Zeal Education Society's

# ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

*NBA Accredited, NAAC Accredited with A+ Grade, ISO 21001:2018*

## DEPARTMENT OF CIVIL ENGINEERING

## Curriculum Structure and Syllabus of

## S.Y. B. Tech. – Civil Engineering

## (With effect from - Academic Year 2025 - 26)
## (2024 Pattern)

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## VISION OF THE INSTITUTE

To be a premier institute in technical education by imparting academic excellence, research, social and entrepreneurial attitude.

## MISSION OF THE INSTITUTE

- To achieve academic excellence through innovative teaching and learning process.
- To imbibe the research culture for addressing industry and societal needs.
- To inculcate social attitude through community engagement initiatives.
- To provide conducive environment for building the entrepreneurial skills.

# DEPARTMENT OF CIVIL ENGINEERING

## VISION:

To contribute to the field of Civil Engineering by focusing state of the art technical knowledge, promoting research, nurturing social responsibility and imparting entrepreneurial attitude.

## MISSION:

**M1:** To strengthen academics with holistic teaching learning practices.
**M2:** To inculcate a research approach pertaining to the civil engineering domain.
**M3:** To foster students for the development of entrepreneurial skills.
**M4:** To nurture the sense of ethics, morality and social responsibility.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

**PEO1:** Graduates will be proficient in critical thinking and problem solving based on abroad range of civil engineering technical areas.
**PEO2:** Graduates will be good decision makers with a blend of ethical, global, regional and local concerns, effective communication and leadership.
**PEO3:** Graduates will be able to contribute to society by civic engagement.
**PEO4:** Graduates will attain the pursuit of professional development and ever learning.

## PROGRAM OUTCOMES (POs):

**PO1:** **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
**PO2:** **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
**PO3:** **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
**PO4:** **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
**PO5:** **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6:** **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7:** **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8:** **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9:** **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10:** **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11:** **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12:** **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAM SPECIFIC OUTCOMES (PSOs):**

**PSO1:** Graduates will be able to develop the professional skills for analysing and designing of structural, geotechnical, transportation, environmental, irrigation and hydraulic systems to cater societal and /or industrial needs.

**PSO2:** Graduates will be able to apply the knowledge pertaining to surveying, construction and/or management, town planning, estimation, valuation and soft computing tools to solve real time problems related to civil engineering.

## DEPARTMENT OF CIVIL ENGINEERING

# LIST OF ABBREVIATIONS

| Abbreviation | Description |
|---|---|
| BSC | Basic Science Course |
| ESC | Engineering Science Course |
| PCC | Program Core Course |
| PEC | Program Elective Course |
| MDM | Multidisciplinary Minor |
| OE | Open Elective - Other than a particular program |
| VSEC | Vocational and Skill Enhancement Course |
| AEC | Ability Enhancement Course |
| ENTR | Entrepreneurship |
| EC | Economics |
| MC | Management Courses |
| IKS | Indian Knowledge System |
| VEC | Value Education Courses |
| RM | Research Methodology |
| CEP | Community Engagement Project |
| FP | Field Project |
| PROJ | Project |
| INT | Internship |
| OJT | On Job Training |
| CC | Co-curricular Courses |
| HSSM | Humanities Social Science and Management |
| ELC | Experiential Learning Course |
| B. Tech | Bachelor of Technology |
| L | Lecture |
| P | Practical |
| T | Tutorial |
| H | Hours |
| CR | Credits |
| CIE | Continuous Internal Evaluation |
| ETE | End Term Evaluation |
| TW | Term Work |
| OR | Oral |
| PR | Project |

## DEPARTMENT OF CIVIL ENGINEERING

## Second Year B. Tech. – Civil Engineering: Semester - III

| Course Code | Course Type | Course Name | Teaching Scheme (hrs/Week) | | | | | | | Evaluation Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | P | T | H | CR | | | CIE | ETE | TW | PR | OR | Total |
| | | | | | | | TH | PR/Tut | Total | | | | | | |
| CEPC302 | PCC | Structural Mechanics | 3 | 2 | - | 5 | 3 | 1 | 4 | 40 | 60 | - | - | 25 | 125 |
| CEPC303 | PCC | Geotechnical Engineering | 3 | 2 | - | 5 | 3 | 1 | 4 | 40 | 60 | - | - | 25 | 125 |
| CEMD301 | MDM | Mathematics for Civil Engineers | 3 | - | - | 3 | 3 | - | 3 | 40 | 60 | - | - | - | 100 |
| ALOE301 | OE | Open Elective – I# | 2 | - | - | 2 | 2 | - | 2 | 40 | 60 | - | - | - | 100 |
| CEMC301 | HSSM-MC | Project Management | 3 | - | - | 3 | 3 | - | 3 | 40 | 60 | - | - | - | 100 |
| CEVS303 | VSEC | Computer Aided Building Drawing | 1 | 4 | - | 5 | 1 | 2 | 3 | - | - | 25 | 50 | - | 75 |
| CECE301 | CEP | Project Based Learning | - | 2 | - | 2 | - | 1 | 1 | - | - | 50 | - | - | 50 |
| CEIN302 | ELC - INT | Internship – II | 4 Weeks | | | | - | 2 | 2 | - | - | 25 | - | - | 25 |
| **Total** | | | **15** | **10** | **-** | **25** | **15** | **07** | **22** | **200** | **300** | **100** | **50** | **50** | **700** |

| # - Select any one course from the given Open Elective Courses | | |
|---|---|---|
| **Course Code** | **Course Type** | **Open Elective - I** |
| ALOE301A | OEC | Digital Literacy and Applications |
| ALOE301B | | Environmental Studies |
| ALOE301C | | Green Energy and Sustainability |
| ALOE301D | | Basics of Consumer Electronics |
| ALOE301E | | Renewable Energy Systems |

BoS Chairman

PU/PN/Engg./285/2007

Director
ZES's Zeal College of Engineering & Research
Narhe, Pune - 411041.

## DEPARTMENT OF CIVIL ENGINEERING

### Second Year B. Tech. – Civil Engineering: Semester - IV

| Course Code | Course Type | Course Name | Teaching Scheme (hrs/Week) | | | | | | | Evaluation Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | P | T | H | CR | | | CIE | ETE | TW | PR | OR | Total |
| | | | | | | | TH | PR/Tut | Total | | | | | | |
| CEPC404 | PCC | Fluid Mechanics | 3 | 2 | - | 5 | 3 | 1 | 4 | 40 | 60 | - | - | 50 | 150 |
| CEPC405 | PCC | Surveying | 3 | - | - | 3 | 3 | - | 3 | 40 | 60 | - | - | - | 100 |
| CEPC406 | PCC | Structural Analysis | 3 | - | - | 3 | 3 | - | 3 | 40 | 60 | - | - | - | 100 |
| CEMD402 | MDM | Construction Management | 3 | - | - | 3 | 3 | - | 3 | 40 | 60 | - | - | - | 100 |
| ALOE403 | OE | Open Elective – II# | 2 | - | - | 2 | 2 | - | 2 | 40 | 60 | - | - | - | 100 |
| CEAE402 | HSSM-AEC | Generative AI | - | 4 | - | 4 | - | 2 | 2 | - | - | 50 | - | - | 50 |
| CEVE401 | VEC | Professional Communication Etiquette | - | 2 | - | 2 | - | 1 | 1 | - | - | 25 | - | - | 25 |
| CEVS404 | VSEC | Professional Practices in Surveying | - | 4 | - | 4 | - | 2 | 2 | - | - | - | 50 | - | 50 |
| CEIN403 | ELC - INT | Internship – III | 4 Weeks | | | | - | 2 | 2 | - | - | 25 | - | - | 25 |
| **Total** | | | **14** | **12** | **-** | **26** | **13** | **11** | **22** | **200** | **300** | **100** | **50** | **50** | **700** |

| # - Select any one course from the given Open Elective Courses | | |
|---|---|---|
| **Course Code** | **Course Type** | **Open Elective - II** |
| ALOE402A | OEC | Cyber Security and Laws |
| ALOE402B | | Sustainability and Climate Change |
| ALOE402C | | Energy Audit and Electrical Safety |
| ALOE402D | | Digital Marketing |
| ALOE402E | | Entrepreneurship and Innovations |

BoS Chairman

ZES's Zeal College of Engineering & Research PU/PN/Engg./285/2007 Narhe, Pune-41

Director
ZES's Zeal College of Engineering & Research Narhe, Pune - 411041.

## DEPARTMENT OF CIVIL ENGINEERING

# INDEX

# SYLLABUS

## SEMESTER - III

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | **Semester:** III | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Structural Mechanics | | | | | | | **Code:** CEPC302 | | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| 03 | 02 | - | 03 | 40 | 60 | - | 25 | - | 125 |

**Prerequisites:**

Fundamentals of Physics, Mathematics and Engineering Mechanics.

**Course Objectives:**

1. To study various types of stresses for determinate structural members.
2. To learn concept of Shear Force and Bending Moment Diagram for determinate beams.
3. 3. To learn the concept of slope and deflection for determinate structural members.

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

| | |
|---|---|
| **CO1** | Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures. |
| **CO2** | Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram. |
| **CO3** | Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram |
| **CO4** | Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains. |
| **CO5** | Analyze axially loaded and eccentrically loaded column. |
| **CO6** | Determine the slopes and deflection of determinate beams and trusses. |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Simple Stresses and Strains:**<br>a) Materials used in construction and their nature, Hook's Law, Stress-Strain Diagram for elastic, plastic materials and brittle material, Idealized stress-strain diagram , Concept of axial stresses (compression, tension), strains(linear, lateral, shear and volumetric), Elastic constants and their relations. Stresses and strains due to change in temperature.<br>b) Stresses, strains and deformations in determinate and indeterminate structures for homogeneous and composite structures under concentrated loads and temperature changes. | 07 |
| 2. | **Shear Force and Bending Moment Diagram:**<br>Concept of shear force and bending moment. Relation between shear force, bending moment and intensity of loading. Shear force and bending moment diagrams for determinate beams due to concentrated, uniformly distributed, uniformly varying loads and couples. Bending moment and loading diagram | 07 |

| | | |
|---|---|---|
| | from given shear force diagram. | |
| 3. | **Shear and Bending Stresses:**<br>a) Shear stresses in beams: concept of shear, complimentary shear, derivation of shear stress formula, shear stress distribution for various cross sections, maximum and average shear stress for circular and rectangular sections.<br>b) Bending stresses in beams: theory of simple or pure bending, assumptions, derivation of flexure formula, bending stress distribution diagrams | 07 |
| 4. | **Principal Stresses and Strains:**<br>Principal stresses and strains: concept of principal planes and principal stresses, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress. | 07 |
| 5. | **Axially and Eccentrically Loaded Columns**:<br>a) Axially loaded columns: concept of critical load and buckling, Euler's formula for buckling load with hinged ends, concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula.<br>b) Effect of lateral force and self-weight. Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid and hollow rectangular and circular sections. | 07 |
| 6. | **Slope and Deflection of Beams and Trusses:**<br>Slope and deflection of determinate beams by Macaulay's method and Strain energy method, Castigliano's first theorem. Joint displacement of determinate trusses by Unit load method. | 07 |
| | **TOTAL** | **42** |

**List of Experiments:** Perform any eight (8) Experiments

1. Tension test on mild and TMT steel.
2. Shear (Single & Double) test on mild steel.
3. Torsion test on mild steel.
4. Impact (Izod & Charpy) test on mild steel, aluminum, brass.
5. Compression test on timber (Parallel & Perpendicular)
6. Bending test on timber and plywood.
7. Field tests on bricks.
8. Compressive strength test on bricks
9. Flexural strength of flooring tiles.
10. Assignment on Influence Line Diagram (ILD) of Reactions, Shear Force and Bending moment of determinate beams.
11. Market survey of structural materials including its costing.

**Text Books:**

1. S. Ramamrutham and R. Narayan, "Theory of Structures", Dhanpat Rai Publishing Company (P) Ltd.

2. S. S. Bhavikatti, "Structural Analysis-I & II", Vikas Publishing House Pvt. Ltd.
3. G. S. Pandit and S. P. Gupta, "Structural Analysis: A Matrix Approach", Tata McGraw Hill Education Pvt. Limited.

**Reference Books:**

1. C. K. Wang, "Intermediate Structural Analysis", Tata McGraw Hill Education Pvt. Ltd.
2. Dr. H. J. Shah and S. B. Junnarkar, "Mechanics of Structures Vol. II (Theory and Analysis of Structures)", Charotar Publishing House Pvt. Ltd.
3. C. S. Reddy, "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd.
4. R. C. Hibbler, "Structural Analysis", Pearson Education.

**E-Resources:**

1. Understanding Stress-Strain Concepts in Various Structures
   NPTEL - Application of Stress/Strain: https://www.youtube.com/watch?v=U7CPRj1T5n8
   NPTEL - Analysis of Stress - 1: https://www.youtube.com/watch?v=iNG4bLMyeFA
2. Calculating Shear Force and Bending Moment in Determinate Beams
   NPTEL - Shear Force and Bending Moment Diagram (Part 1 of 3):
   NPTEL - Beams II: https://www.youtube.com/watch?v=74pm8A0RJ-0
3. Explaining Shear and Bending Stresses in Beams
   NPTEL - Stresses in Beams - III: https://www.youtube.com/watch?v=7Lda4Bi5g_M
4. Applying Theory of Torsion and Understanding Principal Stresses
   NPTEL - Torsion - I: https://www.youtube.com/watch?v=IQB0bJRCRxo
5. Examples on Principal Stresses - Engineering Video Lectures:
   https://engineeringvideolectures.com/video/15026
6. Analyzing Axially and Eccentrically Loaded Columns
7. Design of Column with Uniaxial Moment | Eccentrically Loaded Column:
   https://www.youtube.com/watch?v=Oi5XZ8rC-HM
8. Initially Bent Columns - Class Central: https://www.classcentral.com/course/youtube-imperfect-columns-438036
9. Determining Slopes and Deflections in Beams and Trusses
   NPTEL - Deflection of Beams - I: https://www.youtube.com/watch?v=GUOKSExdjq8
   NPTEL - Slope Deflection Method (Part - 1):
   https://www.youtube.com/watch?v=dXvvhUrMfAU

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | | **Semester:** III | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Geotechnical Engineering | | | | | | | | **Code:** CEPC303 | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| 03 | 02 | - | 03 | 40 | 40 | - | 25 | - | 125 |

**Prerequisites:**

1. Engineering Mathematics (Differentiation, Integration)
2. Engineering Mechanics (Law of mechanics)
3. Engineering Geology

**Course Objectives:**

1. To make aware of soil classification and provide the knowledge of methods for determination of index and engineering properties of soil.
2. To impart the knowledge of the soil-water interaction and the effects of static vs flowing water on soil strength.
3. To provide the knowledge of soil behavior under stress regime.

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

| | |
|---|---|
| **CO1** | Determine index properties of soil and classify in to different types of soil. |
| **CO2** | Describe the concepts of permeability and apply it in seepage analysis. |
| **CO3** | Explain the concepts of compaction and its application. |
| **CO4** | Calculate shear strength parameters using strength tests. |
| **CO5** | Determine the vertical stress, effective stress and its influence on soil behavior. |
| **CO6** | Compute the lateral thrust due to backfill on the retaining wall and classify the soil slopes |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Introduction and Index Properties of Soil:**<br>a) Basics of geotechnical engineering, its civil engineering applications, soil structure types, and objectives of soil exploration.<br>b) Three-phase soil system, weight-volume relationships, determination and importance of index properties, and soil classification (IS & Unified systems). | 07 |
| 2. | **Permeability and Seepage:**<br>a) Definition and importance of permeability, Darcy's law, influencing factors, lab tests (constant & falling head – IS 2720), field tests (pumping in/out – IS 5529 Part-I), and permeability in stratified soils.<br>b) Seepage concepts, seepage pressure, quicksand and critical gradient, 2D flow equation (Laplace), flow nets – properties, uses, and construction (e.g., for earthen dams). | 07 |

| | | |
|---|---|---|
| 3. | **Compaction:**<br>a) Introduction, compaction vs. consolidation, compaction tests (Standard & Modified Proctor), zero air void line, factors affecting compaction, and its impact on soil properties.<br>b) Field compaction methods and equipment for various soils, placement water content, field compaction control using lab test results and proctor needle. | 07 |
| 4. | **Shear Strength of Soil:**<br>a) Introduction to shear strength, Mohr's circle, Mohr-Coulomb theory, effective stress concept, peak vs. residual strength, and influencing factors.<br>b) Shear strength tests: direct shear, triaxial, unconfined compression, vane shear – suitability for soil types, drainage conditions, and properties like sensitivity and thixotropy in cohesive soils. | 07 |
| 5. | **Stress Distribution in Soils:**<br>a) Boussinesq's theory (point and circular load with assumptions and numerical), stress distribution on horizontal and vertical planes, pressure bulb concept and significance.<br>b) Westergaard's theory, equivalent point load method, and approximate stress distribution methods | 07 |
| 6. | **Earth Pressure and Stability of Slopes:**<br>a) Earth pressure basics, Rankine's theory (active, passive, at rest), effects of submerged backfill, surcharge, sloping backfill; Coulomb's wedge theory.<br>b) Slope stability: slope types and failure modes, Taylor's stability number, infinite slopes in cohesive and cohesionless soils. | 07 |
| | **TOTAL** | 42 |

**List of Experiments:**

Perform any **8 practicals** from the given list. **Practical No. 13 is compulsory**

1. Water content determination by two methods a) oven drying method, b) calcium carbide method
2. Specific gravity determination by pycnometer /density bottle.
3. Sieve analysis, particle size determination and IS classification as per I.S. Codes.
4. Determination of consistency limits and their use in soil classification as per I.S. Codes.
5. Field density test by a) core cutter b) sand replacement
6. Determination of coefficient of permeability by a) constant head and b) variable head method.
7. Direct shear test. 8. Unconfined compression test.
8. Vane shear test.
9. Standard proctor test / Modified proctor test.
10. Differential free swell test.
11. Triaxial test
12. Collection of sample soil investigation report for any construction project and write report about interpretation of index properties of soil.

**Assignments:**

1. Solution of problems on shear strength parameters using graph.
2. Rehbann's and Culmann's graphical method for determination of earth pressure.
3. 3. Flow net construction for sheet pile or earthen dam.

**Text Books:**

1. B. C. Punmia, "Soil Mechanics and Foundation Engineering", Laxmi Publications, 16th Edition, 2017.
2. Shashi K. Gulhati and Manoj Datta, "Geotechnical Engineering", Tata McGraw Hill, 2017.
3. V. N. S. Murthy, "Principles of Soil Mechanics and Foundation Engineering", UBS Publishers, 2018.
4. K. R. Arora, "Soil Mechanics and Foundation Engineering", Standard Publisher, 7th Edition, 2019.

**Reference Books:**

1. C. Venkatramaiah, "Geotechnical Engineering", New Age International Publishers, 5th Edition, 2017.
2. Braja M. Das, "Principles of Geotechnical Engineering", Cengage Learning, 8th Edition, 2020.
3. P. Purushothama Raj, "Geotechnical Engineering", Tata McGraw Hill, 2017.
4. Donald P. Coduto, "Geotechnical Engineering: Principles & Practices", Pearson Education, 2nd Edition, 2017.
5. Gopal Ranjan and A. S. R. Rao, "Basic and Applied Soil Mechanics", New Age International, 3rd Edition, 2016.
6. Joseph E. Bowles, "Physical and Geotechnical Properties of Soils", International Students Edition.

**E-Resources:**

1. http://ascelibrary.org/page/books/sgsp.
2. https://www.accessengineeringlibrary.com/content/book/9780071789714
3. http://nptel.ac.in/courses/105101084/F
4. http://nptel.ac.in/courses/105106142/

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | | **Semester:** III | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Mathematics for Civil Engineering | | | | | | | | **Code:**CEMD301 | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| 03 | - | - | 03 | 40 | 60 | - | - | - | 100 |

**Prerequisites:**

Differential equations of first order and first degree, Integral calculus and vector calculus, Elementary algebra, introductory probability and statistics concepts.

**Course Objectives:**

To make the students familiarize with concepts and techniques in Ordinary & Partial differential equations statistical methods, Probability theory and numerical methods. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

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

| | |
|---|---|
| **CO1** | Solve higher-order linear differential equations with constant coefficients using appropriate analytical methods, and apply them to solve physical and engineering problems. |
| **CO2** | Analyze and solve practical engineering problems related to structural mechanics, including bending of beams and buckling of columns, using differential equations. |
| **CO3** | Apply numerical methods to solve systems of linear equations and ordinary differential equations arising in civil engineering problems. |
| **CO4** | Summarize and interpret data using statistical techniques. |
| **CO5** | Apply concepts of probability in decision making involved in civil engineering problems. |
| **CO6** | Model and solve Partial differential equations such as wave equation, one- and two-dimensional heat flow equations. |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Linear Differential Equations (LDE):** Linear Differential Equations (LDE) of nth order with constant coefficients, Complementary function and particular integral, Method of Variation of Parameters, Cauchy's and Legendre's Differential Equation, Symmetric and Simultaneous Differential Equations. | 08 |
| 2. | **Applications of Differential Equations:** Bending of Beams: Freely supported and cantilever beams. Buckling of Columns, rods and Struts. | 06 |
| 3. | **Numerical Solutions to Linear Systems:** Gauss Elimination Method, Gauss-Seidel Method: Numerical Solutions of Ordinary Differential Equations (ODEs): Euler's Method, Modified Euler's Method, Runge-Kutta Method (4th Order), Predictor-Corrector Methods (Milne's | 07 |

| | | |
|---|---|---|
| | or Adams-Bashforth). | |
| 4. | **Statistics:**<br>Descriptive Statistics: Measures of Central Tendency: Mean, Median, Mode. Measures of Dispersion: Standard Deviation and Coefficient of Variation. Higher-Order Statistics: Moments (up to fourth order), Skewness and Kurtosis. Bivariate Data Analysis: Correlation and Linear Regression Analysis | 07 |
| 5. | **Probability:**<br>Definition and Theorems of Probability, random variable, Continuous and Discrete Probability distribution: Binomial Distribution, Poisson Distribution and Normal (Gaussian) Distribution.<br>Statistical Inference: hypothesis testing Chi-Square test for goodness-of-fit. | 07 |
| 6. | **Partial Differential Equation and it's Applications:**<br>Partial Differential Equations (PDE), Solution of PDE by Variation of Parameter. modeling and solution of Vibrating String, One- and Two-dimensional Heat flow problems. | 07 |
| | **TOTAL** | **42** |

**Text Books:**

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 40th Edition, 2008.
2. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics, Volume I and II", Pune Vidyarthi Griha Prakashan, Pune.
3. B. V. Ramana, "Engineering Mathematics", Tata McGraw-Hill.
4. H. K. Das, "Higher Engineering Mathematics", S. Chand Publication.

**Reference Books:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley Publications, 2015.
2. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 5thEdition, Elsevier Academic Press.
3. B. V. Raman, "Engineering Mathematics", Tata McGraw-Hill.
4. C. R. Wylie and L. C. Barrett, "Advanced Engineering Mathematics", McGraw-Hill, Inc.
5. Joel Hass, Christopher Heil, and Maurice Weir, "Thomas' Calculus", 13thEdition, Pearson India, 2016.

**E-Resources:**

**NPTEL Online Courses:**

1. https://onlinecourses.nptel.ac.in/noc25_ma85
2. https://onlinecourses.nptel.ac.in/noc25_ma90

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | **Semester:** III | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course::** Project Management | | | | | | **Code:**CEVS303 | | | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **PR** | **OR** | **Total** |
| 03 | - | - | 03 | 40 | 60 | - | - | - | 100 |

**Prerequisites:**

Fundamentals of Management.

**Course Objectives:**

1. To introduce the principles, functions, and significance of project and scientific management in construction.
2. To familiarize students with project planning tools, WBS, Gantt charts, and network techniques like CPM and PERT.
3. To understand resource optimization techniques and methods for effective project tracking and control.
4. To impart knowledge on material planning, inventory control, and use of tools like MS Project in construction.
5. To introduce quality control methods and the importance of TQM in construction processes.
6. To understand basic project economics, financing, and the role of consultants in project feasibility and reporting.

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

| | |
|---|---|
| CO1 | Analyze the significance of project management, roles, and organizational structures in construction success. |
| CO2 | Apply project planning processes like WBS, Gantt for scheduling construction projects and evaluate the suitability of CPM and PERT techniques for project control and monitoring. |
| CO3 | Apply resource allocation, levelling, and crashing techniques to optimize project execution and monitor costs. |
| CO4 | Analyze material management principles, planning, and Inventory Control Techniques for construction projects. |
| CO5 | Synthesize a plan for implementing Total Quality Management (TQM) in construction, including quality control, process improvement, and software tools. |
| CO6 | Understand economical terms associated with project management. |

| **Unit** | **Course Contents** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Introduction to Project Management:** Importance, Objectives & Functions of Management, Principles of Management, Modern Scientific Management (Fayol. F.W, Taylor), Role and responsibilities of a Project Manager, Importance of Organizational Structure, Types of Organization, Importance of effective project management in the construction industry, PMBOK | 07 |

| | | |
|---|---|---|
| 2. | **Project Planning and Scheduling:** Project planning process and its components, Work Breakdown Structure, Introduction to Gantt/ Bar Charts & limitations, Network Planning, Network Analysis, Components of Network Basic Terminology, Types of Networks, Network Rules, Analysis of CPM & PERT. | 07 |
| 3. | **Project Execution and Monitoring:** Resource Allocation, Resource Smoothening, Resource Levelling, Crashing Network, Updating of Network | 07 |
| 4. | **Material Planning & Management:** Definition and significance of material management, Material requirement planning, Material scheduling, Raising of Indents, Inventory Control, Inventory Classification, Inventory management, Inventory Models, Economic order quantity, ABC analysis, MS Project | 07 |
| 5. | **Total Quality Management:** Importance of Total Quantity Management in Construction Process, Steps Involved in TQM in Construction, Concept of Quantity Control, Quality Assurance, Method Statement, SOP Checklist | 07 |
| 6. | **Project Economics:** Introduction to Project Economics - Definition, Principles, Importance in Construction Industry, Annuities and its Types, Sources of Project Finance. Study of Project Feasibility Report and Detailed Project Report (DPR), Role of Project Management Consultants in Pre-Tender and Post-Tender. | 07 |
| | **TOTAL** | **42** |

**Text Books:**

1. Dr. B. C. Punmia and K. K. Khadelwal, "Project Planning and Control with PERT and CPM", Firewall Media, Laxmi Publications, New Delhi.
2. B. B. Goel, "Project Management Principles and Techniques", Deep and Deep Publishers.

**Reference Books:**

1. Khatua, "Project Management", Oxford University Press.
2. K. K. Chitkara, "Construction Project Management: Planning, Scheduling and Controlling", Tata McGraw Hill Publishing Company, New Delhi.
3. B. Sengupta and H. Guha, "Construction Management and Planning", Tata McGraw Hill Publishing Company, New Delhi.
4. Dennis Lock, "The Essentials of Project Management", Gower Publishing Ltd., UK.
5. Asok Mukherjee, "Essentials for Decision Makers", Scitech Publication, New Delhi.
6. Dr. S. Rajaram and Dr. M. Sivakumar, "Total Quality Management", Biztantra.
7. Sunil Sharma, "Total Engineering Quality Management", Macmillan India Ltd.
8. R. Panneerselvam, "Engineering Economics", PHI Learning, 2nd Edition, 2014.

**E-Resources:**

## DEPARTMENT OF CIVIL ENGINEERING

1. A Video on the "Importance & Objectives of Management",
   https://www.youtube.com/watch?v=q6LMjurECZM
2. A Video on the "Principles of Management"
   https://www.youtube.com/watch?v=90qpziPNRnY
3. A Video on the "Role & Responsibilities of a Project Manager"
   https://www.youtube.com/watch?v=KG5cltHpbYs
4. A Video on the "Importance of Organizational Structure
   https://www.youtube.com/watch?v=zUd0UNHyy60

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | **Semester:** III | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Computer Aided Building Drawing | | | | | | **Code:** CECC101 | | | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| 01 | 04 | - | 03 | - | - | 25 | - | 50 | 75 |

**Prerequisites:**

Basic Civil Engineering, Basics of building planning and drawing, Units and unit conversions

**Course Objectives:**

1. To introduce students to the fundamentals of CAD software and its applications in engineering drawing.
2. To develop proficiency in using CAD software for creating, editing, and managing 2D Drawing.
3. To enhance students' skills in precision drawing, dimension, and annotation using CAD tools.
4. To enable students to design comprehensive architectural plans, including line plans, layouts of columns, footings, and beams for buildings.
5. To equip students with the skills to proficiently use AutoCAD for creating detailed plans, sections, and elevations of engineering components and simple objects, ensuring accuracy and adherence to industry standards.

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

| | |
|---|---|
| **CO1** | Demonstrate basic CAD drawing commands and navigate the CAD interface effectively. |
| **CO2** | Utilize object selection methods and manage layers and properties in CAD drawings. |
| **CO3** | Apply advanced drawing commands and precision techniques to create detailed CAD drawings. |
| **CO4** | Use modifying tools and dimensioning to edit and annotate CAD drawings accurately. |
| **CO5** | Draw Layouts of Structural components Using AutoCAD |
| **CO6** | Create Comprehensive Building Drawings with AutoCAD |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Introduction to CAD and Basic Drawing Commands:** Introduction to CAD and CAD Software, Overview of CAD and its applications, Introduction to various CAD software tools. Understanding the CAD Interface, Workspace, command line, and toolbars, Navigating the CAD interface. Units and Measurement, setting up units, Understanding measurement systems in CAD. Basic Drawing Commands, Line, Circle, Arc, Rectangle, Polygon. Editing Commands, Erase, Move, Copy, Mirror, Rotate. | 02 |
| 2. | **Object Selection and Layer Management:** Object Selection Methods, Selecting objects: Select, Window, Crossing, Fence, Using selection filters and quick select. Using Layers and Properties, creating | 02 |

| | | |
|---|---|---|
| | layers, assigning colors, line types, and line weights, Managing layer properties. | |
| 3. | **Advanced Drawing Commands and Precision Techniques:** Advanced Drawing Commands, Polyline, Hatch, Region. Working with Blocks and Attributes, Creating, inserting, and editing blocks, Understanding and using attributes. | 02 |
| 4. | **Modifying Tools and Dimensioning:** Introduction to Modifying Tools, Stretch, Scale, Trim, Extend, Inquiry Commands, Distance, Area. Dimensioning Basics, Linear dimensions, aligned dimensions, Radius and Diameter dimensions, Annotation Tools, Text, Multiline Text, Leaders, Adding and managing annotations. | 02 |
| 5. | **Structural Component Layouts in AutoCAD** Detailed layouts of Simply supported beam, Cantilever beam, Continuous beam,columns and footings. | 02 |
| 6. | **Comprehensive Building Drawings Using AutoCAD** Develop plan, elevation, and section for a single residential building including plumbing, sanitary, and electrical layouts, preparing schedule of opening. | 02 |
| | **TOTAL** | **12** |

**List of Experiments:**

1. Drawing Simple Shapes: Create basic geometric shapes such as squares, circles, and triangles using line, circle, and polyline tools.
2. Practice various object selection methods (Select, Window, Crossing, Fence, Quick Select) and effectively create, manage, and organize layers with appropriate colors, line types, and visibility settings in AutoCAD
3. Utilize advanced AutoCAD drawing tools—Polyline, Hatch, Region—and efficiently create, insert, and edit blocks with attributes to produce organized and reusable drawing components.
4. Execute modify commands (Stretch, Scale, Trim, Extend), employ inquiry tools (Distance, Area), and apply dimensioning methods (linear, aligned, radius/diameter) along with annotation tools like text, multiline text, and leaders for precise and well-annotated AutoCAD drawings
5. Produce detailed AutoCAD layouts for footings, columns, simply supported, cantilever, and continuous beams, following RCC detailing standards and detailed hardcopy of output for each structural component.
6. Develop detailed AutoCAD drawings for plan, elevation, and section of a single residential building—including plumbing, sanitary, and electrical layouts—and prepare a schedule of openings in compliance with building standards and Detailed hardcopy of output for each structural component.

**Text Books:**

1. Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication
2. K. Venugopal, K, (2015), "Engineering and Graphics", New Age International

**Reference Books:**

1. AUTOCAD® 2019, BEGINNING AND INTERMEDIATE, Munir M. Hamad, Autodesk Approved Instructor, Mercury Learning And Information LLC. ISBN: 978-1-683921-76-9

## DEPARTMENT OF CIVIL ENGINEERING

| **E-Resources:** |
|---|
| 1. AutoCAD Quick Start Guide – https://www.autodesk.com/learn/ondemand/curated/autocad quick-start-guide<br>2. NPTEL - https://nptel.ac.in/courses/112/103/112103019/<br>3. NPTEL - https://nptel.ac.in/courses/112/101/112101097/<br>4. YouTube - https://www.youtube.com/user/sourcecad |

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | | **Semester:** III | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Project Based Learning | | | | | | | | **Code:** CECE301 | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| - | 02 | - | 01 | - | - | 50 | - | - | 50 |

**Prerequisites:**

Basic knowledge of civil engineering concepts, Teamwork and communication skills, Report writing and presentation skills, Basic research and ICT (computer) skills

**Course Objectives:**

1. To engage students in constructive learning environment and develop self-learning abilities.
2. To develop critical thinking and solving civil engineering problems by exploring and proposing sustainable solutions.
3. To integrate knowledge and skills from civil and other engineering areas.
4. To develop professional skills and project management.

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

| | |
|---|---|
| **CO1** | Identify the community/ practical/ societal needs and convert the idea into a product/ process/ service. |
| **CO2** | Analyse and design the physical/ mathematical/ ICT model in order to solve identified problem/project. |
| **CO3** | Create; work in team and applying the solution in practical way to specific problem. |

**Course Content:**

Introduction to Project Based Learning, Traditional vs. Cognitive Learning, Why PBL? Principles of Problem Design, Seven Steps of Problem Design, Online PBL Applications and Research Trends Case Studies in Civil Engineering.

**Group Structure:**

Working in mentor-monitored groups. The students identify, plan, manage and complete a task/ project/ activity which addresses the stated problem related to civil engineering.
There should be team/group of maximum four students.
A supervisor/ mentor faculty teacher assigned to individual groups.

**Selection of Project/Problem:**

At start of course revision of PBL significance, guidelines and evaluation parameters should be discussed commonly at onset of semester. In this exercise basic plan, in brief research methodology points relevant to PBL, sample case studies related to civil engineering and brief information about project, problem and publications should be given.
Selection of project, problem or any technical aspect of civil engineering should be encouraged. If any project/problem selected in first year engineering related to civil engineering can be continued if feasible in second year after preliminary discussion. The project or problem can be project/ design problem/ case study/ product/ process/ software etc.

It is expected that the project/problem selected could have different alternative solutions which could be theoretical, mathematical modelling, experimental or software models. Projects should be based on real life problems encountered in professional or daily life. Projects can be product, service mainly practical, scientific or applied domain. It is recommended to include hands-on activities, reading, analysis, field visits, and experimental work to learn and explore new trends of technologies. Proper representation of project/problem, outcome and report on results and conclusions is important for assessment of course.

**Assessment:**

The faculty/ mentor is committed to assessing and evaluating both students' performance and students' learning process in every phase of PBL. It is monitored regularly on weekly basis. It is expected that the faculty/ mentor should assess the progress and report both quality of the group work and each student's individual contribution. Rubrics for measurement and assessment should be prepared and be part of assessment of term work. For this purpose, it is recommended that Civil Engineering Department is required to prepare guidelines related to:

- Selection of Project/ Problem
- Rubrics for Assessment and evaluation
- Supervision and Students monitoring sheet
- PBL Log Book format

Departmental level assessment panel should support students in this activity and should assess students on the basis of the guidelines mentioned and assessment rubrics. At least two intermediate reviews should be held with progress monitoring in terms of performance and submission. Intermittent review sheet and status of each group should be done after six weeks from the start of semester. Proper log has to be maintained and weekly report has to be verified and signed by mentor. Each group should submit their progress and outcome in the form of documented project/ report. Individual log is to be maintained for each student (including individual work, role and activities in the project). Group assessment (roles defined, distribution of work, intra-team and inter-team collaboration).

**Evaluation and Continuous Assessment:**

Prepare "PBL Log Book" which includes record of activities performed and evaluation carried out with proper signatories. Maintain regular record on weekly basis. Records and observations must also be maintained at student level. Continuous assessment sheet must be prepared by each faculty which consists assessment made on weekly basis also performance made during mid-review and end-review. PBL log book must be maintained as a record even after completion of semester. It will serve as document which will reflect the punctuality, accountability, technical writing ability and project workflow.

**Recommended parameters for assessment, evaluation and weightage:**

Evaluation criteria and respective percentage weightage for marks.
Idea/ Selection of problem and product and of course = 50% (individual assessment and team assessment)
Documentation in the form of PBL report (typed, hard copy) = 15%
Presentation/ involvement during mid PPT review = 10%

Participation/ involvement in group activity = 10%
Continuous assessment on technical parameters based on the given evaluation parameters for excellent, meritorious, acceptable and not acceptable = 15%

**References:**

1. M. Savin-Baden and C. Howell Major, "Foundations of Problem-Based Learning", McGraw-Hill Education, 2004.
2. R. A. Reiser, D. A. Stepich, J. D. Lehman, and J. D. Russell, "Instructional Technology and Media for Learning: Instructional Design Integrating Computers and Using Media", Merrill/Macmillan, Columbus, OH, 1996.
3. Anjali Khirwadkar, "Educational Technology: Teaching and Learning Methods and Development", Neelkamal Publications, Hyderabad, 2011.
4. Erik Graaff, Ronald Ulrich, and Anette Kolmos, "PBL in Engineering Education: International Perspectives on Curriculum Change", Sense Publishers, 2007.
5. Mahendra R. Gaikwad and Nisha Dabhade, "The Wiley Handbook of Problem-Based Learning", Wiley, 2019.
6. Larmer, Krauss, and Suzanne K. Boss, "Project Based Teaching", ASCD, 2018.
7. John Larmer, David Ross, and John R. Mergendoller, "Project Based Learning (PBL) Starter Kit: To-the-Point Advice, Tools and Tips for Teachers", 2015.
8. John Larmer and Suzie Boss, "Setting the Standard for Project Based Learning: A Proven Approach to Rigorous Classroom Instruction", 2015.
9. William N. Bender, "Project Based Learning: Differentiating Instruction for the 21st Century".
10. Suzie Boss and John Larmer, "Transforming Schools Using Project-Based Learning, Performance Assessment, and Common Core Standards".
11. Suzie Boss, "Implementing Project-Based Learning Strategies", ASCD Resources, www.ascd.org.

**E-Resources:**

1. www.pblwork.org
2. www.my.pblworks.org
3. www.swayam.gov.in/nd2_ntr20_ed12/preview
4. www.schoology.com

**Format of PBL report: Sequence of pages**

i. Front Cover Page
ii. Certificate
iii. Acknowledgement
iv. Synopsis
v. Contents
vi. List of Figures
vii. List of Tables
viii. Notations

## DEPARTMENT OF CIVIL ENGINEERING

**Chapters:**

**Chapter 1 Introduction** (This consists of: 1.1 Introduction of the Project Work; 1.2 Problem Statement; 1.3 Objectives and 1.4 Scope of the Project Work; 1.5 Research Methodology; 1.6 Limitations of study; 1.7 Expected Outcome)

**Chapter 2 Literature Review** (It shall include theoretical support, details regarding work done by various persons, methods established, any new approach.)

**Chapter 3 Planning Schedule/ Flow Chart for Completion of Project**

**Chapter 4 Conclusion**

References and Bibliography (The references and bibliography shall include either a book/manual/book title, title of paper/read manual/book, name of the journal, month & year of publication, volume number/ISBN number, page number x-y. The references and bibliography shall be as per universal standards as mentioned in any international journal of professional body).

**Report Printing Details:**

1. Report shall be typed on A4 size Executive Bond paper with single spacing preferably on both sides of paper.
2. Margins: Left Margin: 35 mm, Right Margin: 25 mm, Top Margin: 25 mm, Bottom Margin: 25 mm
3. Page number at bottom margin at center.
4. Size of Letters: Chapter Number: 16 font size, Times New Roman in Capital Bold Letters, Chapter Titles (1.1, 1.2 etc.) Bold Letters, Main Titles (1.1.1, 1.1.2 etc.) 16 Font size in Bold Letters. Sub Titles in sentence case (1.1.1.5, 4.5.1 etc.) 14 Font size in Bold Letters Sentence case but neither in bold nor in italics.
5. Blank line left in between paragraphs.
6. Figure name: 12 Font in sentence case Bold- Below the figure.
7. Table title - 12 font size in sentence case. Bold-Above the table.

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | **Semester:** III | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Internship – II | | | | | | **Code:** CEIN302 | | | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| - | - | - | 02 | - | - | 25 | - | - | 25 |

**Preamble:**

Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.

**Course Objectives:**

1. Exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry.
2. Learn to implement the technical knowledge in real industrial situations.

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

| | |
|---|---|
| **CO1** | Gain exposure to industry practices and understand how academic concepts are applied in professional settings. |
| **CO2** | Develop and demonstrate effective communication and teamwork skills within a work environment. |
| **CO3** | Improve your problem-solving and time management skills by working in real-world industry settings. |

**Internship Requirements**

1. **Internship Duration:** It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 4 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW).
2. **Internship Opportunities:** Students can explore various opportunities for internships at:
    a. Industries
    b. Research labs or organizations
    c. Collegiate clubs
    d. In-house research projects
    e. Online internships
3. **Support and Assistance:** Students can seek assistance for securing internships from:
    a. The Training and Placement cell, along with departmental coordinators
    b. Department or institute faculty members
    c. Personal contacts
    d. Directly connecting with industries or organizations
4. **Request Letter:** Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the

standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.

5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.

# SYLLABUS

## SEMESTER - IV

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | | | **Semester:** IV |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Fluid Mechanics | | | | | | | | | **Code:** CEPC404 |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| 03 | - | - | 03 | 40 | 60 | - | 50 | - | 150 |

**Prerequisites:**

Physics, Engineering Mechanics, Engineering Mathematics

**Course Objectives:**

1. To study basics of Fluid Mechanics, Fluid properties and concept of submerged & floating structure in a static fluid.
2. To make use of principles of continuity, momentum, and energy as applied to fluid motions.
3. To apply fundamental principles of fluid mechanics for the solution of practical civil engineering problems.

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

| | |
|---|---|
| **CO1** | Use fluid properties and dimensional analysis to solve fluid flow problems. |
| **CO2** | Solve fluid statics problems. |
| **CO3** | Measure fluid pressure. |
| **CO4** | Calibrate flow measuring instruments such as the venturimeter and orifice meter. |
| **CO5** | Analyze the pipe network |
| **CO6** | Apply the knowledge of uniform flow and depth-energy to solve problems on open channel flow. |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Properties of Fluids & Dimensional Analysis:**<br>a) Properties of Fluid - Definition of fluid, physical properties of fluids: density, specific weight, specific volume, relative density and viscosity. Newton's law of viscosity, classification of fluids, Dynamic and kinematic viscosity, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure.<br>b) Unit & Unit Conversions - Dimensions of physical quantities, dimensional homogeneity, dimensional analysis using Buckingham's π theorem method, geometric kinematic and dynamic similarity, important dimensionless parameters (Reynolds No., Froude No., Euler No., Mach no. and Weber No) and their significance , Model Laws (Froude's Law and Reynold's law) | 07 |
| 2. | **Fluid Statics:**<br>The basic equation of hydrostatics, concept of pressure head, measurement of pressure (absolute, gauge), application of the basic equation of hydrostatics, | 07 |

| | | |
|---|---|---|
| | Pressure measuring devices, Centre of pressure, total pressure on plane and curved surfaces, practical applications. | |
| 3. | **Fluid Kinematics:**<br>Methods of describing the motion of fluid, velocity and acceleration, and their components in Cartesian co-ordinates, stream line, stream tube, path line, and streak line, control volume. Classification of flow: steady and unsteady; uniform and non-uniform; laminar and turbulent; One, two, and three-dimensional flows; compressible and incompressible; rotational and irrotational, Equation of continuity for three dimensional flow in Cartesian co-ordinates, flow net, methods of drawing flow net, uses. | 07 |
| 4. | **Fluid dynamics:**<br>a) Forces acting on fluid mass in motion, Euler's equation of motion along a streamline and its integration, assumptions of Bernoulli's equation, Modified Bernoulli's equation, its applications and limitations, Hydraulic grade line and total energy line. b) Application of Bernoullis's equation - Venturimeter, Orifice and orifice meter, Rotameter and Pitot tube. | 07 |
| 5. | **Laminar flow and Flow Through Pipes:**<br>Characteristics of laminar flow, laminar flow through a circular pipe: Hagen Poiseuille equation, Hazen-Williams formula. Characteristics of turbulent flow, Darcy-Weisbach Equation, Moody's diagram, Major and minor losses of energy in pipes, flow through pipes in simple and compound pipe, pipes in series, parallel, Dupit's equation, Introduction to pipe network and design: Hardy cross method. | 07 |
| 6. | **Introduction to Open Channel:**<br>Introduction to Open channel flow: Classification of channels, channel flows and geometric elements of channel, Velocity distribution in open channel flow and hydraulic jump.<br>Uniform flow in open channels: Uniform flow formulae: Chezy's and Manning's formulae; Factors affecting Manning's roughness coefficient. Most efficient channel sections: rectangular, trapezoidal.<br>Depth-Energy Relationships in Open Channel Flow: Specific energy and Specific force diagram, Depth discharge Diagram, Critical depth, Conditions for occurrence of critical flow; Froude's number, flow classification based on it, Introduction to channel transition. | 07 |
| | **TOTAL** | **42** |

**List of Experiments:**

The term work shall consist of a journal giving details of a minimum 8 out of the following experiments.

1. Measurement of viscosity by Redwood viscometer.
2. Measurement of pressures using different pressure measuring devices (including transducers /state of arts digital instruments also).
3. Determination of stability of floating bodies using ship models.

4. Experimental verification of Bernoulli's theorem with reference to loss of energy
5. Calibration of Venturimeter / Orifice meter.
6. Drawing flow net by electrical analogy for flow below weir (with & without sheet pile)
7. Plotting the pattern of laminar flow using Reynolds apparatus or Heleshaw's apparatus.
8. Transition of Laminar and turbulent flow through pipes.
9. Determination of, minor loss in a pipe system/friction factor for a given pipe.
10. Measurement of surface tension.
11. Demonstration of fluid flow through appropriate VCD/Audio visual / PPT's.

**Assignments: any two of the following**

1. Solve three reservoir problem / pipe network analysis using Excel or any programming language.
2. Determination of friction factor for a pipe using any programming language.
3. Application of any fluid mechanics software to analyze the problem.
4. Developing a demo model related to any fluid flow phenomenon (physical model/ soft model).
5. 5. Assignment on drawing of flow net graphically.

**Text Books:**

1. Dr. P. N. Modi and Dr. S. M. Seth, "Hydraulics & Fluid Mechanics", Standard Book House.
2. Sukumar Pati, "Fluid Mechanics and Hydraulic Machines", McGraw Hill Education (India).

**Reference Books:**

1. Yunus Cengel and John Cimbala, *"Fluid Mechanics: Fundamentals and Applications"*, Tata McGraw-Hill Education, New Delhi.
2. R. J. Garde and A. J. Mirajgaonkar, "Engineering Fluid Mechanics", SCITECH Publications.
3. Streeter and Wylie, "Fluid Mechanics", Tata McGraw-Hill Education.
4. Dr. A. K. Jain, *"Fluid Mechanics"*, Khanna Publishers.
5. K. Subramanya, *"Fluid Mechanics and Hydraulic Machines"*, McGraw-Hill Education.
6. Frank White, *"Fluid Mechanics"*, McGraw-Hill Education.
7. R. K. Bansal, *"Fluid Mechanics and Fluid Machinery"*, Laxmi Publications.

**E-Resources:**

1. NPTEL - http://nptel.iitm.ac.in/courses.php
2. NPTEL -https://nptel.ac.in/courses/112/105/112105171/
3. NPTEL - https://nptel.ac.in/courses/112/104/112104118/
4. YouTube-https://www.youtube.com/playlist?list=PLbMVogVj5nJRzR7yqOq4NnqmGJ4uPtY-w
5. YouTube-https://www.youtube.com/playlist?list=PL3oM2Yb9qScX8LGmAFcvR3jEGk8pJGnG8

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | | | **Semester:** IV |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Surveying | | | | | | | | | **Code:**CEPC405 |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| 03 | - | - | 03 | 40 | 60 | - | - | - | 100 |

**Prerequisites:**

Basic Civil Engineering. (Principles of survey, applications of survey, scale, use of tape, dumpy level etc., is essential)

**Course Objectives:**

1. To develop an ability in students to apply knowledge of mathematics, science, and engineering to understand the measurement techniques in surveying.
2. To make students competent to use techniques, methods and equipment/tools necessary for linear and angular measurement in horizontal and vertical planes.

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

| | |
|---|---|
| **CO1** | Utilize Plane Table Surveying techniques to prepare a plan depicting all significant field details accurately. |
| **CO2** | Establish Reduced Levels to develop accurate contour maps for the designated terrain. |
| **CO3** | Perform angular measurements, conduct theodolite traversing, and apply methods for coordinate computation, traverse balancing, and area calculation using transit theodolite. |
| **CO4** | Compute horizontal distances, elevations, and prepare tacheometric contour maps using principles of stadia tacheometry. |
| **CO5** | Set out simple circular curves using linear and angular methods. |
| **CO6** | Apply advanced surveying techniques using Electronic Total Stations (ETS) and Global Positioning System (GPS) in various field applications. |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Introduction and Plane Table Surveying:**<br>a) Introduction, purpose, and principles of surveying; types of surveys – plane, geodetic, cadastral, hydrographic, photogrammetry, aerial, layout, control, topographical, route, and reconnaissance.<br>b) Plane table surveying – principle, equipment and uses, methods, advantages and limitations. | 07 |
| 2. | **Levelling and Contouring:**<br>a) Levelling – Basics, types of levels, dumpy level components and adjustments, reciprocal levelling, corrections for curvature and refraction, visible horizon distance.<br>b) Contouring – Contour interval, horizontal equivalent, contour maps and their uses, methods of contouring. | 07 |

| | | |
|---|---|---|
| 3. | **Theodolite Surveying:**<br>a) Types and uses of theodolite, parts and functions of transit theodolite, vernier reading, key terms, fundamental axes, adjustments (temporary & permanent), measurement of horizontal angles (direct & repetition methods), error elimination, and vertical angle measurement.<br>b) Theodolite traversing – computation of consecutive and independent coordinates, Balancing of closed traverse by Bowditch's rule and transit rule, Gale's traverse table. Checks, omitted measurements, area calculation by independent coordinates | 07 |
| 4. | **Tacheometry:**<br>Tacheometry – Principle of stadia tacheometry, finding tacheometric constants. Methods, Fixed hair method with vertical staff to determine horizontal distances and elevations of points, Tacheometric contouring. | 07 |
| 5. | **Curves:**<br>Necessity and types of curves, simple circular curves, Notations and properties Setting out of a simple circular curve by linear methods such as offsets from the long chord, Offsets from chord produced, radial and perpendicular offsets from tangents. Angular methods: Rankine's method of deflection angles. | 07 |
| 6. | **Advanced Surveying Techniques and Applications:**<br>a) Electronic Distance Measurement: Study and use of Electronic Total Station (ETS), its types, remote elevation and distance measurements, and area measurement.<br>b) Global Positioning System (GPS): Components – space, control, and user segments; reference systems, satellite orbits, GPS observations, and applications.<br>Applications: Setting out works (buildings), profile levelling, cross-sectioning, and pipeline surveying | 07 |
| | **TOTAL** | **42** |

**List of Experiments:** Perform any six (06) Experiments and Any 02 projects are mandatory.

**a) Experiments:**

1. Actual mapping of small structure/ area using the Radiation and intersection Method.
2. Differential leveling (with at least two change points) using auto / digital level.
3. Measurement of horizontal angles (by repetition method) using vernier transit theodolite.
4. Measurement of vertical angles using vernier transit theodolite.
5. Finding multiplying and additive constants of a tacheometer.
6. Setting out a building from a given foundation plan (minimum six coordinates).
7. Setting out a circular curve by Rankine's method of deflection angles.
8. Practical based on various special functions available in a total station such as remote elevation measurements, remote distance measurements and co-ordinate stakeout.

**b) Projects**

1. **Project I:** Road project using Auto level for a minimum length of 100 m including fixing of alignment, profile levelling, cross- sectioning, plotting of L section and Cross Section. (One full imperial sheet including plan, L-section and any three typical Cross- sections).
2. **Project II:** Tacheometric contouring project with at least two instrument stations about 60 m to 100 m apart and plotting contours (minimum contour interval 1 meter).
3. **Project III:** Total Station Traversing
4. **Project IV:** Practical: Determining Coordinates Using Handheld GPS

**Text Books:**

1. N.N. Basak, "Surveying and Levelling", Tata McGraw-Hill.
2. B.C. Punmia, "Surveying", Vol. I, II, and III, Laxmi Publications, New Delhi.
3. T.P. Kanetkar, S.V. Kulkarni, "Surveying and Leveling", Vol. I & II, Pune Vidyarthi Griha Prakashan.

**Reference Books:**

1. A.M. Chandra, "Plane Surveying", New Age International Publishers.
2. James M. Anderson, Edward M. Mikhail, "Surveying: Theory and Practice", Tata McGraw-Hill.
3. David Clark, "Plane and Geodetic Surveying for Engineers, Vol. I", Constable.

**E-Resources:**

1. NPTEL Video lecture on "Surveying", https://youtube.com/playlist?list=PL20A0651466E8A776&si=ulKIz8G2aAvHUGGj
2. NPTEL web lecture on "Surveying"https://archive.nptel.ac.in/courses/105/107/105107122/

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | **Semester:** IV | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Structural Analysis | | | | | | | **Code:** CEPC406 | | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| 03 | - | - | 03 | 40 | 60 | - | - | - | 100 |

**Prerequisites:**

Fundamentals of Physics, Mathematics, Engineering Mechanics and Mechanics of Structures

**Course Objectives:**

1. This subject will build on the concepts from Engineering Mechanics and Mechanics of Structures.
2. This will create a foundation for analyzing real life structures by imparting knowledge about various methods involved in the analysis of indeterminate structures.

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

| | |
|---|---|
| **CO1** | Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams. |
| **CO2** | Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames. |
| **CO3** | Implement application of the slope deflection method to beams and portal frames. |
| **CO4** | Analyze beams and portal frames using moment distribution method. |
| **CO5** | Determine response of beams and portal frames using structure approach of stiffness matrix method. |
| **CO6** | Apply the concepts of plastic analysis in the analysis of steel structures. |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Fundamentals of Structure and Analysis of Redundant Beams:**<br>a) Types and classification of structures based on structural forms, concept of indeterminacy, static and kinematics degree of indeterminacy.<br>b) Analysis of propped cantilever, fixed beam and continuous beams with indeterminacy up to second degree by strain energy method. | 07 |
| 2. | **Analysis of Redundant Pin Jointed Frames and Multi-Storied Multi-Bay 2-D Rigid Jointed Frames:**<br>a) Analysis of redundant trusses by unit load method for external loading, lack of fit, sinking of support and temperature changes (indeterminacy up to second degree).<br>b) Approximate methods of analysis of multi-storied multi-bay 2-D rigid jointed frames by Cantilever method and Portal method. | 07 |

| | | |
|---|---|---|
| 3. | **Slope-Deflection Method:**<br>a) Slope-deflection equations, equilibrium equation of Slope-deflection method, application of Slope deflection method to beams with and without joint translation and rotation, yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.<br>b) Sway analysis of rigid joint rectangular single bay single storey portal frames using Slope- deflection method. (Involving not more than three unknowns) | 07 |
| 4. | **Moment Distribution Method:**<br>a) Stiffness factor, carry over factor, distribution factor, application of Moment distribution method of analysis to beams with and without joint translation and yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.<br>b) Sway analysis of rigid jointed rectangular single bay single storey portal frames using Moment distribution method (Involving not more than three unknowns). | 07 |
| 5. | **Stiffness Method:**<br>a) Fundamental concepts of flexibility and stiffness, relation between them. Stiffness method of analysis- Structure approach only. Application to beams (Involving not more than three unknowns).<br>b) Application of Stiffness structure approach to rigid jointed rectangular portal frames (Involving not more than three unknowns). | 07 |
| 6. | **Influence Line Diagrams for Beams:**<br>Basic Concept of Influence lines, Construction of Influence Line Diagrams (ILD) for Support reactions, Shear Force and Bending Moment at a given section for simply supported beams, overhanging beams and compound beams. | 07 |
| | **TOTAL** | **42** |

**Text Books:**

1. S. Ramamrutham and R. Narayan, "Theory of Structures", Dhanpat Rai Publishing Company (P) Ltd.
2. S. S. Bhavikatti, "Structural Analysis-I & II", Vikas Publishing House Pvt. Ltd.
3. G. S. Pandit and S. P. Gupta, "Structural Analysis: A Matrix Approach", Tata McGraw Hill Education Pvt. Limited.

**Reference Books:**

1. C.K. Wang, "Intermediate Structural Analysis", Tata McGraw-Hill Education Pvt. Ltd.
2. H.J. Shah, S.B. Junnarkar, "Mechanics of Structures Vol. II (Theory and Analysis of Structures)", Charotar Publishing House Pvt. Ltd.
3. C.S. Reddy, "Basic Structural Analysis", Tata McGraw-Hill Education Pvt. Ltd.
4. R.C. Hibbeler, "Structural Analysis", Pearson Education.
5. B.G. Neal, "The Plastic Methods of Structural Analysis", Chapman & Hall.

**E-Resources:**

1. **Fundamentals of Structure and Analysis of Redundant Beams:**
   NPTEL - Indeterminate Structures by Prof. Devdas Menon (IIT Madras)
   YouTube - Strain Energy Method for Beams (Gate Academy)
   Lecture Notes PDF - Indeterminacy and Redundant Structures
   https://nptel.ac.in/courses/105/106/105106050/
2. **Analysis of Redundant Pin-Jointed Frames and Multi-storied 2D Frames**
   NPTEL - Truss Analysis by Unit Load Method
   YouTube - Approximate Methods (Portal & Cantilever)
   Lecture Slides - Truss Indeterminacy Analysis
3. **Slope-Deflection Method**
   NPTEL - Slope Deflection Method (IIT Kharagpur)
   YouTube - Slope Deflection (MKS Learning)
4. **Moment Distribution Method**
   NPTEL - Moment Distribution Method (IIT Madras)
   YouTube - MDM with Sway
5. **Stiffness Method (Structure Approach)**
   NPTEL - Stiffness Method (IIT Guwahati)
   YouTube - Stiffness Method Examples
6. **Plastic Analysis of Structures**
   NPTEL - Plastic Analysis by Prof. S.R. Gandhi (IIT Bombay)
   YouTube - Plastic Analysis (EduPoint)

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | **Semester:** IV | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Construction Management | | | | | | | **Code:** CEMD402 | | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| 03 | - | - | 03 | 40 | 60 | - | - | - | 100 |

**Prerequisites:**

Project Management, Building Materials and Construction

**Course Objectives:**

1. To understand various construction activities and evaluating construction projects.
2. To handle all situations with knowledge of various labour laws and financial aspects of construction projects.
3. To know about risk management and value engineering
4. To utilize material and human resources efficiently with managerial skills interpersonal and intrapersonal skills.
5. To apply knowledge of artificial intelligence on construction project

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

| | |
|---|---|
| **CO1** | Understand the overview of construction sector. |
| **CO2** | Illustrate construction scheduling, work study and work measurement. |
| **CO3** | Acquaint various labor laws and financial aspects of construction projects. |
| **CO4** | Explain elements of risk management and value engineering. |
| **CO5** | State material and human resource management techniques in construction. |
| **CO6** | Understand basics of artificial intelligence techniques in civil engineering. |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Overview of Construction Sector:** Role of construction industry in infrastructure development, construction management, project management consultants, project overruns, project monitoring and reporting systems, managerial correspondence and communications, generation and identification of project investment opportunities. | 07 |
| 2. | **Introduction to Construction Scheduling Software & BIM:** Introduction to Building Information Modeling (BIM),Construction Scheduling Softwares | 07 |
| 3. | **Labour Laws and Financial Aspects of Construction Project:** Need and importance of labour laws, study of some important labour laws associated with construction sector, workman's compensation act 1923, building and other construction workers act 1996, child labour act, the minimum wages act 1948,Introduction to BOCW Act, Capital investments, means of finance, working capital requirements, project cash flow projections and statements. | 07 |

| | | |
|---|---|---|
| 4. | **Risk Management and Value Engineering:**<br>Risk Management, origin, use of mathematical models, risk identification, mitigation of project risks, role of insurance in risk management. Value Engineering, Phases & Stages of Value Engineering in Construction, Construction safety Management (Formwork) | 07 |
| 5. | **Material Management:**<br>Material, concept of material management, various phases of material flow system, role of material manager, role of material management in construction management, inventory control methods, concept of logistics and supply chain management, ERP Software, role of ERP in material management and material resource information systems. | 07 |
| 6. | **Work Study & Motion Study:**<br>Definition and objectives of work study & Motion Study, Various recording Techniques, Principles of Motion Economy, Techniques of work measurement, Time study, Time Study Procedure , Labour & Machinery | 07 |
| | **TOTAL** | **42** |

**Text Books:**

1. B. Sengupta and H. Guha, "Construction Management and Planning", Tata McGraw Hill Publications.
2. P. K. Joy, "Total Project Management – The Indian Context", Macmillan Publications.
3. Prasanna Chandra, "Projects: Planning, Analysis, Selection, Implementation and Review", Tata McGraw Hill Publications.

**Reference Books:**

1. C. Alan Twort and J. Gordon Rees, "Civil Engineering Project Management", Elsevier Publications.
2. Roy Pilcher, "Principles of Construction Management", McGraw Hill.
3. Biswajeet Pattanayak, "Human Resource Management", Prentice Hall Publishers.
4. Gopalkrishnan and Sunderasan, "Materials Management", Prentice Hall Publications.
5. S. N. Mishra, "Labour and Industrial Laws", Central Law Publications.
6. Veganarayanan, "Artificial Neural Network", Prentice Hall.

**E-Resources:**

1. https://www.youtube.com/watch?v=q6LMjurECZM
2. https://www.youtube.com/watch?v=90qpziPNRnY
3. https://www.youtube.com/watch?v=WNWSQOynrl0
4. https://www.youtube.com/watch?v=dFTG3ohAcso
5. https://www.youtube.com/watch?v=E7JlYl8RcBM&list=PLJdQgRDfPMeBLIHYf8oNuXJ7daeMj8JGx
6. https://www.youtube.com/watch?v=_h4i9C47rT8
7. https://www.youtube.com/watch?v=HjMy8FxpAgE&t=941s
8. https://www.youtube.com/watch?v=C03CqJoMmPQ

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | | **Semester:** IV | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Generative AI Tools in Civil Engineering | | | | | | | | **Code:** CEAE402 | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| - | 4 | - | 2 | - | - | 50 | - | - | 50 |

**Prerequisites:**

Basic scripting for data processing, Knowledge of Civil Engineering

**Course Objectives:**

1. To introduce the fundamentals of Generative AI and its application in engineering disciplines.
2. To develop the ability to craft effective prompts for various generative AI tools.
3. To enable Civil Engineering students to integrate AI into practical problem-solving and design workflows.
4. To explore real-world use cases of generative AI in structural design, urban planning, environmental analysis, and construction management.
5. To build critical thinking and creativity through AI-assisted generative tools.
6. To prepare students for industry-relevant applications using cutting-edge AI technologies.

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

| | |
|---|---|
| **CO1** | Understand the principles and types of Generative AI models and tools. |
| **CO2** | Write precise and structured prompts to interact with text-to-text, text-to-image, and other generative models. |
| **CO3** | Apply AI tools to Civil Engineering problems such as modeling, visualization, design optimization, and analysis. |
| **CO4** | Interpret and evaluate AI-generated content critically in the context of engineering design. |
| **CO5** | Demonstrate the ability to automate repetitive tasks and enhance productivity using prompt engineering. |
| **CO6** | Develop mini-projects that integrate generative AI into real-life Civil Engineering workflows. |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Introduction to Generative AI & Prompt Engineering:** Overview of Artificial Intelligence and Generative AI, Types of generative models: GANs, Diffusion Models, Transformers, Generative AI vs Traditional AI, Applications of Generative AI in Civil Engineering, Introduction to tools: ChatGPT | 07 |
| 2. | **Fundamentals of Prompt Engineering:** Prompt Engineering, Types of prompts: Zero-shot, Few-shot, Chain-of-thought, Prompt structure: context, instruction, input, output format, Writing effective prompts for different tasks, Safety, bias, and ethical considerations. | 07 |
| 3. | **Text-based Generative AI for Civil Engineering:** Automating report writing, documentation, and proposal drafting, Generating specifications, standards, and estimation sheets, Language models for contract | 07 |

| | | |
|---|---|---|
| | drafting and regulatory compliance, Case Study: Writing an Environmental Impact Assessment report using ChatGPT | |
| 4. | **Image and Design Generation using AI:** Text-to-Image tools (DALL·E), Enhancing Site Photos, Conceptual Drawings, 3D Views, Real-Life Use: Generating Concept Visuals for Bridges, Buildings, Urban Planning | 07 |
| 5. | **Data Handling and Simulation with AI:** Prompting for Code Generation: Python for Civil Simulations, Auto-generating Data Analysis Code (e.g., traffic data, soil reports) , AI Tools for Spreadsheet Analysis and Simulation Prompts, Examples: Load Calculations, Rainwater Harvesting Simulation, Concrete Mix Design | 07 |
| 6. | **Ethical Use of Generative AI and Capstone Project:** Ethical Concerns: Bias, Accuracy, Plagiarism, Safety, Limitations of Generative AI in Engineering Design, Responsible Use Guidelines in Academia and industry, Final Capstone Project: Solving a real-life civil problem using multiple Generative AI tools. | 07 |
| | **Total** | **42** |

**List of Experiments:**

1. Create content, synthesize information, Text summarization, word / pdf documents analysis, Text classification, using **any one** of the Generative AI tool like ChatGPT, Gemini, Claude, Copilot.
2. Create PPT on Civil Engineering topic by using **any one** of the Generative AI tool like Gamma, Canva.
3. **AI Writing Tools:** Automate writing tasks, generate effective copy, and integrate with Google Sheets/Excel using **any one** of the Generative AI tool like Claude-2 , Grammerly, Buffer's AI assistant, Jasper.
4. **Design Automation:** Use ChatGPT to auto-generate project proposals, Bill of Quantities, or tender documents for a residential or public project.
5. **AI-Enhanced Documentation:**
   Prepare DPR (Detailed Project Reports) or structural reports using prompt-based text generation.
6. **Infrastructure Ideation:**
   Use generative tools to ideate designs for bridges, parking structures, or green buildings.
7. **AI in Environmental Design:**
   Create environmental impact layouts or green campus designs using AI image generation tools.
8. **Mini Project:**
   A small design or planning project integrating at least two types of generative tools (e.g., text + image, or text + 3D sketch), showing civil engineering feasibility.

**Text Books:**

1. James Phoenix ,Mike Taylor, "Prompt Engineering for Generative AI", Publisher(s): O'Reilly Media, Inc, May 2024.
2. Nathan Hunter," "The Art of Prompt Engineering with ChatGPT: A Hands-on Guide, Jan 2023.

| **Reference Books:** |
|---|
| 1. Navveen Balani, "Prompt Engineering: Unlocking Generative AI: Ethical Creative AI for All"<br>2. Jack Wylder, "An Illustrated Guide to AI Prompt Mastery: for MidJourney, DALL-E, NightCafe, Deep Dream Generator<br>3. Samuel Inbaraja S, "A Practical and Short Textbook of Prompt Engineering" |
| **E-Resources:** |
| 1. https://www.udemy.com/share/108c2m3@Vo0l6ssb2rwlHQzbaBcfHTPH6TQU1GNnNDFWPVRYoq9BEpkDSgfu1mLY4OCyI2XeLw==/<br>2. https://openai.com/index/dall-e-3/<br>3. https://chatgpt.com/<br>4. https://audiodenoise.com/ |

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | **Semester:** IV | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Professional Communication Etiquettes | | | | | | **Code:** CEVE401 | | | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| - | 02 | - | 01 | - | - | 25 | - | - | 25 |

**Prerequisites:**

Self-Awareness and Emotional Intelligence, Active Listening Skills, Basic Language Proficiency, Professional Attitude, Time Management

**Course Objectives:**

1. To introduce the basics of professional communication and its significance in the workplace.
2. To develop skills in listening, note-taking, and drafting business documents.
3. To enhance writing skills for resumes, emails, and formal letters with proper etiquette.
4. To build confidence in presentations, interviews, group discussions, and ethical workplace behavior.

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

| | |
|---|---|
| **CO1** | Understand the fundamentals of professional communication, its types, and identify barriers that affect effective communication. |
| **CO2** | Demonstrate active listening, effective note-taking, and the ability to draft formal documents such as notices, agendas, and minutes of meetings. |
| **CO3** | Apply professional writing skills in creating resumes, cover letters, formal emails, and business correspondence with proper etiquette. |
| **CO4** | Deliver structured oral presentations and participate effectively in group discussions and debates using appropriate communication strategies. |
| **CO5** | Prepare various types of reports and technical documents with clarity, structure, and professional tone. |
| **CO6** | Demonstrate understanding of professional ethics and apply organizational skills like planning, time management, and digital organization in workplace scenarios. |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Professional Communication: An Overview:**<br>1.1 Definition of professional communication- Importance, relevance, Elements and process of communication.<br>1.2 7-C's of Professional Communication (Clarity, Conciseness, correctness, Coherent, concrete, courteous and Complete).<br>1.3 Types –Verbal (Oral-Written), Formal, Informal (Grapevine), Vertical Barriers to communication, Types of barriers (Linguistic, Psychological, Technological ) | 02 |

| | | |
|---|---|---|
| 2. | **Listening, Note Taking & Office Drafting:**<br>2.1 Difference between listening & Hearing<br>2.2 Types of listening a) Active listening b) Passive listening c) Selective listening<br>2.3 Techniques of Note taking, Types of note taking (Outline notes, Mind Mapping, Flowcharts)<br>2.4 Format of Notice and Circular<br>2.5 Drafting Agenda<br>2.6 Preparing Minutes of meeting | 02 |
| 3. | **Interview & Writing Abilities for Professional Communication:**<br>3.1 Interview: Interview Process, Types of Interview: Job interview, Appraisal Interview, Exit, Interview, Panel Interview; Self Introduction, Pre and Post interview activities, Skills evaluated in interview, Do's and Don'ts during Interview<br>3.2 Cover letter & Resume: Job Application letter, Difference between CV and Resume Writing skills, Resume writing, Writing SOPs<br>3.3 Corporate Etiquettes: Dressing Etiquettes, Dining Etiquettes, Telephonic etiquette, Business card Etiquettes, Email etiquettes, Writing official E- Mails to communicate intended purposes Drafting Enquiry letter and Complaint letter | 02 |
| 4. | **Presentation Skills, Group Discussion and Debate:**<br>4.1 Oral Presentation: Voice modulation, tone, describing a process, Presentation Skills: Oral presentation and public speaking skills, business presentations, Preparation: organizing the material, self-Introduction, introducing the topic, answering questions, individual presentation practice, presenting visuals effectively.<br>4.2 Debate and Group Discussions: introduction to Group Discussion (GD), differences between GD and debate; participating GD, understanding GD, brainstorming the topic, questioning and clarifying, GD strategies, activities to improve GD skills | 02 |
| 5. | **Report Writing:**<br>5.1 Introduction to report writing<br>5.2 Accident Report<br>5.3 Investigation Report<br>5.4 Daily Report<br>5.5 Technical Writing | 02 |
| 6. | **Professional Ethics & Organizational Skills:**<br>**Professional Ethics:** Integrity, Objectivity, Professional competence and due care, Confidentiality Professional behavior.<br>**Organizational Skills:** Physical Organization, Digital Organization, Planning, Time management & Communication | 02 |
| | **TOTAL** | **12** |
| **List of Experiments:** | | |
| The term work shall consist of a journal giving details of a **minimum 8** out of the following experiments. | | |

1. Report on Role play or group discussion to demonstrate types and barriers of communication.
2. Listen to an audio/video in the language lab and make effective notes**.**
3. Prepare agenda and write minutes of a mock meeting.
4. Write a job application letter with a resume/CV for a given job role.
5. Draft a cover letter and Statement of Purpose (SOP) for higher studies or internships.
6. Write an enquiry letter and a complaint letter for given scenarios.
7. Participate in a group discussion (GD) on a technical or current topic.
8. Engage in a classroom debate focusing on clarity, tone, and argumentation.
9. Write an accident or investigation report based on a case study.
10. Face a mock interview with proper attire, resume, and interview etiquette.

**Assignments (Any 2)**

1. Draw and explain the Communication Cycle with real-life examples.
2. Prepare notes using mind mapping, flowchart, or outline method on a technical topic.
3. Draft a notice and circular for a college or departmental event.
4. Demonstrate corporate etiquette through role play (dressing, dining, telephonic).
5. Deliver an oral presentation using the 7 C's of communication also write its report.

**Text Books:**

1. M. Ashraf Rizvi, "Effective Communication Skills", Tata McGraw-Hill Publication.
2. Sanjay Kumar and Pushp Lata, "Communication Skills", Oxford University Press.
3. C. Murlikrishna and Sunita Mishra, "Communication Skills for Engineers", Pearson.

**Reference Books:**

1. Orient Blackswan, "English for Engineers and Technologists (Combined Edition, Vol. 1 and 2)", Orient Blackswan, 2010.
2. Meenakshi Raman, Sangeeta Sharma, "Technical Communication: Principles and Practice", 2nd Edition, Oxford University Press, 2011.
3. Stephen E. Lucas, "The Art of Public Speaking", 10th Edition, McGraw Hill Education, 2012.
4. William Strunk Jr., E.B. White, "The Elements of Style", 4th Edition, Pearson, 1999.
5. David F. Beer, David McMurrey, "Guide to Writing as an Engineer", John Wiley, New York.
6. Goodheart-Willcox, "Professional Communication", 1st Edition, Goodheart-Willcox Publisher.
7. Stephen P. Robbins, Phillip L. Hunsaker, "Training in Interpersonal Skills: Tips for Managing People at Work", 6th Edition, Pearson Education, India, 2015.
8. Gopal Ramesh, Mahadevan Ramesh, "The Ace of Soft Skills: Attitude, Communication and Etiquette for Success", 1st Edition, Pearson Education, 2013.
9. Anand Ganguly, "Success in Interview", 5th Edition, Ramesh Publishing House (RPH), 2016.
10. Raman Sharma, "Technical Communications", Oxford University Press, London, 2004.

**E-Resources:**

1. https://www.britishcouncil.in
2. https://www.coursera.org
3. https://www.udemy.com
4. http://www.makeuseof.com

# DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | | | **Semester:** IV | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Professional Practices in Surveying | | | | | | | | **Code:** CEVS404 | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| - | 04 | - | 02 | - | - | - | - | 50 | 50 |

**Prerequisites:**

Understanding of Units and Scales, Geometric and Trigonometric Foundations, Survey Calculations

**Course Objectives:**

1. To understand plane table equipment, adjustments, and methods for plotting and mapping in the field.
2. To learn the principles, instruments, and procedures for differential and simple levelling.
3. To study the parts, adjustments, and use of vernier transit theodolite for angle measurements.
4. To understand the principles and field procedure of tacheometry and its use in distance measurement.
5. To learn the types, elements, and setting-out methods of simple circular curves in the field.
6. To introduce total station and GPS for advanced surveying, data collection, and coordinate measurements.

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

| | |
|---|---|
| **CO1** | Utilize Plane Table Surveying techniques to prepare a plan depicting all significant field details accurately. |
| **CO2** | Establish Reduced Levels to develop accurate contour maps for the designated terrain. |
| **CO3** | Perform angular measurements, conduct theodolite traversing, and apply methods for coordinate computation, traverse balancing, and area calculation using transit theodolite. |
| **CO4** | Compute horizontal distances, elevations, and prepare tacheometric contour maps using principles of stadia tacheometry. |
| **CO5** | Set out simple circular curves using linear and angular methods. |
| **CO6** | Apply advanced surveying techniques using Electronic Total Stations (ETS) and Global Positioning System (GPS) in various field applications. |

**Course Contents:**

| **Unit** | **Description** | **Duration (Hrs.)** |
|---|---|---|
| 1. | **Plane Table Survey:** Introduction to Plane Table Surveying, Plane Table Equipment and Accessories, Temporary Adjustments of Plane Table, Methods of Plane Table Surveying, Plotting and Mapping. | 08 |
| 2. | **Levelling:** Introduction to Differential Leveling, Instruments Used: Auto Level, Digital Level, Principle of Levelling, Types of Levelling: Simple, Differential Levelling, Procedure and Field work. | 08 |

| | | |
|---|---|---|
| 3. | **Vernier Transit Theodolite:**<br>Instrument Description, Introduction to Horizontal Angle and Vertical Angle Measurement: Parts and function of Vernier Transit Theodolite, Temporary and permanent adjustments, Least count calculation, Principle of Repetition Method, Field Procedure, Observation and Recording | 08 |
| 4. | **Tacheometer:**<br>Introduction to Tacheometry, Description of Tacheometer: Components and features of a tacheometer, Difference between ordinary theodolite and tacheometer. Stadia hairs and fixed telescope length, Tacheometric Principle and Formula, Objectives of the Practical, Instruments Required, Field Procedure. | 08 |
| 5. | **Circular Curve:**<br>Introduction to Circular Curves, Elements of a Simple Circular Curve, Method of setting out Curves: Linear Method and Angular Method, Instruments and Accessories Required, Field Procedure and Calculations | 12 |
| 6. | **Total Station & GPS:**<br>Introduction to Total Station, Special Functions Overview, Remote Elevation Measurement (REM), Remote Distance Measurement (RDM), Coordinate Stakeout, Instrument Setup & Configuration, Data Collection and Recording, GPS | 12 |
| | **TOTAL** | **56** |

**List of Experiments:** Perform any six (06) Experiments and Any 02 projects are mandatory.

**a) Experiments:**

1. Actual mapping of small structure/ area using the Radiation and intersection Method.
2. Differential leveling (with at least two change points) using auto / digital level.
3. Measurement of horizontal angles (by repetition method) using vernier transit theodolite.
4. Measurement of vertical angles using vernier transit theodolite.
5. Finding multiplying and additive constants of a tacheometer.
6. Setting out a building from a given foundation plan (minimum six coordinates).
7. Setting out a circular curve by Rankine's method of deflection angles.
8. Practical based on various special functions available in a total station such as remote elevation measurements, remote distance measurements and co-ordinate stakeout.

**b) Projects**

1. **Project I:** Road project using Auto level for a minimum length of 100 m including fixing of alignment, profile levelling, cross- sectioning, plotting of L section and Cross Section. (One full imperial sheet including plan, L-section and any three typical Cross- sections).
2. **Project II:** Tacheometric contouring project with at least two instrument stations about 60 m to 100 m apart and plotting contours (minimum contour interval 1 meter).
3. **Project III:** Total Station Traversing
4. **Project IV:** Understanding GNSS and Hands-On Position Logging

## DEPARTMENT OF CIVIL ENGINEERING

| **Text Books:** |
|---|
| 1. N. N. Basak, "Surveying and Levelling", Tata McGraw Hill.<br>2. Dr. B. C. Punmia, "Surveying Vol. I, II and III", Laxmi Publishers, New Delhi.<br>3. T. P. Kanetkar and S. V. Kulkarni, "Surveying and Leveling Vol. I & II", Pune Vidhyarthi Gruh. |
| **Reference Books:** |
| 1. M. Chandra, "Plane Surveying", New Age International Publishers.<br>2. James M. Anderson and Edward M. Mikhail, "Surveying: Theory and Practice", Tata McGraw Hill.<br>3. David Clark, "Plane and Geodetic Surveying for Engineers, Vol. I", Constable. |
| **E-Resources:** |
| 1. **Virtual Labs Links -** Ministry of Education<br>https://sl-iitr.vlabs.ac.in/List%20of%20experiments.html<br>2. **Virtual Labs Links - ZCOER**<br>Virtual Labs - Zeal College of Engineering and Research<br>3. **Modern Tools & Techniques!**<br>https://acesse.one/vnPKx<br>4. **Measurement of distances b/w points using Total Station: Surveying practical**<br>https://acesse.one/mofDR<br>5. **Profile and cross sectional Levelling**<br>https://acesse.one/OKdrd |

## DEPARTMENT OF CIVIL ENGINEERING

| **Program:** B. Tech. (Civil Engineering) | | | | | | **Semester:** IV | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course:** Internship – III | | | | | | **Code:** CEIN403 | | | |
| **Teaching Scheme (Hrs/week)** | | | | **Evaluation Scheme (Marks)** | | | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **CIE** | **ETE** | **TW** | **OR** | **PR** | **Total** |
| - | - | - | 02 | - | - | 25 | - | - | 25 |

**Preamble:**

Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.

**Course Objectives:**

1. Exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry.
2. Learn to implement the technical knowledge in real industrial situations.

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

| | |
|---|---|
| **CO1** | Gain exposure to industry practices and understand how academic concepts are applied in professional settings. |
| **CO2** | Develop and demonstrate effective communication and teamwork skills within a work environment. |
| **CO3** | Improve your problem-solving and time management skills by working in real-world industry settings. |

**Internship Requirements**

1. **Internship Duration:** It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 3 to 5 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW).
2. **Internship Opportunities:** Students can explore various opportunities for internships at:
    a. Industries
    b. Research labs or organizations
    c. Collegiate clubs
    d. In-house research projects
    e. Online internships
3. **Support and Assistance:** Students can seek assistance for securing internships from:
    a. The Training and Placement cell, along with departmental coordinators
    b. Department or institute faculty members
    c. Personal contacts
    d. Directly connecting with industries or organizations
4. **Request Letter:** Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the

standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.

5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.