

## Structural Engineering Roadmap (12 Weeks)

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### Week 1: Introduction to Structural Engineering

- Overview of structural engineering and its role.
  - Types of structures: buildings, bridges, towers.
  - Basics of loads: dead, live, wind, seismic.
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### Week 2: Mechanics of Materials

- Stress and strain.
  - Elasticity, plasticity, Hooke's law.
  - Axial, shear, bending stresses.
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### Week 3: Structural Analysis Fundamentals

- Types of supports and reactions.
  - Static equilibrium and free body diagrams.
  - Analysis of determinate structures: beams, trusses, frames.
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### Week 4: Indeterminate Structures and Methods

- Introduction to indeterminate structures.
  - Methods: force method, displacement method.
  - Moment distribution method.
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### Week 5: Design of Structural Elements (Concrete)

- Properties of concrete and reinforcement.
  - Design of beams, slabs, columns.
  - Limit state design principles.
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### Week 6: Design of Structural Elements (Steel)

- Properties of steel.

- Design of tension members, compression members.
  - Connections and weld design.
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#### Week 7: Foundation Engineering

- Types of foundations: shallow and deep.
  - Soil-structure interaction.
  - Bearing capacity and settlement.
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#### Week 8: Load Analysis and Load Combinations

- Dead load, live load, environmental loads.
  - Load factors and load combinations per codes (e.g., IS, ACI).
  - Impact of dynamic loads.
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#### Week 9: Structural Dynamics and Earthquake Engineering

- Natural frequency and mode shapes.
  - Response to dynamic loading.
  - Seismic design basics and codes.
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#### Week 10: Finite Element Method (FEM) Basics

- Concept and applications in structural analysis.
  - Mesh generation and element types.
  - Software introduction (ANSYS, STAAD Pro).
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#### Week 11: Advanced Topics

- Composite structures.
  - Prestressed concrete.
  - Structural health monitoring.
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#### Week 12: Project / Case Study

- Structural design of a multi-storey building or bridge.
  - Analysis using software tools.
  - Documentation and presentation.
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#### Tools and Software:

- STAAD.Pro, ETABS, SAP2000, ANSYS
- AutoCAD for drafting
- MATLAB for custom analysis