD1, CD2, CD5 |
| CD2 | Tutorials/Assignments | | CO2 | CD1, CD2, CD4, CD5 |
| CD3 | Seminars | | CO3 | CD1, CD2, CD5 |
| CD4 | Mini projects/Projects | | CO4 | CD1, CD2, CD5 |
| CD5 | Laboratory experiments/teaching aids | | CO5 | CD1, CD2, CD4, CD5 |
| CD6 | Industrial/guest lectures | | | |
| CD7 | Industrial visits/in-plant training | | | |
| CD8 | Self- learning such as use of NPTEL materials and internets | | | |
| CD9 | Simulation | | | |

**COURSE INFORMATION SHEET (VOC2)**

**Course Code: CE24152**
**Course Title: SURVEYING**
**Pre-requisite(s):**
**Co- requisite(s): CE24208**
**Credits: 3** L: 1 T: 0 P: 4
**Class schedule per week: 5**
**Class: B. Tech**
**Semester / Level: I / 1**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course envisions to impart to students:

| | |
|---|---|
| 1. | Execute chain survey. |
| 2. | Execute compass survey. |
| 3. | Perform plane table surveying. |
| 4. | Carry out levelling works. |
| 5. | Measurements by using theodolite. |

**Course Outcomes**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Perform chain survey. |
| **CO2** | Perform compass survey. |
| **CO3** | Perform plane table surveying. |
| **CO4** | Carry out levelling works. |
| **CO5** | Measurement of horizontal and vertical angles with theodolite. |

**SYLLABUS**

| MODULE | (NO. OF LECTURE HOURS) |
|---|---|
| **Module – I: Chain**<br>Introduction, Principle of survey, Errors and obstacles in chain survey | 2 |
| **Module – II: Compass**<br>Introduction, Bearings, Traversing, Local attraction, Magnetic declination | 2 |
| **Module – III: Plane Table Survey**<br>Introduction, Instruments used in plane tabling, Working operations, Methods of plane table survey, Errors in plane tabling. | 2 |
| **Module – IV: Levelling**<br>Principle of Levelling, Booking and reducing the levels, Curvature and Refraction corrections | 2 |
| **Module – V Theodolite**<br>Introduction, Classification of theodolites, Parts of transit theodolite, Measurement of angles with theodolite. | 2 |

**SYLLABUS (List of experiments)**

**Fieldwork I:** Perform survey for an area using chain
**Fieldwork II:** Perform survey for an area using compass
**Fieldwork III:** Perform survey for an area using plane table.
**Fieldwork IV:** Carry out profile leveling and cross-sectioning work along a road.
**Fieldwork V:** Measurement of horizontal and vertical angles with a theodolite.

**TEXTBOOKS:**

1. Punmia, B.C., Jain, A.K., Jain, A.K. "Surveying" – Vol. 1 and 2, Laxmi Publications (P) Ltd.
2. Kanetkar, T.P., Kulkarni S.V. "Surveying and Levelling." – Part 1 and 2, Pune Vidyarthi Griha Prakashan.

**REFERENCE BOOKS:**

1. Duggal, S.K. "Surveying" – Vol. 1 and 2, Tata McGraw-Hill Companies, New Delhi.
2. Arora, K.R. "Surveying" – Vol. 1 and 2, Standard Book House, New Delhi.

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

| Course Delivery methods | |
|---|---|
| Lecture by use of boards/LCD projectors/OHP projectors | |
| Tutorials/Assignments | |
| Seminars | |
| Mini projects/Projects | |
| Laboratory experiments/teaching aids | ✓ |
| Industrial/guest lectures | |
| Industrial visits/in-plant training | ✓ |
| Self- learning such as use of NPTEL materials and internets | ✓ |
| Simulation | |

## Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**Mapping of Course Outcomes onto Program Outcomes and Program Specific Outcomes**

| | Program Outcomes | | | | | | | | | | | Program Specific Outcome | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcome | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 1 | 2 | 3 |
| 1 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |
| 2 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 |
| 5 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 |

| Mapping Between COs and Course Delivery (CD) methods | | | | |
|---|---|---|---|---|
| | | | | |
| **CD** | **Course Delivery methods** | | **Course Outcome** | **Course Delivery Method** |
| CD1 | Lecture by use of boards/LCD projectors/OHP projectors | | CO1 | CD5, CD8 |
| CD2 | Tutorials/Assignments | | CO2 | CD5, CD8 |
| CD3 | Seminars | | CO3 | CD4, CD5, CD7, CD8 |
| CD4 | Mini projects/Projects | | | |
| CD5 | Laboratory experiments/teaching aids | | | |
| CD6 | Industrial/guest lectures | | | |
| CD7 | Industrial visits/in-plant training | | | |
| CD8 | Self- learning such as use of NPTEL materials and internets | | | |
| CD9 | Simulation | | | |

**COURSE INFORMATION SHEET (VOC3)**

**Course Code: CE24251**
**Course Title: CEMENT CONCRETE AND ROAD MATERIALS**
**Pre-requisite(s):**
**Co- requisite(s):**
**Credits: 3** L: 1 T: 0 P: 4
**Class schedule per week: 5**
**Class: B.Tech.**
**Semester / Level: IV/II**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course enables the students to:

| | |
|---|---|
| **1.** | To familiarize students with IS code–based testing procedures for cement, aggregates, concrete, and road materials. |
| **2.** | To impart hands-on skills for quality control testing relevant to site and laboratory practice. |
| **3.** | To interpret test results for material suitability, durability, and compliance with codal requirements. |
| **4.** | To prepare students for entry-level technical roles in the construction and highway sector. |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Perform and interpret standard cement tests for quality assurance. |
| **CO2** | Assess properties of coarse aggregates, including specific gravity, water absorption, impact value, and abrasion resistance. |
| **CO3** | Evaluate workability of fresh concrete. |
| **CO4** | Assess compressive and flexural strength of hardened concrete. |
| **CO5** | Perform standard bitumen tests (penetration, ductility, or softening point) for pavement quality control. |

**SYLLABUS (List of experiments)**

1. Cement (3)
    a. Standard Consistency of Cement (Vicat method).
    b. Initial and Final Setting Time of Cement.
    c. Fineness of Cement by Sieve Analysis / Blaine Air Permeability. Compression Test on Brittle Material
2. Aggregates (3)
    a. Specific Gravity and Water Absorption of Coarse Aggregate.
    b. Aggregate Impact Value Test.
    c. Los Angeles Abrasion Value Test.
3. Concrete (4)
    a. Workability of Fresh Concrete – Slump Test.
    b. Workability of Fresh Concrete – Compaction Factor / Vee-Bee Test.
    c. Compressive Strength of Concrete Cubes (7 & 28 days).
    d. Flexural Strength of Concrete Beam (Modulus of Rupture).
4. Pavement Material (1)
    a. Bitumen Tests (any one – Penetration / Ductility / Softening Point)

**REFERENCE MATERIALS:**

1. Lab manuals (available on department website)

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

**1. Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Laboratory demonstrations by faculty. |
| **CD2** | Hands-on experimental performance in groups. |
| **CD3** | Data recording, analysis, Report writing, viva-voce |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **3** | **2** | **0** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **2** | **2** | **3** |
| CO2 | **3** | **2** | **0** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **2** | **2** | **3** |
| CO3 | **3** | **2** | **0** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **2** | **2** | **3** |
| CO4 | **3** | **3** | **0** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **3** | **2** | **3** |
| CO5 | **3** | **2** | **0** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **2** | **2** | **3** |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| **Course Outcomes** | **Course Delivery Method** |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |

**COURSE INFORMATION SHEET (VOC4)**

**Course Code: CE24252**
**Course Title: SOIL INVESTIGATIONS AND TESTING**
**Pre-requisite(s):**
**Co- requisite(s):**
**Credits: 3** L: 1 T: 0 P: 4
**Class schedule per week: 5**
**Class: B.Tech.**
**Semester / Level: IV/II**
**Branch: CIVIL ENGINEERING**
**Name of Teacher:**

**COURSE OBJECTIVES**

This course enables the students to:

| | |
|---|---|
| **1.** | Introduce students to the fundamental soil testing procedures used in civil engineering practice. |
| **2.** | Develop skills to determine physical and engineering properties of soils through laboratory and field experiments. |
| **3.** | Familiarize students with IS code practices for soil testing and interpretation of results. |
| **4.** | Enable students to correlate experimental results with geotechnical applications such as compaction, permeability, and shear strength. |

**COURSE OUTCOMES (COs)**

After the completion of this course, students will be able to:

| | |
|---|---|
| **CO1** | Determine basic physical properties of soils such as moisture content, specific gravity, and grain size distribution. |
| **CO2** | Evaluate soil consistency limits (Atterberg limits, shrinkage limit) for classification and engineering behavior. |
| **CO3** | Perform field density tests to assess in-situ compaction of soils |
| **CO4** | Conduct compaction and permeability tests and interpret results for geotechnical design applications. |
| **CO5** | Determine shear strength parameters and unconfined compressive strength of soils for stability analysis. |

**SYLLABUS (List of experiments)**

1. Determination of moisture content of soil.
2. Determination of specific gravity of soil solids (pycnometer method).
3. Grain size distribution by sieve analysis.
4. Grain size distribution by hydrometer analysis.
5. Determination of liquid limit and plastic limit (Atterberg limits).
6. Determination of shrinkage limit.
7. Field density test by core cutter method.
8. Field density test by sand replacement method.
9. Standard Proctor compaction test.
10. Constant head permeability test.
11. Falling head permeability test.
12. Direct shear test on sandy soil.
13. Unconfined compression test (UCC).

**REFERENCE MATERIALS:**

1. Lab manuals (available on department website)

**GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)**

**POS MET THROUGH GAPS IN THE SYLLABUS**

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN**

**COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE**

**DIRECT ASSESSMENT**

| Assessment Tool | % Contribution during CO Assessment |
|---|---|
| Lab Journal | 30 |
| Lab quizes | 20 |
| Progressive viva | 20 |
| End Sem Examination | 30 |

| Continuous Internal Assessment | % Distribution |
|---|---|
| Lab Journal | 30 |
| Lab quiz | 10 |
| Progressive viva | 20 |

| Assessment Components | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Continuous Internal Assessment | Y | Y | Y | Y | Y |
| Semester End Examination | Y | Y | Y | Y | Y |

**INDIRECT ASSESSMENT**

1. **Student Feedback on Course Outcome**

**COURSE DELIVERY METHODS**

| | |
|---|---|
| **CD1** | Laboratory demonstrations by faculty. |
| **CD2** | Hands-on experimental performance in groups. |
| **CD3** | Data recording, analysis, Report writing, viva-voce |

**MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 2 |
| CO2 | 3 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 3 |
| CO3 | 2 | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 |
| CO4 | 3 | 2 | 2 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 2 |

**Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3**

**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**

| Course Outcomes | Course Delivery Method |
|---|---|
| **CO1** | CD1, CD2, CD3 |
| **CO2** | CD1, CD2, CD3 |
| **CO3** | CD1, CD2, CD3 |
| **CO4** | CD1, CD2, CD3 |
| **CO5** | CD1, CD2, CD3 |