



# **SHIVAJI UNIVERSITY, KOLHAPUR**

## **REVISED SYLLABUS**

SECOND YEAR (B. Tech) CBCS

## **CIVIL ENGINEERING**

To be introduced from the academic year 2019-20  
(i.e. from June 2019) onwards

**ENGINEERING MATHEMATICS-III**

| Course                                         | Teaching Scheme |    |   |        |        | Evaluation Scheme |                  |                  |                  |
|------------------------------------------------|-----------------|----|---|--------|--------|-------------------|------------------|------------------|------------------|
|                                                | L               | T  | P | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                                |                 |    |   |        |        | Max.              | Min. for Passing | Max.             | Min. for Passing |
| <b>Engineering Mathematics-III (BSC-CV301)</b> | 03              | 01 | - | 04     | ISE    | -                 | -                | 25               | 40%              |
|                                                |                 |    |   |        | CIE    | 30                | 40%              | -                | -                |
|                                                |                 |    |   |        | ESE    | 70                | 40%              | -                | -                |

ISE: In semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

**Course Objectives:**

1. To introduce the concept of linear differential equations of higher and their applications.
2. To introduce concept of vector calculus.
3. To learn the concept of Probability.
4. To familiarize the students with concepts and applications of Laplace Transforms.
5. To understand the concept of Complex variable.

**Course Outcomes:**

After completion of this course students will be able to:

1. Solve Linear differential equations and problems related to applications of differential equation.
2. Perform vector differentiation.
3. Find probabilities by using probability distributions.
4. Find Laplace transform, Inverse Laplace transform of various functions and applications.
5. Find analytic function.

**SECTION I****Unit 1: Linear Differential equations with constant coefficients: (7)**

- 1.1 Linear Differential equations with constants coefficients and their methods of solutions
- 1.2 Applications of Linear Differential equations with constants coefficients to Civil engineering problems (Beam, Cantiliver and strut)

**Unit 2: Vector differential calculus: (5)**

- 2.1 Differentiation of vectors Consistency of linear system equations
- 2.2 Gradient of scalar point function and directional derivative
- 2.3 Divergence of vector point function and solenoidal vector fields
- 2.4 Curl of a vector point function and irrotational vector field

- Unit 3: Probability Distribution:** (6)
- 3.1 Random Variable
  - 3.2 Binomial Distribution
  - 3.3 Poisson distribution.
  - 3.4 Normal distribution

## SECTION II

- Unit 4: Laplace Transform:** (7)
- 4.1 Definition and transforms of elementary functions.
  - 4.2 Properties of Laplace transform.

- Unit 5: Inverse Laplace Transform:** (6)
- 5.1 Inverse Laplace Transform Formulae.
  - 5.2 Inverse Laplace Transform by using partial fraction and convolution theorem.
  - 5.3 Solution of Linear Differential equations with constants coefficients.

- Unit 6: Complex Variable:** (5)
- 6.1. Functions of complex variable.
  - 6.2 Analytic function.
  - 6.3 Necessary and sufficient condition for  $f(z)$  to be analytic.
  - 6.4 Cauchy –Riemann equations in Cartesian and polar coordinates.
  - 6.4 Milne- Thomson method.
  - 6.5 Harmonic function.

**Term work:**

- 1. Batch wise tutorials are to be conducted. The number of students per batch should be as per the university pattern for practical batches.
- 2. Minimum number of assignments should be 6 covering all topics.

**Text Books:**

- 1. A text book of Applied Mathematics, Vol.I by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
- 2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi.
- 3. A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd., New Delhi.
- 4. A text book of Engineering Mathematics Volume I by Peter V. O'Neil and Santosh K. Sengar, Cengage Learning.

**Reference Books:**

- 1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
- 2. Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
- 3. Mathematical methods of Science and Engineering by Kanti B. Datta, Cengage Learning.

**Guidelines regarding the question paper setting**

It will be two sections. Each will include four questions having weight age 12, 11, 11, and 12. Out of four questions of each section attempt any three.

First three questions should be on each unit separately and **question no. 4** should be on all the three units (**out of three solve any two**)

**End Semester Examination**

| Question No. | Unit Number | Marks |
|--------------|-------------|-------|
| 1            | 1           | 12    |
| 2            | 2           | 11    |
| 3            | 3           | 11    |
| 4            | 1,2,and 3   | 12    |
| 5            | 4           | 12    |
| 6            | 5           | 11    |
| 7            | 6           | 11    |
| 8            | 4,5,and 6   | 12    |

**SURVEYING-I**

| Course                             | Teaching Scheme |   |    |        |        | Evaluation Scheme |                  |                  |                  |
|------------------------------------|-----------------|---|----|--------|--------|-------------------|------------------|------------------|------------------|
|                                    | L               | T | P  | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                    |                 |   |    |        |        | Max               | Min. for Passing | Max              | Min. for Passing |
| <b>Surveying-I<br/>(PCC-CV302)</b> | 03              | - | 02 | 04     | ISE    | -                 | -                | 50               | 40%              |
|                                    |                 |   |    |        | CIE    | 30                | 40%              | -                | -                |
|                                    |                 |   |    |        | ESE    | 70                | 40%              | 25               | 40%              |

ISE: In semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

**Course Objectives:**

1. To obtain a full understanding of the methods of measurement, errors to be expected, and their control.
2. To know the basics of levelling and theodolite survey in elevation and angular measurements.
3. To find out area and volumes using various instruments.
4. To study the significance of plane table surveying in plan making.
5. To be able to use minor instruments with efficiency.
6. To understand the importance of surveying in the field of civil engineering.

**Course Outcomes:** After completing of this course, student will be able to:

1. Determine linear and angular measurements.
2. Record various measurements in the field book.
3. Find areas of irregular figures.
4. Prepare plans and sections required for civil engineering projects.

**SECTION I****Unit 1: Levelling and Contouring:****(8)**

- a) Introduction to levelling.
- b) Permanent Adjustments of dumpy level.
- c) Reciprocal levelling, Sensitivity of bubble tube, Corrections – curvature and refraction.
- d) Contouring – methods and applications.

**Unit 2: Areas and volumes:** (5)

- a) Planimeter – Area of Zero Circle and Numerical.
- b) Area- Trapezoidal, Simpsons rule, Mid - ordinate rule, Average ordinate.
- c) Volume- Trapezoidal and Simpsons Rule, Capacity contouring.

**Unit 3: Plane Table Surveying:** (5)

- a) Principles, accessories, significance and adjustments.
- b) Methods and applications of plane table survey.

**SECTION - II**

**Unit 4: Theodolite:** (6)

- a) Vernier theodolite – components, uses and adjustments.
- b) Applications – Trigonometrical levelling.

**Unit 5: Theodolite Traversing:** (7)

- a) Objectives, traverse table, plotting.
- b) Omitted measurements.

**Unit 6: Applications:** (5)

- a) Usage of minor instruments- Hand Level, Abney Level, Ghat Tracer and Box Sextant.
- b) Hydrographic survey.
- c) Tunnel survey.

**Term Work:**

- 1. Differential and reciprocal levelling, by Auto or Dumpy Level.
- 2. Two Peg Method.
- 3. Sensitivity of bubble tube.
- 4. Methods of plane table survey – any two methods.
- 5. Measurement of horizontal angles by any two methods.
- 6. Trigonometrical levelling- when base is accessible.
- 7. Project drawings

**Survey Projects:**

- 1. Block contouring project for at least 100m x 100m- By Auto Level.
- 2. Theodolite traverse – Pentagon.

**Textbooks:**

- 1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni, Pune
- 1. Vidyarthi Griha Prakashan.
- 2. Surveying and Levelling by Subramanian, Oxford University Press.
- 3. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain, Laxmi
- 4. Publications.
- 5. Surveying and Levelling by N. N. Basak, Tata McGraw Hill.
- 6. Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill.
- 7. Surveying and Levelling - R. Agor, Khanna Publishers, New Delhi.

**Reference Books:**

1. Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning - Van Nostrand Reinhold.
2. Plane Surveying by A. M. Chandra, New Age International Publishers.
3. Surveying Vol. I & II by Dr. K. R. Arora, Standard Book House.
4. Plane surveying – David Clark.

**Guidelines for Question Paper Setting:**

1. It will include two sections. Each section will include 4 questions having weightage 12, 11, 11 and 12. **Attempt any three out of 4 Questions from each section.**
2. First three questions should be on each unit separately and Question No.4 should be on all the three units. **Question No.4 and 8 should be of short notes** ( Attempt any three out of five)

**End Semester Examination**

| <b>Question No.</b> | <b>Unit No.</b> | <b>Marks</b> |
|---------------------|-----------------|--------------|
| 1.                  | 1               | 12           |
| 2.                  | 2               | 11           |
| 3.                  | 3               | 11           |
| 4.                  | 1,2 and 3       | 12           |
| 5.                  | 4               | 12           |
| 6.                  | 5               | 11           |
| 7.                  | 6               | 11           |
| 8.                  | 4,5 and 6       | 12           |

# SHIVAJI UNIVERSITY, KOLHAPUR

## SECOND YEAR B. TECH. (CIVIL) SEMESTER -III

### STRENGTH OF MATERIALS

| Course                                   | Teaching Scheme |   |    |        |        | Evaluation Scheme |                  |                   |                  |
|------------------------------------------|-----------------|---|----|--------|--------|-------------------|------------------|-------------------|------------------|
|                                          | L               | T | P  | Credit | Scheme | Theory (Marks)    |                  | Practical (Marks) |                  |
|                                          |                 |   |    |        |        | Max.              | Min. for Passing | Max.              | Min. for Passing |
| <b>Strength of Materials (ESC-CV303)</b> | 03              | - | 02 | 04     | ISE    | -                 | -                | 25                | 40%              |
|                                          |                 |   |    |        | CIE    | 30                | 40%              | -                 | -                |
|                                          |                 |   |    |        | ESE    | 70                | 40%              | 25                | 40%              |

ISE: In Semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

#### Course Objectives:

1. To develop an understanding of the basic principles of Structural Analysis.
2. Study the internal effects and deformations caused by the applied loads.
3. Understand the analysis and design aspects of structural engineering.

#### Course Outcomes:

After completion of this course students will be able to:

1. Evaluate the response of elastic body for external actions and compute design forces.
2. Evaluate shear force and bending moment of statically determinate structure.
3. Analyze the stress, strain and deformation of elastic bodies under bending and shear actions.
4. Analyze the stress, strain and deformation of elastic bodies under external actions.

### SECTION I

#### Unit 1: Stress & Strain: (6)

- 1.1 Engineering properties of different materials.
- 1.2 Simple stress and strain, Hooke's law, elastic behavior of the body under external actions.
- 1.3 Composite sections under axial loading, temperature stresses, elastic constants.
- 1.4 Normal stresses and strains in three dimensions.

#### Unit 2: Shear force diagram & bending moment diagram for determinate beams: (6)

- 2.1 Concept and definition of SF & BM, relation between SFD, BMD & loading.
- 2.2 SFD & BMD due to point load, UDL, UVL & moments/couples.

#### Unit 3: Analysis of trusses: (6)

- 3.1 Introduction to truss.
- 3.2 Analysis of truss using method of joints & method of sections.

## SECTION II

### **Unit 4: Bending stresses:** (6)

- 4.1 Theory of pure bending.
- 4.2 Derivation of flexural formula.
- 4.3 Bending stress for symmetrical & unsymmetrical section.

### **Unit 5: Shear stresses in beam:** (6)

- 5.1 Shear stress distribution for symmetrical & unsymmetrical section.

### **Unit 6: Strain Energy:** (6)

- 6.1 Strain energy due to different types of actions, suddenly applied load, gradually applied load & impact load, strain energy method for deflection of determinate beams.
- 6.2 Analysis of thin walled cylinder.

### **Term Work:**

#### **Term work shall comprise of –**

- A) Perform at least any Seven from following:
  - i. Study of Universal Testing Machine.
  - ii. Tensile test on Mild steel and TMT steel.
  - iii. Compression test on M.S. and C.I, cement bricks or paving blocks
  - iv. Compression test on timber.
  - v. Direct shear test on M.S. bar.
  - vi. Charpy or Izod Impact test on different metals.
  - vii. Bending test on Timber.
  - viii. Water absorption and compression test on burnt bricks.
  - ix. Hardness test on metals.
- B) At least one assignment on each unit.

### **Text Books:**

- 1. “Strength of Materials” - R.K.Bansal., Laxmi Publications.
- 2. “Strength of Materials” - S Ramamrutham, DhanapatRai Publications.
- 3. “Structural Analysis” - Bhavikatti S.S, Vikas Publications house New Dehli.
- 4. “Strength of Materials” - R.K.Rajput., S.Chand Publications.

### **Reference Books:**

- 1. “Mechanics of Materials” - Gere and Timoshenko, CBS publishers.
- 2. “Mechanics of Material” - Beer and Johnston, M.
- 3. “Strength of Material” - F. L. Singer and Pytel, Harper and Row publication.

**Guidelines regarding the Question Paper Setting:**

It will include two sections. Each section will include 4 questions having weightage 11, 12, 12 and 12. **Question No. 1 & 5 is and solve any 2 out of remaining 3 in each section**

**Question No. 1 and 5 should compulsory be on theory**

**End Semester Examination**

| <b>Question No.</b> | <b>Unit No.</b>  | <b>Marks</b> |
|---------------------|------------------|--------------|
| 1.                  | 1, 2, 3 - Theory | 09           |
| 2.                  | 1 - Problem      | 13           |
| 3.                  | 2 - Problem      | 13           |
| 4.                  | 3 - Problem      | 13           |
| 5.                  | 4,5,6 - Theory   | 09           |
| 6.                  | 4 - Problem      | 13           |
| 7.                  | 5 - Problem      | 13           |
| 8.                  | 6 - Problem      | 13           |

**FLUID MECHANICS - I**

| Course                               | Teaching Scheme |   |    |        |        | Evaluation Scheme |                  |                  |                  |
|--------------------------------------|-----------------|---|----|--------|--------|-------------------|------------------|------------------|------------------|
|                                      | L               | T | P  | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                      |                 |   |    |        |        | Max.              | Min. for Passing | Max.             | Min. for Passing |
| <b>Fluid Mechanics-I (ESC-CV304)</b> | 03              | - | 02 | 04     | ISE    | -                 | -                | 25               | 40%              |
|                                      |                 |   |    |        | CIE    | 30                | 40%              | -                | -                |
|                                      |                 |   |    |        | ESE    | 70                | 40%              | 25               | 40%              |

ISE: In Semester Evaluation      CIE: Continuous Internal Evaluation      ESE: End Semester Examination

**Course Objectives:**

1. To study processes and science of fluid and their properties.
2. To study pressure measuring devices and pressure diagram.
3. To apply basic principles in fluid flow problems.
4. To identify the losses in pipes.

**Course Outcomes:**

After successful completion of this course, student will be able to:

1. Study the basic properties of fluids and their behavior under application of various force systems.
2. Discuss the basic concepts and principles in fluid statics, fluid kinematics and fluid dynamics with their applications in fluid flow problems.
3. Recognize the principles of continuity, momentum and energy as applied to fluid in motion.
4. Apply the equations to analyze problems by making proper assumptions and learn systematic engineering methods to solve practical fluid mechanics problems.

**SECTION-I****Unit-1: Properties of fluid:****(6)**

Introduction: Physical Properties of Fluids (Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity: Dynamic and Kinematic Viscosity, Compressibility, Surface tension, Capillary Effect, Vapour Pressure and Cavitation), Newton's law of viscosity, Types of Fluids. Pressure, Types of Pressure, Pascal's Law, Hydrostatic Law.

**Unit-2: Fluid Statics:****(7)**

- A. Pressure Measuring Devices, Pressure Head, Pressure Diagram, Total Pressure and Centre of Pressure, Forces on Plane and Curved Surfaces. Forces on vertical walls, gates and dams.
- B. Buoyancy and Floatation: Archimedes's Principle, Metacentre, Stability of Submerged and Floating Bodies.

**Unit-3: Fluid Kinematics:****(5)**

Types of Flows, Stream lines, Streak Line, Path Line, Stream Tube, Stream Bundle, Equipotential lines, velocity and acceleration of fluid, Stream Function and Velocity Potential Function, Flow Net- (Properties and Uses), Continuity Equation (3-D Cartesian Form).

**SECTION-II****Unit-4: Fluid Kinetics:****(7)**

Forces Acting on Fluid in Motion, Euler's Equation along a Streamline, Bernoulli's equations, Bernoulli's Theorem assumptions, Limitations and modifications.

**Bernoulli's Applications:** Venturimeter (Horizontal and Vertical), Orificemeter, Orifices, Time required for Emptying the Tank, Concept of HGL and TEL. Theoretical and Experimental determination of hydraulic coefficients of orifice. Introduction of mouthpiece and Rotameter.

**Unit-5: Laminar and Turbulent Flow:****(6)**

- A. Laminar Flow and Turbulent Flow: Reynold's Experiment, Hazen Poissuille's Equation for Viscous Flow through Circular Pipes, Prandtl Mixing Length Theory, Introduction to Moody's Chart.
- B. Boundary Layer Theory: Concept, Various Thicknesses (Nominal, Displacement, Momentum, Energy), Hydraulically Smooth and Rough Boundaries, Separation of Boundary Layer, Control of Separation.

**Unit-6: Losses in Pipes:****(5)**

- A. Major and Minor Losses, Darcy-Wiesbach Equation, Concept of Equivalent Pipe, Dupit's Equation.
- B. Pipes in Series, Parallel and Syphon, Two Reservoir Problems, Three Reservoir Problems Concept of Water hammer. Surge Tanks (Function, Location and Uses).

**Term work:**

Perform at least Eight Experiments from the Following:

1. Study of Pressure Measuring Devices.
2. Measurement of Discharge.
3. Determination of Metacentric Height for Floating Bodies.
4. Verification of Bernoulli's Theorem.
5. Calibration of Venturimeter.
6. Calibration of Orificemeter.
7. Determination of Hydraulic Coefficients of Orifice.
8. Reynold's Experiment.
9. Determination of Friction Factor for Given Pipe.
10. Determination of Minor Losses in a Given Pipe.
11. Study of Moody's Chart.

**Text Books:**

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi.
2. Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi/Seth – Standard Book House, Delhi.
3. Fluid Mechanics – S. Nagrathanam – Khanna Pub., Delhi.
4. Fluid Mechanics – Garde-Mirajgaonkar – Nemchandand Bros., Roorkee.
5. Fluid Mechanics – Arora.
6. Fluid Mechanics through Problems – Garde R. J.
7. Fluid Mechanics and hydraulic machine-R.K.Bansal, Laxmi Publication.

**Reference books:**

1. Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland.
2. Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd. Tokyo.
3. Fundamentals of Fluid Mechanics, Munson, Young, Okiishi, Huebesch, Wiley Publication.
4. Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland.

**Guidelines regarding the question paper setting:**

It will include two sections. Each section will include 4 questions having weightage 11, 12, 11 and 12. **Out of 4 Questions of each section attempt any three.**

First three questions should be on each unit separately and Question No.4 should be on all the three units. **Question No.4 and 8 should be of short notes.**

**End Semester Examination**

| Question No. | Unit No.  | Marks |
|--------------|-----------|-------|
| 1.           | 1         | 11    |
| 2.           | 2         | 12    |
| 3.           | 3         | 11    |
| 4.           | 1,2 and 3 | 12    |
| 5.           | 4         | 11    |
| 6.           | 5         | 12    |
| 7.           | 6         | 11    |
| 8.           | 4,5 and 6 | 12    |

# SHIVAJI UNIVERSITY, KOLHAPUR

## SECOND YEAR B. TECH. (CIVIL) SEMESTER -III

### BUILDING CONSTRUCTION AND MATERIALS

| Course                                          | Teaching Scheme |   |    |        |        | Evaluation Scheme |                  |                  |                  |
|-------------------------------------------------|-----------------|---|----|--------|--------|-------------------|------------------|------------------|------------------|
|                                                 | L               | T | P  | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                                 |                 |   |    |        |        | Max.              | Min. for passing | Max.             | Min. for passing |
| Building Construction and Materials (PCC-CV305) | 04              | - | 02 | 05     | ISE    | -                 | -                | 50               | 40%              |
|                                                 |                 |   |    |        | CIE    | 30                | 40%              | -                | -                |
|                                                 |                 |   |    |        | ESE    | 70                | 40%              | -                | -                |

ISE: In Semester Evaluation      CIE: Continuous internal Evaluation      ESE: End Semester Examination

#### Course Objectives:

1. To understand the properties and suitability of building materials.
2. To understand the different building components.
3. To understand the masonry work by using stones, bricks, blocks.
4. To understand the various types of doors and windows with their components.
5. To understand the requirements of good stairs and design of stairs.
6. To understand different types of roofs and floors.

#### Course Outcomes:

After completion of this course students will be able to:

1. Know the building Materials.
2. Describe properties and suitability of various building materials.
3. State the different building components.
4. Demonstrate different bonds in brick masonry.
5. Produce drawings of different building components.
6. Explain different types of roof coverings & types of flooring.

### SECTION I

#### Unit 1: Engineering properties and use of following materials: (9)

**1.1 Stones** – Requirements of good building stone, uses of building stones.

**1.2 Bricks** – Manufacturing, Types (clay bricks, fly ash, cellular light weight concrete brick, aerated cement concrete brick or autoclave brick ) and Engineering Properties.

**1.3 Timber** – Natural and Artificial wood and their application in Civil Engineering.

**1.4 Steel** – Standard structural sections, steel as reinforcement.

**1.5 Tiles** - Ceramic, Vitrified, Natural Stone, Paving Blocks.

**1.6 Miscellaneous** – Aluminium, Glass, Plastic.

**Unit 2: (9)**

- a) **Basic requirements of a building as a whole:** Strength and stability, Dimensional stability, comfort and convenience, damp prevention, water-proofing techniques, heat insulation, day lighting and ventilation. Sound insulation and anti termite treatment.
- b) **Building components and their basic requirements :** Foundations, plinth, walls and columns in superstructure, floors, doors and windows, sills, lintels and weather sheds, roofs, steps and stairs, utility fixtures.
- c) **Formwork:** Materials (wooden, steel and aluminium).
- d) **Foundations:** Types and their suitability (Stepped, isolated, combined, strip, raft, strap or cantilever, pile.)

**Unit: 3 (6)**

- a) **Stone Masonry** – Random Rubble, Uncoursed Rubble, Coursed Rubble and Ashlar Masonry.
- b) **Brickwork and Brick Bonds** - English, Flemish, Composite masonry.

**SECTION II**

**Unit: 4 (8)**

- a) **Lintel:** Necessity, Materials: wood, stone, brick, steel, R.C.C. and reinforced brick lintels.
- b) **Doors** – Classification, T.W. Paneled Door, Flush Door, Aluminum Glazed Doors, Steel Doors, fixtures and fastening.
- c) **Windows** - Classification, T.W. Glazed Windows, Aluminum Glazed Windows, fixtures and fastening.

**Unit: 5 (8)**

**Stairs:** Technical terms, requirements of a good stair, uses, types, materials for construction. Design of stairs (Dog Legged, quarter turn and Open Well), Ramps, lifts and escalator.

**Unit: 6 (8)**

- a) **Roofs and Roof coverings:** Terms used. Roof and their selection, pitched roofs and their types, Steel Trusses types and their suitability, roof covering, material, details, fixtures mangalore tiles, A. C., G. I. and Precoated sheets, concept of proflex (truss less) roof and their selection.
- b) **Construction of floors:** Concrete Flooring, R.C.C. slabs, R.C.C. beams and slab. Flat slab floor.
- c) **Waterproofing:** Materials, methods and systems.

**Term Work:**

**1. Drawing to a Scale, Draw on Half Imperial Drawing Sheet.**

- a. Foundations: - Isolated, Combined Footing, Under Reamed Piles. (With reinforcement details)
- b. Stone Masonry: UCR, Course Rubble.
- c. Brick masonry: English bond, Flemish bond.
- d. Doors: T.W. Paneled Door.
- e. Windows: T.W., Glazed and aluminium Window.
- f. Stairs: Dog legged, quarter turn and Open well.

## 2. Sketch Book:

- Lettering, Symbols, Types of lines and dimensioning as per IS 962.
- Doors: Flush doors, Revolving door, Collapsible door and rolling shutter.
- Windows: Louvered window, Sliding Window, Bay window, Casement window, Dormer Window, Corner Window.
- Roofs: Line Sketches of steel trusses for different spans.
- Stairs: Quarter turn, bifurcated, Spiral, Geometrical.
- Lifts and Ramps.
- Formwork: footing, column and beam.

## Text Book:

- Building Construction – B.C.Punmia (Laxmi Publications).
- Basic Civil Engineering – G. K. Hiraskar (Dhanpat Rai Publications).
- A Text Book of Building Construction – S.P. Arora, S.P. Bindra (Dhanpat Rai Publications).
- Construction Technology (Volume 1 to 4) – R. Chudley (ELBS).
- A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)
- Civil Engineering Drawing – M. Chakraborty.
- Engineering Materials – R.K.Rajput (S Chand).

## References Book:

- A to Z of Practical Building Construction and Its Management- Sandeep Mantri SatyaPrakashan, New Delhi.
- Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy).

## Codes of standards:

- SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi.
- I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.

## Guidelines for Question Paper Setting:

### End Semester Examination

| Question No | Unit No | Marks | Remark                                                            |
|-------------|---------|-------|-------------------------------------------------------------------|
| 1           | 1       | 11    | Solve any 3                                                       |
| 2           | 2       | 12    |                                                                   |
| 3           | 3       | 11    |                                                                   |
| 4           | 1,2,3   | 12    |                                                                   |
| 5           | 4       | 12    | Drawing problem on Door or window                                 |
| 6           | 5       | 18    | Drawing problem on Dog legged, Open well & quarter turn staircase |
| 7           | 6       | 5     | Solve any one                                                     |
| 8           | 4,5,6   | 5     |                                                                   |

# SHIVAJI UNIVERSITY, KOLHAPUR

## SECOND YEAR B. TECH. (CIVIL) SEMESTER -III

### NUMERICAL METHODS

| Course                           | Teaching Scheme |   |    |        |        | Evaluation Scheme |                  |                  |                  |
|----------------------------------|-----------------|---|----|--------|--------|-------------------|------------------|------------------|------------------|
|                                  | L               | T | P  | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                  |                 |   |    |        |        | Max.              | Min. for Passing | Max.             | Min. for Passing |
| Numerical Methods<br>(ESC-CV306) | 03              | - | 02 | 04     | ISE    | -                 | -                | 50               | 40%              |
|                                  |                 |   |    |        | CIE    | -                 | -                | -                | -                |
|                                  |                 |   |    |        | ESE    | -                 | -                | -                | -                |

ISE: In Semester Evaluation      CIE: Continuous Internal Evaluation      ESE: End Semester Examination

#### Course Objectives:

1. To introduce the concept of Numerical differentiation.
2. To introduce Numerical methods for evaluating definite integrals.
3. To learn fitting of straight lines and parabola.
4. To introduce the concept of Linear Programming Problem.
5. To understand methods of solution of partial differential equations.
6. To solve problems in civil engineering.

#### Course Outcomes:

After completion of this course students will be able to:

1. Identify, classify and choose the most appropriate numerical method for solving a problem.
2. Illustrate basic theory of correlation and regression.
3. Form and solve Linear Programming Problem.
4. Use methods of solutions to solve classical problems.
5. Deploy skills effectively in the solution of problems in civil engineering.

#### SECTION I

##### Unit 1: Numerical Differentiation:

(6)

- 1.1 Finite differences and difference operators.
- 1.2 Newton's forward and backward formulae.
- 1.3 Lagrange's interpolation formula.
- 1.4 Sterling central difference formulas.

##### Unit 2: Numerical Integration:

(6)

- 2.1 Trapezoidal Rule.
- 2.2 Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rules Gradient of scalar point function and directional derivative.
- 2.3 Romberg integration-recursive formula.

##### Unit 3: Curve Fitting:

(6)

- 3.1 Correlation and regression.
- 3.2 Lines of regression of bivariate data.
- 3.3 Fitting of curves by methods of least squares (straight-line and parabola).

## SECTION II

### **Unit 4: Linear Programming:** (6)

- 4.1 Types of solutions to linear programming problems.
- 4.2 Formation of L.P.P.
- 4.3 Simplex method to solve Linear Programming Problem.

### **Unit 5: Partial Differential Equations:** (6)

- 5.1 Elliptical equation.
- 5.2 Laplace equation.
- 5.3 Liebmen's method.

### **Unit 6: Calculus of variation:** (6)

- 6.1. Introduction and definition.
- 6.2 Euler's Equation, Extremal.
- 6.3 Isoperimetric problem.

### **Term Work:**

- Batch wise Practical's are to be conducted. The number of students per batch should be as per University pattern for practical batches.
- Programs on applications to civil engineering problems using C and C++ Language
  - 1. Trapezoidal Rule
  - 2. Simpson's  $1/3^{\text{rd}}$  rule.
  - 3. Simpson's  $3/8^{\text{th}}$  rule.
  - 4. Newton's forward formula.
  - 5. Least square method.
  - 6. Linear Programming Problem by simplex method.
  - 7. Solution of Laplace equation.
  - 8. Lagrange's interpolation formula.

Minimum number of practical should be 6 covering all topics.

### **Text Books:**

1. A text book of Applied Mathematics, Vol.I by P. N. Wartikar & J. N. Wartikar, Pune, Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi.

### **Reference Books:**

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
2. Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
3. A text book of Engineering Mathematics Volume I by Peter V. O'Neil and Santosh K.Sengar, Cengage Learning.
4. Mathematical methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
5. A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd., New Delhi.

**STRUCTURAL MECHANICS**

| Course                                  | Teaching Scheme |    |     |        |        | Evaluation Scheme |                  |                  |                  |
|-----------------------------------------|-----------------|----|-----|--------|--------|-------------------|------------------|------------------|------------------|
|                                         | L               | T  | P   | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                         |                 |    |     |        |        | Max.              | Min. for Passing | Max.             | Min. for Passing |
| <b>Structural Mechanics (ESC-CV401)</b> | 03              | 01 | --- | 04     | ISE    | -                 | -                | 25               | 40%              |
|                                         |                 |    |     |        | CIE    | 30                | 40%              | -                | -                |
|                                         |                 |    |     |        | ESE    | 70                | 40%              | -                | -                |

ISE: In Semester Evaluation  
Examination

CIE: Continuous Internal Evaluation

ESE: End Semester

**Course Objectives:**

1. Introduction to structural systems, and to methods of analyzing these systems under various loading conditions.
2. To understand behavior of structure.
3. To analyze the structures subjected to moving loads.

**Course Outcomes:**

After completion of this course students will be able to:

1. Identify the response of elastic body for external actions.
2. Distinguish engineering properties of the materials are understood.
3. Compute the design forces in the structures.
4. Analyze the stress, strain and deformation of elastic bodies under external forces.

**SECTION I****Unit 1: Principal planes & stresses:****(6)**

- 1.1 Normal and shear stresses on any oblique plane.
- 1.2 Concept of principal planes and stresses by analytical & graphical methods (Mohr's circle of stress 2-D).
- 1.3 Theories of failure: Maximum normal stress, maximum shear stress and maximum strain energy theory.

**Unit 2: Combined direct and bending stresses:****(6)**

- 2.1 Combined direct and bending stresses, eccentric load, core /kernel of section.
- 2.2 Stability analysis of gravity dam, retaining wall & chimney.

**Unit 3: Influence line diagrams:****(6)**

- 3.1 Muller's Breslau's principle & its applications to statically determinate simple and compound beam.
- 3.2 ILD for member forces in statically determinate truss.

## SECTION II

### **Unit 4: Buckling of long columns:** (6)

- 4.1 Effective length for various end conditions.
- 4.2 Slenderness ratio.
- 4.3 Euler's theory & Rankine's theory.

### **Unit 5: Slope and deflection of determinate beams:** (6)

- 5.1 Double integration method.
- 5.2 Macaulay's method.
- 5.3 Moment-Area method & Conjugate beam method.

### **Unit 6: Torsion of circular shaft:** (6)

- 6.1. Analysis of circular shaft subjected to torsion.
- 6.2 Power transmitted to circular shaft.
- 6.3 Shafts subjected to combined bending, torsion & axial thrust.

#### **Term work:**

- 1. One assignment per unit (minimum 4 problems per assignment)

#### **Recommended Books:**

- 1. "Strength of Materials" - R.K.Bansal., Laxmi Publications.
- 2. "Strength of Materials" - S Ramamrutham, DhanapatRai Publications.
- 3. "Structural Analysis" - Bhavikatti S.S, Vikas Publications house New Dehli.

#### **Reference Books:**

- 1. "Mechanics of Materials" - Gere and Timoshenko, CBS publishers.
- 2. "Mechanics of Material" - Beer and Johnston, M.
- 3. "Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
- 4. "Strength of Materials" - R.K.Rajput., S.Chand Publications.

#### **Discussion regarding the question paper setting:**

It will include two sections. Each section will include 4 questions having weight age 11, 12, 12 and 12. **Question No. 1 & 5 is compulsory and solve any 2 out of remaining 3 in each section Question No. 1 and 5 should be on theory**

#### End Semester Examination

| Question No. | Unit No. | Marks |
|--------------|----------|-------|
| 1.           | 1, 2, 3  | 09    |
| 2.           | 1        | 13    |
| 3.           | 2        | 13    |
| 4.           | 3        | 13    |
| 5.           | 4,5,6    | 09    |
| 6.           | 4        | 13    |
| 7.           | 5        | 13    |
| 8.           | 6        | 13    |

**SURVEYING - II**

| Course                              | Teaching Scheme |   |    |        |        | Evaluation Scheme |                  |                  |                  |
|-------------------------------------|-----------------|---|----|--------|--------|-------------------|------------------|------------------|------------------|
|                                     | L               | T | P  | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                     |                 |   |    |        |        | Max               | Min. for Passing | Max              | Min. for Passing |
| <b>Surveying-II<br/>(PCC-CV402)</b> | 03              | - | 02 | 04     | ISE    | -                 | -                | 25               | 40%              |
|                                     |                 |   |    |        | CIE    | 30                | 40%              | -                | -                |
|                                     |                 |   |    |        | ESE    | 70                | 40%              | 25               | 40%              |

ISE: In Semester Evaluation

CIE: Continuous Internal Evaluation

ESE: End Semester Examination

**Course Objectives:**

1. To understand tachometric surveying in distance and height measurements.
2. To get introduced to different geodetic methods of survey such as triangulation.
3. To get introduced to modern advanced surveying techniques involved such as Remote sensing, Total station, GPS, Photogrammetry etc.
4. To understand the elements of different types of curves and preliminary survey for road.

**Course Outcomes:**

After successful completion of this course students will be able to:

1. Adopt the principles of advanced surveying instruments.
2. Formulate triangulation stations, Flight planning and Ground control points (GCPs).
3. Apply GIS and GPS concepts to civil engineering problems.
4. Design and setout curves by different methods.

**SECTION- I****Unit 1-Measurement of distances and elevations: (7)**

- a) Tachometry – Principles, Suitability, Methods
- b) Stadia diaphragm, Stadia formulae.
- c) Tachometric contouring.

**Unit 2 – Geodetic Surveying: (7)**

- a) Triangulation Principle and Classification, system, Selection of station, Base line,
- b) Measurement, Correction and use of sub tense bar.
- c) Signals, satellite station, Reduction to center, Trilateration.

**Unit 3 – Modern Surveying Equipment's and Project Surveys (4)**

- a) Principle of EDM, Use and applications of Total Station.
- b) Reconnaissance, Preliminary and Detailed survey for road project.

## SECTION- II

### **Unit 4 – Curves: (7)**

- a) Significance of curves and curve setting.
- b) Type of horizontal curve, elements of Simple, Compound curve, Transition curve introduction only, setting out of simple curve by linear and angular methods.
- c) Vertical curves – types, lengths of vertical curves.

### **Unit 5 – Photogrammetry: (5)**

- a) Types of photogrammetry, Terrestrial Photogrammetry- introduction only.
- b) Aerial photogrammetry – Scale of vertical photographs, Flight planning.

### **Unit 6 – Modern methods of surveying: (6)**

- a) Remote sensing – Definition, relevance, types, electromagnetic radiation and energy sources and its characteristics, applications to civil engineering.
- b) GPS – basic principles, GPS segments, receivers, applications in survey.
- c) GIS – Terminology, advantages, basic components of GIS, data types, GIS analysis, applications of GIS software.

### **Term work:**

1. Tacheometry-
  - a. Determination of tacheometric constants.
  - b. Determination of grade of a given line.
  - c. Determination of area of polygon.
  - d. Measurement of horizontal distance by Substrate Bar.
2. Experiments using total station – any two.
3. Setting out of simple curve- one linear and one angular method
4. Use of GPS.
5. Project drawings.

### **Survey Projects:**

1. Road project – at least 1000m.
2. Radial contouring.

### **Textbooks:**

1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni, Pune Vidyarthi Griha Prakashan.
2. Surveying and Levelling by Subramanian, Oxford University Press.
3. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain, Laxmi Publications.
4. Surveying and Levelling by N. N. Basak, Tata McGraw Hill.
5. Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill.
6. Surveying and Levelling - R. Agor, Khanna Publishers, New Delhi

### Reference Books:

1. Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning - Van Nostrand Reinhold.
2. Plane Surveying by A. M. Chandra, New Age International Publishers.
3. Surveying Vol. I & II by Dr. K. R. Arora, Standard Book House.
4. Elements of Photogrammetry - Paul R. Wolf, McGraw Hill Publication.
5. Remote sensing and Geographical Information System- A. M. Chandra and S. K. Ghosh, Narosa Publishing House.
6. Advanced Surveying -Total Station, GIS and Remote Sensing – Satheesh Gopi, R. Sathikumar and N. Madhu, Pearson publication.
7. The GIS Book, 5Th Edition, George B. Korte, PE onwards press.

### Guidelines for Question paper setting:

1. It will include two sections. Each section will include 4 questions having weightage 12, 11, 11 and 12. **Attempt any three out of 4 Questions from each section.**
2. First three questions should be on each unit separately and Question No.4 should be on all the three units .**Question No.4 and 8 should be of short notes** ( Attempt any three out of five)

### End Semester Examination

| Question No. | Unit No.  | Marks |
|--------------|-----------|-------|
| 1.           | 1         | 12    |
| 2.           | 2         | 11    |
| 3.           | 3         | 11    |
| 4.           | 1,2 and 3 | 12    |
| 5.           | 4         | 12    |
| 6.           | 5         | 11    |
| 7.           | 6         | 11    |
| 8.           | 4,5 and 6 | 12    |

**CONCRETE TECHNOLOGY**

| Course                                 | Teaching Scheme |   |    |        |        | Evaluation Scheme |                  |                  |                  |
|----------------------------------------|-----------------|---|----|--------|--------|-------------------|------------------|------------------|------------------|
|                                        | L               | T | P  | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                        |                 |   |    |        |        | Max.              | Min. for Passing | Max.             | Min. for Passing |
| <b>Concrete Technology (PCC-CV403)</b> | 03              | - | 02 | 04     | ISE    | -                 | -                | 25               | 40%              |
|                                        |                 |   |    |        | CIE    | 30                | 40%              | -                | -                |
|                                        |                 |   |    |        | ESE    | 70                | 40%              | 25               | 40%              |

ISE: In Semester Evaluation      CIE: Continuous Internal Evaluation      ESE: End Semester Examination

**Course Objectives:**

1. To study materials used in concrete production.
2. To understand process of concrete manufacturing and to study properties of fresh concrete.
3. To study relationship between compressive strength and tensile strength.
4. To study mix design of concrete by using IS code method and ACI method
5. To study different Non Destructive Tests (NDT).
6. To study different types of special concrete and their manufacturing.

**Course Outcomes:**

After completion of this course students will be able to:

1. Impart knowledge of physical properties of ingredients of concrete and their effect on strength and durability.
2. Explain the fundamentals of process of making good quality concrete and its elastic properties.
3. Understand the factors affecting properties of concrete.
4. Design the concrete mix proportion as per Indian standard code of practice.
5. Demonstrate Non Destructive Testing (NDT) and evaluate quality of existing concrete.
6. Understand different types of concrete and their applications.

**SECTION I****Unit 1****(7)****Ingredients of Concrete:**

**Cement:** Manufacturing process of cement, chemical composition, grades of cement, hydration, types of cement, Tests for cement: fineness, Standard consistency, setting time, soundness and compressive strength.

**Aggregates:** classification, requirements, Tests for coarse aggregates: specific gravity, grading of aggregate, Flakiness index, Elongation Index, Impact value, abrasion value, crushing value. Tests for fine aggregates: specific gravity, sieve analysis, fineness modulus. Alkali aggregate reaction, bulking of sand, Artificial and Recycled aggregate.

**Water:** general requirements, quality of water.

**Unit 2** (6)

**Fresh Concrete:**

**Workability:** factors affecting, different tests for measurement of workability. Segregation, bleeding. Manufacturing process of concrete: batching, mixing, transportation, compaction, curing of concrete, curing methods.

**Unit 3** (8)

**Hardened concrete:**

Strength of concrete: w/c ratio, gel/space ratio, gain of strength with age, maturity concept of concrete, effect of maximum size of aggregate on strength. Test on hardened concrete: compressive strength, comparison of compressive strength between cube test and cylinder test, flexural strength. Relation between compressive and tensile strength. Elastic constants, factors affecting modulus of elasticity, definition and factors affecting creep and shrinkage. Nondestructive testing: Schmidt's rebound hammer, Ultrasonic pulse velocity method.

**SECTION II**

**Unit 4** (8)

**Concrete Mix Design:**

Objectives of mix design, different methods of mix design, factors affecting mix proportions, quality control of concrete, statistical methods, acceptance criteria, Numerical on mix design by ACI 211.1-1991, IS 10262- 2009 and IS 456 -2000. Mix design of fly ash concrete by IS 10262 – 2009.

**Unit 5** (5)

**Admixtures in concrete:**

- a) Chemical Admixtures: Plasticizers, Super plasticizers, Retarders, Air entraining agents, IS 9103 Specifications
- b) Mineral Admixtures: Fly ash, Silica Fume, GGBS, Rice husk ash, metakaolin

**Unit 6** (6)

**Special Concretes and Durability of concrete:**

- a. Special Concretes: Light weight concrete, Polymer modified concrete, concept of fibre reinforced concrete, High performance concrete, Pumpable concrete, Roller compacted concrete, Self compacting concrete.
- b. Durability of concrete: Significance, Permeability and Durability, Chemical Attack, Sulphate attack, Attack by Seawater, Acid attack, Chloride attack, Carbonation of concrete and its determination.

**Term work:**

Perform At least any 12 experiments from following:

1. To determine fineness of cement by Sieve analysis and/or Blaine's air permeability method.
2. To determine the standard consistency of cement using Vicat's apparatus.
3. To determine initial and final setting time of cement.
4. Determination of soundness of cement by Le-Chatelier's apparatus and/or Auto Clave test.
5. To determine compressive strength of cement.

6. Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate).
7. Determination of specific gravity of fine aggregates.
8. Determination of specific gravity and water absorption of coarse aggregates.
9. To determine flakiness and elongation index of coarse aggregates.
10. To determine workability of fresh concrete by using slump cone.
11. To determine compaction factor for workability of fresh concrete.
12. To determine workability of fresh concrete by using Vee Bee Consistometer.
13. Nondestructive test on concrete by: Rebound Hammer Test, Ultrasonic Pulse Velocity Test.
14. Tests for compressive strength of concrete cubes for M20 or M30 (ACI 211.1-91, IS 10262- 2009 and IS 456 2000).

**Text books:**

1. Shetty, M.S., Concrete Technology, S. Chand Publication.
2. Gambhir, M.L., Concrete Technology, Tata McGraw Hill.

**Reference books:**

1. A. M. Neville, J. J. Brooks, "Concrete Technology" Pearson Education India
2. A. M. Neville, "Properties of Concrete", Pearson Education India.
3. R.S. Varshney, "Concrete Technology", Oxford and IBH.
4. P. Kumar Mehta, "Microstructure and properties of concrete", Prentice Hall.SP-26..

**IS codes:**

1. IS: 10262 - 2009, Recommended guidelines for Concrete Mix Design.
2. IS: 456- 2000, Indian Standard Plain and Reinforced Concrete.

**Guidelines for Paper Setting:**

1. One question on each unit.
2. Optional question should be given on Unit 3 and 6. (Weightage of optional question should not be more than 30% of total marks ie. 21 marks out of 70 marks).
3. Compulsory Numerical on mix design should be asked with required table and chart in question paper (ACI 211.1-91, IS 10262 - 2009).

**End Semester Examination**

| Question No. | Unit No. | Marks |
|--------------|----------|-------|
| 1            | 1        | 12    |
| 2            | 2        | 11    |
| 3            | 3        | 12    |
| 4            | 4        | 15    |
| 5            | 5        | 08    |
| 6            | 6        | 12    |
| Total        |          | 70    |

**FLUID MECHANICS - II**

| Course                                | Teaching Scheme |   |    |        |        | Evaluation Scheme |                  |                  |                  |
|---------------------------------------|-----------------|---|----|--------|--------|-------------------|------------------|------------------|------------------|
|                                       | L               | T | P  | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                       |                 |   |    |        |        | Max.              | Min. for Passing | Max.             | Min. for Passing |
| <b>Fluid Mechanics-II (ESC-CV404)</b> | 03              | - | 02 | 04     | ISE    | -                 | -                | 25               | 40%              |
|                                       |                 |   |    |        | CIE    | 30                | 40%              | -                | -                |
|                                       |                 |   |    |        | ESE    | 70                | 40%              | -                | -                |

ISE: In Semester Evaluation

CIE: Continuous Internal Evaluation

ESE: End Semester Examination

**Course Objectives:**

1. To study uniform and non-uniform flow in open channel.
2. To apply basic principles in fluid flow problems.
3. To study velocity and discharge measurement devices.
4. To study impact of jet, Pumps and turbines.

**Course Outcomes:**

After successful completion of this course, student will be able to:

1. Provide students with basic knowledge of fluid properties and utilizing principles developed in fluid mechanics.
2. Develop the principle and equation for pressure flow and momentum analysis.
3. Provide the students with the analytical knowledge of pressure and velocity distribution in an open channel in order to solve practical problems.
4. Illustrate and develop the equations and design principles for open channel flows, including sanitary and storm sewer design and flood control hydraulics.

**SECTION I****Unit-1: Uniform Flow in Open Channel:****(6)**

- A. Introduction, Difference between Pipe Flow and Open Channel Flow. Types of Open Channels, Types of Flows in Open Channel, Geometric Elements, Velocity Distribution, Measurement of Velocity- (Pitot tube, Current Meter)
- B. Steady and Uniform Flow: Characteristics of uniform flow, Chezy's and Manning's Formula, Uniform Flow Computations, Hydraulically Efficient Section (Rectangular, Triangular, Trapezoidal)

**Unit -2: Gradually Varied Flow (GVF):****(6)**

- A. Depth Energy Relationship in Open Channel Flow: Specific Energy (Definition and Diagram, Critical, Sub-Critical, Super-Critical Flow), Specific Force (Definition and Diagram)

- B. Gradually Varied Flow (GVF): Definition, Classification of Channel Slopes, Dynamic Equation of GVF (Assumption and Derivation), Classification of GVF Profiles- Practical Examples, Direct Step Method of Computation of GVF Profiles.

**Unit-3: Rapidly Varied Flow (RVF): (6)**

- A. Rapidly Varied Flow (RVF): Definition, Hydraulic Jump- Phenomenon, Conjugate Depth Relationship, Characteristics, Hydraulic Jump (uses, types, location and application) ,Hydraulic Jump as an Energy Dissipater, Surges in open channel- Positive and Negative Surge.
- B. Spatially Varied Flow: Introduction, Basic Principles and Assumptions.

**SECTION II**

**Unit-4: Notches and Weirs: (7)**

Types, Derivation of Discharge Equation, Velocity of Approach, Francis Formula, Calibration of Notches, Errors in Measurement of Discharge, Sharp, Broad and Round Crested Weirs, Calibration of Weir, Time of Emptying Tank with Weir.

**Unit-5: Impact of Jet: (6)**

Impulse Momentum Principle, Impact of Jet on Vanes- Flat, Curved (Stationary and Moving), Inlet and Outlet Velocity Triangles, Series of Flat, Curved Vanes Mounted on Wheel.

**Unit-6: Pumps and Turbines: (5)**

- A. Hydraulic Turbines: Importance of Hydro-Power, Classification of Turbines- Pelton, Francis and Kaplan Turbine (Detailed Design Need Not To Be Dealt With), Unit Quantities, Specific Speed, Performance Characteristics, Selection of Type of Turbine, Concept of Draft Tube.
- B. Centrifugal Pump: Classification, Component Parts, Working of Centrifugal Pump, Performance Characteristics, Common Pump Troubles and Remedies, Net Positive Suction Head (NPSH).

**Term Work:**

- A. Perform at least three experiments from the Following:
1. Study of Specific Energy Curve for Different Discharges.
  2. Calibration of V-Notch / Rectangular Notch.
  3. Study of Hydraulic Jump.
  4. Study of Flow over Weirs.
  5. Impact of Jet.
- B. Study of Turbines (Demonstration).
- C. Test on Centrifugal Pump.
- D. Visit report of Hydropower Plant.
- E. Assignments on GVF and SVF.

**Text Books:**

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi.
2. Open Channel flow – Rangaraju – Tata McGraw-Hill Pub. Co., Delhi.
3. Fluid Mechanics – K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi.
4. Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi / Seth – Standard Book House, New Delhi.
5. Flow in open channel - K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi.
6. Fluid Mechanics and hydraulic machine-R.K.Bansal, Laxmi Publication.

**Reference Books:**

1. Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland.
2. Flow in open channel – V. T. Chaw - McGraw-Hill International Book Co., Auckland.
3. Fluid Mechanics – K. L. Kumar – Eurasia Publication House, Delhi.

**Guidelines regarding the question paper setting:**

It will include two sections. Each section will include 4 questions having weightage 11, 12, 11 and 12. **Out of 4 Questions of each section attempt any three.** First three questions should be on each unit separately and Question No.4 should be on all the three units. **Question No.4 and 8 should be of short notes.**

**End Semester Examination**

| Question No. | Unit No.  | Marks |
|--------------|-----------|-------|
| 1.           | 1         | 11    |
| 2.           | 2         | 12    |
| 3.           | 3         | 11    |
| 4.           | 1,2 and 3 | 12    |
| 5.           | 4         | 11    |
| 6.           | 5         | 12    |
| 7.           | 6         | 11    |
| 8.           | 4,5 and 6 | 12    |

**BUILDING DESIGN AND DRAWING**

| Course                                         | Teaching Scheme |   |    |        |        | Evaluation Scheme |                  |                  |                  |
|------------------------------------------------|-----------------|---|----|--------|--------|-------------------|------------------|------------------|------------------|
|                                                | L               | T | P  | Credit | Scheme | Theory (Marks)    |                  | Practical(Marks) |                  |
|                                                |                 |   |    |        |        | Max.              | Min. for Passing | Max.             | Min. for Passing |
| <b>Building Design and Drawing (PCC-CV405)</b> | 03              | - | 04 | 05     | ISE    | -                 | -                | 50               | 40%              |
|                                                |                 |   |    |        | CIE    | 30                | 40%              | -                | -                |
|                                                |                 |   |    |        | ESE    | 70                | 40%              | 50               | 40%              |

ISE: In Semester Evaluation

CIE: Continuous internal

ESE: End Semester Examination

**Course Objectives:**

1. To understand Principles of Building planning and building planning bye laws.
2. To understand planning of residential buildings with procedure.
3. To understand Low cost housing and Maintenance, Repairs, Rehabilitation of Structures Per IS 1893.
4. To understand various systems such as plumbing, electrification, Air conditioning, fire resistance, thermal insulation Per IS 13920.
5. To understand various building finishes.

**Course Outcomes:**

After completion of this course students will be able to:

1. Know principles of building planning.
2. Describe Building Bye-Laws and regulations.
3. Plan and draw residential building considering principle of planning and Building Bye-Laws and regulations.
4. Explain techniques of maintenance, repair and rehabilitation of structure.
5. Draw the working drawing of foundation detail, plumbing and electrification of building.
6. Illustrate the concept of ventilation, air conditioning and thermal insulation.
7. Describe different types of building finishes.

**SECTION I****Unit: 1 (4)**

**Site Selection criteria:** Principles of Building planning, Significance Sun path diagram, Wind Diagram, Orientation, Factors affecting, criteria under Indian condition.

**Unit: 2 (9)**

**Building Planning Byelaws and regulations:** As per SP-7, 1983 National Building code of India group 1 to 5.

**Planning of Residential Building:** (Bungalows, Row Bungalows, Apartments and Twin Bungalows) Procedure of Building Permission, significance of commencement, plinth completion or occupancy certificate.

**Unit: 3** (5)

**Low cost Housing:** Materials and Methods (conceptual introduction only)

**Maintenance, Repairs, Rehabilitation of Structures:** (Conceptual introduction only)

**Green building:** Concept and rating.

**SECTION II**

**Unit: 4** (6)

**Plumbing system:** Various Materials for system like A-PVC, C-PVC, GI, and HDPE. Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing and Drainage plan, introduction to rainwater harvesting.

**Electrification:** Concealed and Open Wiring, Requirements and Location of various points, Concept of Earthing.

**Fire resistance in building:** Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire.

**Unit: 5** (7)

**Ventilation:** Definition and necessity of Ventilation, functional requirement, various system and selection criteria.

**Air conditioning:** Purpose, Classification, Principles, Systems and Various Components of the same.

**Thermal Insulation:** General concept, Materials, Methods.

**Introduction to Acoustics:** Absorption of sound, various materials, conditions for good acoustics.

**Sound Insulation:** Methods of noise control.

**Unit: 6** (5)

**Paints:** Different types and application methods.

**Plastering:** Pointing and various techniques.

**Wall cladding:** Skirting, dado work with various materials.

**Miscellaneous finishes:** POP, Gypsum plaster.

**Term Work:**

1. Imperial size sheet based on actual measurement of existing residential building consisting of plan, elevation, section passing through staircase, Site plan, Area statement and brief Specifications (G+1 building and minimum 5 rooms, Measurement drawing should be done in group of maximum 5 students).

**Note: The center line plan drawn expected to be transferred on ground as an exercise.**

2. Planning and design of residential building (G+1).

3. Full set of drawings for the building planned in 2- (a) Municipal Submission drawing.  
(b) Working Drawings (Max. 2 student group).
  - Foundation / Center Line Drawing.
  - Furniture layout plan.
  - Electrification plan.
  - Water supply and drainage plan.
4. Project report giving details of following systems
  - Stair Case
  - Drainage System
  - Water Supply System
  - Water Tank
  - Septic Tank
  - Design of terrace Drainage System.
5. Site visit along with report.

**Text Book:**

1. Building Construction – B.C.Punmia (Laxmi Publications).
2. Basic Civil Engineering – G. K. Hiraskar (Dhanpat Rai Publications).
3. A Text Book of Building Construction – S.P. Arora, S.P. Bindra (Dhanpat Rai Publications).
4. Construction Technology (Volume 1 to 4) – R. Chudley (ELBS).
5. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons).
6. Civil Engineering Drawing – M. Chakraborty.
7. Engineering Materials – R.K.Rajput (S. Chand).

**References Books:**

1. A to Z of Practical Building Construction and Its Management- Sandeep Mantri (SatyaPrakashan, New Delhi).
2. Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P. Ltd.).
3. Form follows feelings, the Architectural Pramod Beri, Anjali Prakashan.

**Code of Standards:**

1. SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi.
2. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.

**Guidelines regarding the question paper setting:**

**End Semester Examination**

| Question No. | Unit No. | Marks | Remark                                      |
|--------------|----------|-------|---------------------------------------------|
| 1            | 1        | 07    | Solve any 2 from Q. 1.3.4.<br>Q2 Compulsory |
| 2            | 2        | 21    |                                             |
| 3            | 3        | 07    |                                             |
| 4            | 1,3      | 07    |                                             |
| 5            | 4        | 12    | Solve any 3                                 |
| 6            | 5        | 12    |                                             |
| 7            | 6        | 11    |                                             |
| 8            | 4,5,6    | 11    |                                             |