

Structural Design Course

Duration: 3 Months

Course Curriculum

A) Theoretical Background:

1) Basics of structural Analysis:

- Stress and Strain
- Stress Strain curve for concrete and Mild Steel and High Yield Strength Deformed bars(HYSD)
- Modulus of Elasticity
- Creep Analysis
- Shear Force Diagram (SFD) and Bending Moment Diagram (BMD)
- Analysis of Structure by approximate methods Portal & Cantilever Method.
- Matrix approach of Structural Analysis.

2) Structural Design:

- Design Principles in RCC such as Working Stress Design (WSM) and Limit State Design (LSM).
- Beam Design: Singly Reinforced & Doubly Reinforced Design approach
- Column Design: Square, Rectangular & Spiral Column. Short and Long Column Design
- Slab Design: One Way Slab, Two Way Slab Design as per IS code
- Foundation Design: Isolated and combined Footing.

3) Lateral Load Concept:

- Wind Load Analysis as per IS-875-3
- Earthquake Resistant Design of building as per IS-1893-Part-I
- Seismic Coefficient Method or Static Analysis of Earthquake.
- Dynamic Analysis of Earthquake.
- Lateral Stability Checks to satisfy lateral load analysis.

4) Geotechnical Engineering:

- Basics Terminology related to Soil Mechanics such as SBC, Settlement of soil for designing Foundation of Structure.
- Different type of Pile Overview.
- Concept of Pile Foundation
- Under Reamed Piles.

B) Software Computing Application:

Structural Analysis & Design Using E-Tabs:

1) Introduction to Etabs:

- Software Algorithm and Workflow in Etabs.
- Difference between Line Element, Area Element, Solid Element.
- Strength and Weakness of Etabs.
- Etabs Manual.
- Sample Models and Templates.

2) Modelling Process & Techniques:

- Geometry Creation Process by Grid System as well as importing option from AutoCAD Drawing to Etabs.
- Creation & Assignment of property such as Materials, Sections etc.
- Loadings: Types of Load, Dead Load, Live Load, Wind Load, Earthquake Load, Temperature Load etc.
- Releases, Diaphragms & Constraints.
- Check Model

3) Analysis:

- Locking, Unlocking of Model.
- Different types of Analysis such as Static Analysis, Dynamic Analysis, and second order P-Delta Analysis.
- Significance of each Analysis
- Checking Lateral Stability checks; Drifts, Torsion Irregularity, Mass Irregularity & Stiffness Irregularity etc.

4) Design:

- Design of Beam with Ordinary and Ductile.
- Design of Column as Ordinary and Ductile.
- Design of Slab using FEM based design
- Design of Shear Wall

5) Report:

- Generation of Report of complete design in Etabs
- Save Report from Etabs to Word or Doc file.

Structural Analysis & Design Using Staad. Pro :

1) Introduction to Staad:

- Software Algorithm and Workflow in Staad. Pro.
- Co-ordinate System
- Creating a new project in Staad pro
- Units

2) Modelling Process & Techniques:

- Model generation, Creating nodes & members.
- Model editing tool; Translation Repeat, Circular Repeat, Move, Mirror & Rotate command.
- Structure Wizard for generating model for Trusses, Frames etc.
- Material Specification, Support Specification.

3) Assignment of Load and Load Combinations:

- Creating Primary load
- Adding Self Weight, Member load, Nodal Load.
- Uniform Force and Moment
- Concentrated Force and Moment.
- Linear Varying Load, Trapezoidal Load, Hydrostatic Load.
- Area Load, Floor Load.
- Wind Load as per ASCE as well as IS: 875 –III of Static Wind Method.
- Seismic (Earthquake) Load as per IS: 1893-I
- Load Combination according to IS:456:2000

4) Analysis:

- Perform Analysis
- Interpretation of Results: Shear Forces, Bending Moment, Support Reactions, Stress Distribution, Animated Shape.
- Seismic Coefficient Method or Linear Static Method of Earthquake.
- Dynamic Analysis of Earthquake: Response Spectrum Method.
- Check of Deflection.

5) Design:

- RCC Design as per IS: 456; Beam, Column, Slab Design.
- Steel Design as per IS: 800.
- Water Tank Design
- Shear Wall Modelling and Design

6) Report Setup:

- Viewing output files for design
- Print Specification.
- Preparing Structural Drawing, Detailed Working Drawing.

AutoCAD:

- Planning in AutoCAD, Drawing Commands in AutoCAD, All Editing Commands in AutoCAD, general arrangement drawing of real life on-going project.
- Creating elevations, isometric views using 3D drawing commands, 3D editing commands, structural detailed drawing for RCC and Steel design projects.
- Preparing detailed drawings with structural specification for real Life project of consultancy.