



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



**Second Year B. Tech Civil (Regular Track)**

**Academic Year – 2026-2027**

**Semester – III (2026 Pattern)**

**Course Code: ES2301T**

**Course Name: Differential Equations and Vector Calculus**

| Teaching Scheme:       | Credit Scheme: | Examination Scheme:         |
|------------------------|----------------|-----------------------------|
| Lectures: 3 Hrs./Week  | 4              | In-Sem Evaluation: 20 Marks |
| Tutorials: 1 Hrs./Week |                | Mid-Sem Exam: 30 Marks      |
|                        |                | End-Sem Exam: 50 Marks      |

**Prerequisites:** - Calculus , Fourier Series and Vector Algebra.

**Course Objectives:**

To familiarize the students with concepts and techniques in Ordinary, Partial differential equations and Vector calculus. 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 successful completion of the course, students will be able to**

**CO1:** Solve first order linear differential equations and its applications to modelling and analysing engineering problems such as Newton's Law of Cooling, Rectilinear Motion, Simple Harmonic Motion, One dimensional Conduction of Heat.

**CO2:** Solve higher order linear differential equations and its applications to modelling and analyzing engineering problems such as mass-spring systems.

**CO3:** Solve second order Partial differential equations (PDEs) such as wave equation, one and two dimensional heat flow equations.

**CO4:** Perform vector differentiation & integration, analyze the vector field and apply to fluid flow problems.

**Unit I: First Order Ordinary Differential Equations (ODE) (07 Hours)**

First order ordinary differential equation, Exact differential equations, Equations reducible to exact form using integrating factor, Linear differential equations (LDEs), Equations reducible to linear form and Bernoulli's equations.

**Unit II: Applications of First Order Ordinary Differential Equations (07 Hours)**

Applications to Orthogonal Trajectories, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Rectilinear Motion, Simple Harmonic Motion, Onedimensional Conduction of Heat.

**Unit III: Linear Differential Equations (LDE) of nth Order and Applications (08 Hours)**

LDE of nth order with constant coefficients, Complementary Function, Particular Integral, Short methods, Method of Variation of Parameters, Cauchy-Euler DE & Legendre's DE, Series solutions, Legendre & Bessel equations, Solution of IVP using Laplace Transform, Modelling of mass-spring systems, free and forced, damped and undamped systems.

**Unit IV: Applications of Partial Differential Equations (PDE) (08 Hours)**



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



Linear Second Order Partial Differential Equations and their Classification, Modelling of Vibrating String (Wave Equation), One Dimensional Heat Flow Equation (Diffusion Equation) and Two Dimensional Heat Flow Equation (Laplace Equation), Solution Using Method of Separation of Variables, Fourier Series.

**Unit V: Vector Differential Calculus**

(08 Hours)

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative fields, Vector Identities.

**Unit VI: Vector Integral Calculus and Applications**

(07 Hours)

Line, Surface and Volume Integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem. Applications to Problems in Fluid Mechanics.

**Guidelines for Tutorial and Term Work:**

Tutorial shall be engaged in batches (batch size of 22 students maximum) per division.

**Text Books:**

1. Shepley L. Ross, "Differential Equations", Third Edition, Wiley-India Edition, 2007.
2. I. N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill International Editions, 2006.
3. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).

**Reference Books:**

1. William E. Boyce and Richard C. DiPrima, "Elementary Differential Equations and Boundary Value Problems", Tenth Edition, Wiley-India Edition, 2012.
2. T. Amarnath, "An Elementary Course in Partial Differential Equations"; Narosa Publishing House, 1997.
3. Earl A. Coddington, "An Introduction to Ordinary Differential Equations", Prentice Hall India, 2009.
4. S. J. Farlow, "Partial Differential Equations for Scientists and Engineers", Dover Publications, 1993.
5. Erwin Kreyszig, "Advanced Engineering Mathematics" 10e, (Wiley India).
6. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

**ISE: In Semester Evaluation, MSE: Mid Semester Evaluation, ESE: End Semester Evaluation**



**Second Year B. Tech Civil (Regular Track)**

**Academic Year – 2026-2027**

**Semester – III (2026 Pattern)**

**Course Code: CE2301L**

**Course Name: Introduction to Python for Programming and Data Science**

|                                                    |                                |                                                                                                                              |
|----------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br><b>LAB:04Hours/Week</b> | <b>Credit</b><br><b>LAB:02</b> | <b>Examination Scheme:</b><br><b>ISE: 40 Marks</b><br><b>MSE:20 Marks</b><br><b>ESE: 40 Marks</b><br><b>Total: 100 Marks</b> |
|----------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------|

Course Prerequisites : Introduction to computer Programming and Data Structure

**Course Objectives:**

1. Introduce students to computational thinking and problem-solving using Python programming.
2. Develop programming skills for engineering and interdisciplinary applications.
3. Enable students to use Python data structures, functions, and libraries effectively.
4. Provide exposure to data analysis and visualization using Python tools.
5. Develop the ability to solve real-world engineering problems using programming and data science concepts.

**Course Outcomes:**

After successful completion of the course, students shall able to:

- CO1: Develop Python programs using basic programming constructs, operators, control statements, and functions.
- CO2: Apply Python data structures such as lists, tuples, dictionaries, and sets for problem solving.
- CO3: Develop modular Python applications using functions, packages, file handling, and exception handling techniques.
- CO4: Apply object-oriented programming concepts and Python libraries for engineering and data analysis applications.
- CO5: Design and implement basic data analysis and visualization solutions using Python tools and real-world datasets.

**Course Contents**

| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                   | <b>INTRODUCTION TO PYTHON AND COMPUTATIONAL THINKING</b> | <b>04 Hours</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------|
| Introduction to programming and computational thinking, applications of Python in engineering, Python environment setup, Jupyter Notebook and Google Colab, variables, keywords, indentation, input/output operations, data types, operators, expressions, and simple problem-solving programs. |                                                          |                 |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                  | <b>CONTROL STRUCTURES AND FUNCTIONS</b>                  | <b>06Hours</b>  |
| Conditional statements, loops, nested loops, break, continue, pass statements, functions, function arguments, lambda functions, recursion basics, string operations, modular programming approach.                                                                                              |                                                          |                 |



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



| UNIT-III                                                                                                                                                                                                                                                          | DATA STRUCTURES AND NUMERICAL COMPUTING                                      | 08 Hours |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|----------|
| Lists, tuples, sets, dictionaries, indexing, slicing, built-in functions and methods, introduction to NumPy arrays, matrix operations, basic numerical computation and engineering data handling.                                                                 |                                                                              |          |
| Modules and packages, PIP installation, standard libraries, file operations, CSV handling, exception handling, try-except blocks, user-defined exceptions, automation using Python scripts.                                                                       |                                                                              |          |
| UNIT-IV                                                                                                                                                                                                                                                           | FILE HANDLING, MODULES AND EXCEPTION HANDLING                                | 06 Hours |
| Introduction to Pandas, data frames, importing datasets, data preprocessing basics, statistical summaries, data visualization using Matplotlib, line plots, bar charts, scatter plots, engineering applications of data analysis.                                 |                                                                              |          |
| UNIT-V                                                                                                                                                                                                                                                            | DATA ANALYSIS AND VISUALIZATION                                              | 02 Hours |
| Classes, objects, self-variable, Overriding Methods, Data hiding, Data-Abstraction, polymorphism Inheritance- Multiple, Hierarchical and Multi-level inheritance                                                                                                  |                                                                              |          |
| UNIT-VI                                                                                                                                                                                                                                                           | OBJECT ORIENTED PROGRAMMING AND MINI PROJECT                                 | 04Hours  |
| Classes, objects, constructors, inheritance basics, real-world applications of OOP, interdisciplinary mini-project involving data analysis, automation, or engineering problem-solving using Python.                                                              |                                                                              |          |
| Lab Contents                                                                                                                                                                                                                                                      |                                                                              |          |
| Guidelines for Assessment                                                                                                                                                                                                                                         |                                                                              |          |
| Practical/Oral examination based on the practical's performed in the lab. The Performance will be assessed jointly by internal and external examiners.                                                                                                            |                                                                              |          |
| <ul style="list-style-type: none"><li>▪ Total marks for Assessment 50</li><li>▪ It should be continues assessment where performance is judged based on the performances</li><li>▪ Practical/Oral at the end of semester PR50 Total 50 to be recommended</li></ul> |                                                                              |          |
| List of Laboratory Experiments                                                                                                                                                                                                                                    |                                                                              |          |
| 1                                                                                                                                                                                                                                                                 | Introduction to Python IDE/Jupyter Notebook and execution of basic programs. |          |
| 2                                                                                                                                                                                                                                                                 | Programs using operators, expressions, and input/output statements.          |          |
| 3                                                                                                                                                                                                                                                                 | Programs based on conditional statements and loops.                          |          |
| 4                                                                                                                                                                                                                                                                 | Programs using functions and string operations.                              |          |
| 5                                                                                                                                                                                                                                                                 | Implementation of lists, tuples, sets, and dictionaries.                     |          |
| 6                                                                                                                                                                                                                                                                 | Programs using NumPy for numerical computation.                              |          |
| 7                                                                                                                                                                                                                                                                 | File handling and CSV data processing.                                       |          |
| 8                                                                                                                                                                                                                                                                 | Exception handling programs.                                                 |          |
| 9                                                                                                                                                                                                                                                                 | Data analysis using Pandas.                                                  |          |
| 10                                                                                                                                                                                                                                                                | Data visualization using Matplotlib.                                         |          |
| 11                                                                                                                                                                                                                                                                | Mini-project using engineering or real-world datasets.                       |          |
| Text Books:                                                                                                                                                                                                                                                       |                                                                              |          |
| T1. AllenB.Downey,ThinkPython:HowtoThinkLikeaComputerScientist'',<br>edition,Updated for Python 3, Shroff/O'ReillyPublishers,2016                                                                                                                                 |                                                                              | 2nd      |
| T2. GuidovanRossumandFredL.DrakeJr,“AnIntroductiontoPython–<br>RevisedandupdatedforPython3.2,Network TheoryLtd.,2011.                                                                                                                                             |                                                                              |          |



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



**Reference Books:**

- R1.Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
- R2.John V Guttag, “Introduction to Computation and Programming UsingPython”, Revised and expanded Edition, MIT Press , 2013
- R3.Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.
- R4.Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3”, Second edition, Pragmatic Programmers, LLC,2013.

**On-line Recourses:**

[https://onlinecourses.nptel.ac.in/noc22\\_cs32/preview](https://onlinecourses.nptel.ac.in/noc22_cs32/preview)

**ISE: In Semester Evaluation, MSE: Mid Semester Evaluation, ESE: End Semester Evaluation**



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



**S.Y.B. Tech. Civil Engineering**  
**Semester-III (2025 Pattern)**

**[HS2301T]: Universal Human Values and Professional Ethics**

|                                             |                          |                                                                                                                                                         |
|---------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>TH :2<br>Tut: 01 | <b>Credits:</b><br>TH: 3 | <b>Examination Scheme:</b><br>Teacher's Assessment1: 20*<br>Mid Semester Examination: 30*<br>Teacher's Assessment 2: 20<br>End Semester Examination: 30 |
|---------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|

**Course Objectives:**

The course aims to develop understanding of human values and professional ethics among engineering students. It focuses on ethical decision-making, social responsibility, sustainability, integrity, and professionalism through Indian and global ethical perspectives, case studies, and practical applications, in alignment with ABET standards and global best practices.

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

**CO1:** Explain the fundamental concepts of value education, self-exploration, happiness, prosperity, and basic human aspirations.

**CO2:** Develop an understanding of human beings as a co-existence of self and body,

**CO3:** Apply harmony in family, society, and nature by fostering trust, respect, social justice, and ecological ethics in engineering solutions.

**CO4:** Apply professional ethics and responsibilities by following engineering codes of conduct (IEEE, ASME, NSPE, ISTE) and resolving conflicts of interest, confidentiality, and integrity issues in engineering practice

**CO5:** Analyze ethical implications in engineering projects and emerging technologies (AI, biotechnology, data privacy) while understanding leadership and whistleblowing responsibilities

**Course Contents**

| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                                                   | <b>Introduction to value education</b>       | <b>07 Hours</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------|
| Understanding value education, self-exploration as the process for value education, happiness and prosperity, right understanding, relationship and physical facility, happiness and prosperity–current scenario, method to fulfill the basic human aspiration.                                                                 |                                              |                 |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                                                  | <b>Harmony in human being</b>                | <b>07 Hours</b> |
| Understanding human being as a coexistence of the self and body, understanding the needs of self and body, the body as an instrument of the self, understanding activities of self, understanding harmony in the self, understanding the harmony in self with body, programs to fulfill the self-regulation and health.         |                                              |                 |
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                 | <b>Harmony in Family, Society and Nature</b> | <b>10 Hours</b> |
| Harmony in family-a basic unit of human interaction, Human—human relationship, values in relationships, understanding harmony in the society and vision for universal human order. Understanding the harmony in society and nature, understanding the four orders of nature, realizing existence as co- existence at all levels |                                              |                 |



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                        |                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------|
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Professional Ethics and Responsibility</b>                                          | <b>07 Hours</b> |
| Responsibilities of engineers; Integrity, honesty, objectivity; Codes of ethics (IEEE, ASME, NSPE, ISTE); Conflict of interest, confidentiality                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                        |                 |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Leadership &amp; Civic Responsibility, Workplace Ethics and Team Responsibility</b> | <b>07 Hours</b> |
| Leadership & Civic Responsibility, Biographical Study: Present on an engineer (e.g., Verghese Kurien or Elon Musk) who demonstrated ethical leadership.) Teamwork, Confidentiality and conflict of interest, Right of engineers, Whistleblowing Examples like: Case Reference: Edward Snowden/Volkswagen scandal. Reference: NSPE Case No. 18-3. (Professional Obligation vs. Company Loyalty)                                                                                                                                                                                          |                                                                                        |                 |
| <b>UNIT-VI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Ethics in Emerging Technologies</b>                                                 | <b>07 Hours</b> |
| AI and automation; Data privacy and surveillance; Biotechnology and genetic engineering; Risk vs. innovation; Debate on autonomous systems.                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                        |                 |
| <b>Week-wise brief description of activities/Tutorial</b><br>1. Self-Reflection Exercise<br>2. Happiness vs. Desire Debate<br>3. Trust-Building Exercise<br>4. Code of Ethics Comparison<br>5. Harmony in Family, Society and Nature Activity: "Equity vs. Equality" Case Study<br>6. Bias in AI Discussion<br>7. Whistleblowing Debate<br>8 Case Studies<br>9. Human Values and Professional Ethics:<br><a href="https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg125">https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg125</a>                            |                                                                                        |                 |
| <b>Text Books:</b><br>T1. Human values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010<br>T2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.                                                                                                                                                                                                                                                                                                                                                                 |                                                                                        |                 |
| <b>Reference Books:</b><br>R1. Manav Vyavhar Darshan – A. Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 2001.<br>R2. Professional Ethics and Human Values – M. Govindarajan, S. Natarajan, V. S. Senthil Kumar, PHI Learning Pvt. Ltd., New Delhi.<br>R3. Engineering Ethics – Charles E. Harris Jr., Michael S. Pritchard, Michael J. Rabins, Cengage Learning.<br>R4. Ethics in Engineering Practice and Research – Caroline Whitbeck, Cambridge University Press.<br>R5. Ethics, Technology and Engineering: An Introduction – Ibo van de Poel and Lambèr Royakkers, Wiley-Blackwell. |                                                                                        |                 |

**“\*” - No Pen and Paper**

**ISE: In Semester Evaluation, MSE: Mid Semester Evaluation, ESE: End Semester Evaluation**





**Second Year B. Tech Civil**  
**Academic Year – 2026-2027 Semester - III**  
**[CE2302T]: Solid Mechanics**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        |      |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------|---------|
| Teaching Scheme: Theory 3Hours/ Week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Exam Scheme<br><br>Total Marks: 100    | Exam | Marks   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        | ISE  | 20      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        | MSE  | 30      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        | ESE  | 50      |
| Credit: 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                        |      |         |
| Course Prerequisites: Centroid and center of Gravity, Trigonometry and Geometry Basics, Beam Reactions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                        |      |         |
| Course Objective: To develop the ability to understand simple, flexural, shear stresses, bending moment, buckling load and deflection in various structural elements to apply the concepts to engineering problems.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |      |         |
| Course Outcome:<br><b>CO1:</b> Apply concepts of stress, strain, elastic constants, and deformation in structural members.<br><b>CO2:</b> Analyze shear force and bending moment in beams subjected to different types of loading.<br><b>CO3:</b> Analyze the beams for bending and shear stresses.<br><b>CO4:</b> Analyze the structural members for normal, shear, principal stresses and torsion.<br><b>CO5:</b> Analyze the buckling behaviour, load-carrying capacity, and stresses in structural members subjected to axial and eccentric loading.<br><b>CO6:</b> Analyze determinate structures for structural indeterminacy, slopes, and deflections of beams. |                                        |      |         |
| Course Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                        |      |         |
| Unit I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Simple Stresses and Strains            |      | 7 Hours |
| Concept of stress and strains (Linear, lateral, shear and volumetric), Generalized Hook's law, Stress- Strain curves for brittle e and ductile materials.<br>Elastic Constants and their relationships, stresses, strains and deformations in determinate structure for homogeneous and composite structures under concentrated loads, self- weight and temperature changes.                                                                                                                                                                                                                                                                                           |                                        |      |         |
| Unit II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Shear Force and Bending Moment Diagram |      | 7 Hours |
| Concept of Shear force and bending moment of different type of loading and beams. Loading diagram from SFD and BMD. Relationship between rate of loading, shear force and bending moment, Concept of zero shear force, Maximum bending moment, point of contra flexure.                                                                                                                                                                                                                                                                                                                                                                                                |                                        |      |         |
| Unit III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Bending and Shear stresses             |      | 7 Hours |
| Determination of Moment of Inertia for various cross sections. Stress due to ben ding: Theory of pure bending, flexure formula, and Bending stress distribution diagram, Moment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        |      |         |





**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                           |         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------|
| of resistance and section modulus. Shear stress in beam: Concept of shear, Shear stress distribution diagram, concept of average shear Stress; shear connectors.                                                                                                                                                                                                                                                                                                                                                                       |                                                                           |         |
| Unit IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Torsion, Principal stresses and Strains</b>                            | 9 Hours |
| Theory of Torsion, Numerical on shaft subjected to twisting moments. Normal and shear stresses on any oblique planes and concept of principal planes and principal stresses by analytical and graphical method by Mohr's circle.                                                                                                                                                                                                                                                                                                       |                                                                           |         |
| Unit V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Axially and eccentrically loaded columns</b>                           | 6 Hours |
| Concept of critical load and buckling, Euler's formula for column with hinged ends, equivalent length for various end conditions, Rankin's formula, Limitations of Euler's formula, Safe load on column. Direct and Bending stresses for different structural members (axially and eccentrically loaded). Concept of middle third rule of different sections                                                                                                                                                                           |                                                                           |         |
| Unit VI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Fundamentals of Structure, Slope - Deflection of determinate beams</b> | 7 Hours |
| Basic concepts of Structural Analysis – Types and Classification of structure based on structural forms. Concept of indeterminacy and degrees of freedom -Static and Kinematic degree of Indeterminacy. Slope and deflection- Relationship between moment, slope and deflection, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.                                                                                                                                                      |                                                                           |         |
| Reference Books:<br>Timoshenko, S. and and Yungs, D. H., "Strength of Materials", 3 <sup>rd</sup> ed. East West Press.<br>Dr. R.K.Bansal, "Strength of Materials" 6th ed. Mechanics of solids, Laxmi Publications.<br>Subramanian, R., "Strength of Materials", 3 <sup>rd</sup> ed. Oxford Higher Education.<br>Bhavikatti, S. S., "Strength of Material", 4th ed. Vikas Publication.<br>Gambhir, M. L., "Fundamentals of solid Mechanics", PHI Learning 2009.<br>Bhavikatti, S. S. "Structural Analysis 1", 4th ed. Vikas Publication |                                                                           |         |
| IS Codes:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                           |         |
| Special Instructions if Any: Excel programing for SFD and BMD.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                           |         |

**ISE: In Semester Evaluation, MSE: Mid Semester Evaluation, ESE: End Semester Evaluation**



**Second Year B. Tech Civil**  
**Academic Year – 2026-2027**  
**Semester – III (2025 Pattern)**  
**[CE2302L]: Solid Mechanics Lab**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                |             |              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------|--------------|
| Teaching Scheme: Theory 2 Hours/ Week                                                                                                                                                                                                                                                                                                                                                                                                               | Exam Scheme                                                    | <b>Exam</b> | <b>Marks</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Total Marks: 50                                                | <b>ISCE</b> | <b>30</b>    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                | <b>ESE</b>  | <b>20</b>    |
| <b>Credit: 01</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                |             |              |
| <b>Course Prerequisites:</b><br>Basic Engineering Mechanics, Mechanical Properties of Materials, Safety Awareness                                                                                                                                                                                                                                                                                                                                   |                                                                |             |              |
| <b>Course Objective:</b><br>To Study the physical and mechanical properties of different material.                                                                                                                                                                                                                                                                                                                                                  |                                                                |             |              |
| <b>Course Outcome:</b><br><b>After successful completion of the course, students will able to:</b><br><b>CO1: Identify physical and mechanical properties of bricks and tiles</b><br><b>CO2: Compare different metals on the basic of their properties.</b><br><b>CO3: Evaluate properties of timber and plywood.</b><br><b>CO4: Analyze structural element by using ICT tools.</b>                                                                 |                                                                |             |              |
| Course Content                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                |             |              |
| Guidelines for Assessment                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                |             |              |
| Continuous assessment of laboratory work is to be done based on overall performance and lab practical's /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each Lab assignment assessment include- timely completion, performance, innovation, efficient codes, Punctuality and neatness. |                                                                |             |              |
| List of Laboratory Assignments/Experiments (minimum 10 to be covered)                                                                                                                                                                                                                                                                                                                                                                               |                                                                |             |              |
| Group A                                                                                                                                                                                                                                                                                                                                                                                                                                             | Bricks and Tiles (Any Three)                                   |             |              |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Field test, Water absorption and efflorescence test on bricks. |             |              |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Compression strength test on bricks.                           |             |              |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Abrasion test of flooring tiles.                               |             |              |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Flexural strength of flooring tiles.                           |             |              |
| Group B                                                                                                                                                                                                                                                                                                                                                                                                                                             | Metals (Any Five)                                              |             |              |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Tension test on Mild Steel, Aluminum, copper and TMT steel.    |             |              |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Shear (Single and Double) test on mild steel.                  |             |              |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Torsion Test on mild steel.                                    |             |              |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Impact (I and C) test on mils steel, aluminum and brass.       |             |              |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Compression test on Mild Steel/ HYSD bar.                      |             |              |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Bend and Re-bend test on Mild Steel and TMT steel.             |             |              |
| Group C                                                                                                                                                                                                                                                                                                                                                                                                                                             | Timber and Plywood                                             |             |              |



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



|                                                                                                                                                                 |                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 11                                                                                                                                                              | Compression test on timber (Parallel and Perpendicular to grain)       |
| 12                                                                                                                                                              | Bending Test on timber and plywood.                                    |
| Group D                                                                                                                                                         | Analysis of simple structural elements by using programming languages. |
| IS Codes: IS 1608:2005, ISO 6892:1966, IS 432:1966, IS 5242:1969, IS 1717:1985, IS 1757:1973, IS1708:1980, IS 883:1994, IS 1237:1980, IS 654:1972, IS1077(1992) |                                                                        |
| Special Instructions if Any:                                                                                                                                    |                                                                        |

**ISCE: In Semester Continuous Evaluation, MSE: Mid Semester  
Evaluation, ESE: End Semester Evaluation**



**Second Year B. Tech Civil (Regular Track)**  
**Academic Year – 2026-2027**  
**Semester – III (2025 Pattern)**  
**[CE2303T]: Geotechnical Engineering**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 |             |                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------|----------------|
| Teaching Scheme: Theory 3Hours/ Week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Exam Scheme<br><br>Total Marks: 100             | <b>Exam</b> | <b>Marks</b>   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 | <b>ISE</b>  | <b>20</b>      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 | <b>MSE</b>  | <b>30</b>      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 | <b>ESE</b>  | <b>50</b>      |
| Credit: 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                 |             |                |
| Course Prerequisites: Fundamentals of Chemistry, Mathematics and Physics                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                 |             |                |
| <p>Course Objective:</p> <p>To provide the basic principles of soil mechanics, Classification systems, Compaction, Permeability, Consolidation and Shear strength characteristics, to understand the engineering behaviour of soil to address practical problems in Geotechnical Engineering.</p> <p>To understand methods of soil exploration and carry out detailed geotechnical investigation in the field.</p> <p>To apply basic concepts of geotechnical engineering for evaluating bearing capacity of soils.</p>                            |                                                 |             |                |
| <p>Course Outcome:</p> <p>After successful completion of the course, students will able to:</p> <p>CO1: Explain the formation and structure of soil as a three-phase system.</p> <p>CO2: Determine the index properties of soils.</p> <p>CO3: Apply the principles of compaction, permeability, and consolidation.</p> <p>CO4: Analyze total stress, pore pressure, and effective stress in soils.</p> <p>CO5: Compute stress distribution in soils.</p> <p>CO6: Analyze active and passive earth pressures and estimate the bearing capacity.</p> |                                                 |             |                |
| Course Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                 |             |                |
| <b>Unit I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Fundamentals of Soil</b>                     |             | <b>6 Hours</b> |
| a) Introduction of soil; Soil as three phase system; Soil structure<br>b) Introduction: Formation of soils, Phase Diagram, Classification of soil, Need of soil classification.<br>Requirement for a soil classification system.                                                                                                                                                                                                                                                                                                                   |                                                 |             |                |
| <b>Unit II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Soil Classification and Index Properties</b> |             | <b>6 Hours</b> |
| Index properties of soil and Relationships between them. Study of Engineering properties of soil (LL,PL, SL).Particle size classification, IS classification system, Relative Density, Stroke’s Law, Activity number.                                                                                                                                                                                                                                                                                                                              |                                                 |             |                |



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



|                                                                                                                                          |                                              |                |
|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------|
|                                                                                                                                          |                                              |                |
| <b>Unit III</b>                                                                                                                          | <b>Engineering Properties</b>                | <b>6 Hours</b> |
| Compaction, Permeability and Consolidation                                                                                               |                                              |                |
| <b>Unit IV</b>                                                                                                                           | <b>Effective Stress and Seepage Analysis</b> | <b>6 Hours</b> |
| Total stress, Pore pressure, Effective stress; Seepage pressure; Flow net                                                                |                                              |                |
| <b>Unit V</b>                                                                                                                            | <b>Stress due to Load and Shear strength</b> | <b>6 Hours</b> |
| Stress Distribution in Soils Geostatic stress, Shear Strength of Soils                                                                   |                                              |                |
| <b>Unit VI</b>                                                                                                                           | <b>Earth Pressure and Bearing Capacity</b>   | <b>6 Hours</b> |
| Active and Passive earth pressure; Bearing Capacity of Shallow Foundations                                                               |                                              |                |
| Reference Books:                                                                                                                         |                                              |                |
| <b>R1.</b> Lambe, T.W., <i>Soil Testing for Engineers</i> , Wiley Eastern Ltd., New Delhi.                                               |                                              |                |
| <b>R2.</b> Venkataramaiah, C., <i>Geotechnical Engineering</i> , New Age International Publishers, New Delhi.                            |                                              |                |
| <b>R3.</b> Craig, R.F., <i>Craig's Soil Mechanics</i> , 7th Edition, Spon Press, New York.                                               |                                              |                |
| <b>R4.</b> Bowles, J.E. (1988), <i>Engineering Properties of Soils and Their Measurement</i> , McGraw-Hill Book Company, New York.       |                                              |                |
| <b>R5.</b> Das, B.M., <i>Principles of Geotechnical Engineering</i> , 8th Edition, Cengage Learning.                                     |                                              |                |
| <b>R6.</b> Punmia, B.C., Jain, A.K. and Jain, A.K., <i>Soil Mechanics and Foundations</i> , 17th Edition, Laxmi Publications, New Delhi. |                                              |                |
| <b>R7.</b> Ranjan, G. and Rao, A.S.R., <i>Basic and Applied Soil Mechanics</i> , New Age International Publishers, New Delhi.            |                                              |                |
| <b>R8.</b> Arora, K.R., <i>Soil Mechanics and Foundation Engineering</i> , Standard Publishers Distributors, New Delhi.                  |                                              |                |
| IS Codes:                                                                                                                                |                                              |                |
| <b>IS1.</b> IS 1498:1970 – Classification and Identification of Soils for General Engineering Purposes.                                  |                                              |                |
| <b>IS2.</b> IS 2720 (Part 3):1980 – Determination of Specific Gravity.                                                                   |                                              |                |
| <b>IS3.</b> IS 2720 (Part 4):1985 – Grain Size Analysis.                                                                                 |                                              |                |
| <b>IS4.</b> IS 2720 (Part 5):1985 – Determination of Liquid Limit and Plastic Limit.                                                     |                                              |                |
| <b>IS5.</b> IS 2720 (Part 7):1980 – Light Compaction Test (Standard Proctor Test).                                                       |                                              |                |
| <b>IS6.</b> IS 2720 (Part 8):1983 – Heavy Compaction Test (Modified Proctor Test).                                                       |                                              |                |
| <b>IS7.</b> IS 2720 (Part 10):1991 – Unconfined Compression Test.                                                                        |                                              |                |
| <b>IS8.</b> IS 2720 (Part 11):1993 – Triaxial Compression Test.                                                                          |                                              |                |
| <b>IS9.</b> IS 2720 (Part 13):1986 – Direct Shear Test.                                                                                  |                                              |                |
| <b>IS10.</b> IS 2720 (Part 17):1986 – Laboratory Determination of Permeability.                                                          |                                              |                |
| <b>IS11.</b> IS 2720 (Part 28):1974 – Field Density by Core Cutter Method.                                                               |                                              |                |
| <b>IS12.</b> IS 2720 (Part 29):1975 – Field Density by Sand Replacement Method.                                                          |                                              |                |
| <b>IS13.</b> IS 1892:1979 – Code of Practice for Subsurface Investigation for Foundations.                                               |                                              |                |
| <b>IS14.</b> IS 2131:1981 – Standard Penetration Test (SPT).                                                                             |                                              |                |
| <b>IS15.</b> IS 4968 (Part 1):1976 – Static Cone Penetration Test (CPT).                                                                 |                                              |                |



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



- IS16.** IS 4968 (Part 2):1976 – Dynamic Cone Penetration Test (DCPT).  
**IS17.** IS 6403:1981 – Determination of Bearing Capacity of Shallow Foundations.  
**IS18.** IS 8009 (Part 1):1976 – Calculation of Settlement of Foundations.  
**IS19.** IS 1904:1986 – Design and Construction of Foundations in Soils.  
**IS20.** IS 14458 (Part 1):1998 – Guidelines for Retaining Wall Design.

Special Instructions if Any:

**ISE: In Semester Evaluation, MSE: Mid Semester Evaluation, ESE: End Semester Evaluation**



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



**Second Year B. Tech Civil (Regular Track)**

**Academic Year – 2026-2027**

**Semester – III (2025 Pattern)**

**[CE2303L]: Geotechnical Engineering Lab**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                              |             |              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------|--------------|
| Teaching Scheme: Theory 2 Hours/ Week                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Exam Scheme                                                                                  | <b>Exam</b> | <b>Marks</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Total Marks: 50                                                                              | <b>ISCE</b> | <b>30</b>    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                              | <b>ESE</b>  | <b>20</b>    |
| Credit: 01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                              |             |              |
| Course Prerequisites: Fundamentals of Chemistry, Mathematics and Physics                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                              |             |              |
| Course Objective:<br>To provide the basic principles of soil mechanics, Classification systems, Compaction, Permeability, Consolidation and Shear strength characteristics, to understand the engineering behavior of soil to address practical problems in Geotechnical Engineering. To understand methods of soil exploration and carry out detailed geotechnical investigation in the field. To apply basic concepts of geotechnical engineering for evaluating bearing capacity of soils. |                                                                                              |             |              |
| Course Outcome: After successful completion of the course, students will able to:<br>CO1: Classify the type of soils.<br>CO2: Determine Index Properties of soils<br>CO3: Determine in-situ density of soil.<br>CO4: Estimate the coefficient of Permeability of soil.<br>CO5: Determine shear parameter of soil.<br>CO6: Infer the soil investigation report.                                                                                                                                |                                                                                              |             |              |
| Course Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                              |             |              |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Determination of Natural Moisture Content                                                    |             |              |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Determination of Specific Gravity using Density Bottle/Pycnometer                            |             |              |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Grain Size Analysis by Sieve Analysis and Soil Classification as per IS 1498.                |             |              |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Determination of Bulk Density and Dry Density of Soil                                        |             |              |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Relative Density Test for Cohesion less Soils                                                |             |              |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Determination of Consistency Limits and Soil Classification.                                 |             |              |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Field Density Test by Core Cutter Method. Field Density Test by Sand Replacement Method.     |             |              |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Determination of coefficient of permeability by Constant head method<br>Variable head method |             |              |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Shear strength tests on soil Direct shear test and Triaxial Test                             |             |              |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Plate Load Test and SPT Demonstration only                                                   |             |              |





**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| <b>11</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Preparation and Interpretation of Bore Logs |
| <b>12</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Geotechnical Software Demonstration         |
| <p>IS Codes:</p> <p><b>IS1.</b> IS 1498:1970 – Classification and Identification of Soils for General Engineering Purposes.</p> <p><b>IS2.</b> IS 2720 (Part 3):1980 – Determination of Specific Gravity.</p> <p><b>IS3.</b> IS 2720 (Part 4):1985 – Grain Size Analysis.</p> <p><b>IS4.</b> IS 2720 (Part 5):1985 – Determination of Liquid Limit and Plastic Limit.</p> <p><b>IS5.</b> IS 2720 (Part 7):1980 – Light Compaction Test (Standard Proctor Test).</p> <p><b>IS6.</b> IS 2720 (Part 8):1983 – Heavy Compaction Test (Modified Proctor Test).</p> <p><b>IS7.</b> IS 2720 (Part 10):1991 – Unconfined Compression Test.</p> <p><b>IS8.</b> IS 2720 (Part 11):1993 – Triaxial Compression Test.</p> <p><b>IS9.</b> IS 2720 (Part 13):1986 – Direct Shear Test.</p> <p><b>IS10.</b> IS 2720 (Part 17):1986 – Laboratory Determination of Permeability.</p> <p><b>IS11.</b> IS 2720 (Part 28):1974 – Field Density by Core Cutter Method.</p> <p><b>IS12.</b> IS 2720 (Part 29):1975 – Field Density by Sand Replacement Method.</p> <p><b>IS13.</b> IS 1892:1979 – Code of Practice for Subsurface Investigation for Foundations.</p> <p><b>IS14.</b> IS 2131:1981 – Standard Penetration Test (SPT).</p> <p><b>IS15.</b> IS 4968 (Part 1):1976 – Static Cone Penetration Test (CPT).</p> <p><b>IS16.</b> IS 4968 (Part 2):1976 – Dynamic Cone Penetration Test (DCPT).</p> <p><b>IS17.</b> IS 6403:1981 – Determination of Bearing Capacity of Shallow Foundations.</p> <p><b>IS18.</b> IS 8009 (Part 1):1976 – Calculation of Settlement of Foundations.</p> <p><b>IS19.</b> IS 1904:1986 – Design and Construction of Foundations in Soils.</p> <p><b>IS20.</b> IS 14458 (Part 1):1998 – Guidelines for Retaining Wall Design.</p> |                                             |
| Special Instructions if Any:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                             |

**ISCE: In Semester Continuous Evaluation, MSE: Mid Semester  
Evaluation, ESE: End Semester Evaluation**



**Second Year B. Tech Civil**  
**Academic Year – 2026-2027**  
**Semester – III (2025 Pattern)**  
**[CE2304T]: Building Materials and Construction**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      |                 |              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------|--------------|
| Teaching Scheme: Theory 3 Hours/ Week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Exam Scheme<br><br>Total Marks: 100                  | <b>Exam</b>     | <b>Marks</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      | <b>ISE</b>      | <b>20</b>    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      | <b>MSE</b>      | <b>30</b>    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      | <b>ESE</b>      | <b>50</b>    |
| Credit: 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                      |                 |              |
| <b>Course Prerequisites:</b> Understanding of fundamental civil engineering terms and processes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                      |                 |              |
| Course Objective: To make aware about various components of building and their function. The aim is to introduce materials and activities of construction from foundation to finishing of building and also describe importance of the building services, circulation and safety aspects.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                      |                 |              |
| <b>Course Outcome:</b><br><b>CO1:</b> Explain the types of building structures, building components, properties of construction materials, and masonry construction techniques including bonds and partition walls.<br><b>CO2:</b> Describe the principles, components, and applications of formwork, scaffolding, underpinning, lightweight construction, and automation in construction.<br><b>CO3:</b> Illustrate the procedures of concrete casting, curing methods, precast and prestressed concrete construction, construction joints, prefabrication, and 3D printing technology in buildings.<br><b>CO4:</b> Select appropriate flooring, roofing systems, doors, windows, arches, lintels, and sustainable building materials for different construction requirements.<br><b>CO5:</b> Apply the principles of building services and vertical circulation systems for planning safe, comfortable, and efficient buildings.<br><b>CO6:</b> Apply suitable building finishing techniques, damp-proofing, waterproofing, protective cladding, and construction safety practices to enhance the durability and safety of structures. |                                                      |                 |              |
| Course Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |                 |              |
| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Fundamentals of Building Construction</b>         | <b>06 Hours</b> |              |
| Type of structures Load bearing and framed structures, building components and their basic requirements i.e. Substructure and Superstructure, IS specification, Tests, Characteristics of good bricks, Stone. Classification of bricks, Masonry– Introduction of stone masonry, brick masonry, precast block masonry. Types of bonds: English, Flemish, Header, Stretcher, Types of partition wall (metal, wooden, Gypsum).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |                 |              |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Formwork, Scaffolding and Modern Construction</b> | <b>06 Hours</b> |              |



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**

(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



Form work- Conventional, Slip form work: Component parts- design criteria. Mivan shuttering, shoring, Underpinning. Scaffolding: Purpose. Recent trends in light weight construction. Introduction to automation in construction.

|                 |                                                         |                 |
|-----------------|---------------------------------------------------------|-----------------|
| <b>UNIT-III</b> | <b>Casting Procedure of Concrete and Curing Methods</b> | <b>06 Hours</b> |
|-----------------|---------------------------------------------------------|-----------------|

Casting procedure for reinforced concrete columns, beams and slabs. Methods of Curing (Chemical Curing using Admixtures), Precast and pre-stressed concrete work, Construction Joints in concrete work. Prefabrication Construction 3D printing in buildings.

|                |                                          |              |
|----------------|------------------------------------------|--------------|
| <b>UNIT-IV</b> | <b>Building Components and Materials</b> | <b>Hours</b> |
|----------------|------------------------------------------|--------------|

Types of flooring and its functional requirement, floor materials and finishes. Factory floor tremix, laser flooring. Types of roof and its functional requirement. Roofing materials. Doors, Windows, Types of Doors, Windows, Arches, Classification of Arches, Arches and Lintels- Types of Lintels. Ventilators: Purpose. Advanced and Sustainable Materials (Geopolymers Green concrete, Recycled materials) Nano Materials and Technologies- Carbon nanotubes, silicon Dioxide nanoparticles, Titanium Dioxide nanoparticles.

|               |                                                   |                 |
|---------------|---------------------------------------------------|-----------------|
| <b>UNIT-V</b> | <b>Building Services and Vertical Circulation</b> | <b>06 Hours</b> |
|---------------|---------------------------------------------------|-----------------|

Building services- plumbing services, lighting, ventilation, noise and acoustics, communications, Fire Protection System, Thermal Comfort and HVAC, smart and intelligent services. Vertical Circulations: design consideration, Types of staircases, and details of ramps, Ladders, lifts, and escalator. Fire escape staircase.

|                |                                     |                 |
|----------------|-------------------------------------|-----------------|
| <b>UNIT-VI</b> | <b>Building Finishes and Safety</b> | <b>06 Hours</b> |
|----------------|-------------------------------------|-----------------|

Plastering -Purpose of plastering, Methods of plastering, Materials of plastering. Paints, Constituents of paints & types. Painting-Purpose of Painting, Application of Paints to new and old surfaces. Damp Proofing, Waterproofing, types Protective Cladding, Introduction to Construction Safety, Types of construction hazards, Personal Protective Equipment (PPE) Site Safety Practices and Precautions, Safety in Storage of Construction Materials

Reference Books:

- R1 B. C. Punmia, Building construction, Laxmi Publications.
- R2 S. C. Rangwala, Building Construction, Charotdar Publications. S.V.
- R3 Bindra and Arora, Building Construction, Dhanpat Rai Publications
- R4 S.K. Duggal, Building Materials, New Age International Publishers.
- R5 Deodhar, Building Materials, Khanna Publication

IS Codes:

- **IS 1077** – Common Burnt Clay Building Bricks Specification
- **IS 1597 (Part 1 & 2)** – Construction of Stone Masonry
- **IS 456** – Formwork Requirements for Concrete
- **IS 1343:2012** – Prestressed Concrete Code of Practice
- **IS 1237 (Part 1 & 2)** – Cement Concrete Flooring Tiles
- **IS 4021** – Timber Door and Window Shutters
- **IS 1172** – Water Supply, Drainage and Sanitation
- **IS 1661** – Application of Cement and Cement-Lime Plaster Finishes

Special Instructions if Any:



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**  
(An Empowered Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



**ISE: In Semester Evaluation, MSE: Mid Semester Evaluation, ESE: End Semester Evaluation**

JSPM'S RSCOE