CE 305: Design of Steel Structures (3-1-0: 4)

Course objectives: The objective is to provide the ability to perform analysis and design of steel members and connections and design steel structural systems as per the latest IS code.

Introduction

Types of Structural Steel, Mechanical Properties of Steel, Types of Structural Steel, Mechanical Properties of Steel, Cold Work and Strain Hardening, Advantages of Steel as a Structural Materials, Types of Steel Structures, Codes and Specifications.

Design Approach

Factor of Safety, Permissible and Working Stresses, Elastic Method, Plastic Method, Introduction to Limit States of Design.

Connections

Type of Connections, Riveted, Bolted and Welded Connections, Strength, Efficiency and Design of Joints, Modes of Failure of a Riveted Joint, Advantages and Disadvantages of Welded Joints, Design of Fillet and Butt Welds, Design of Eccentric Connections.

Tension Members

Net Sectional Area, Permissible Stress, Design of Axially Loaded Tension Member, Design of Member Subjected to Axial Tension and Bending.

Compression Members

Modes of Failure of a Column, Buckling Failure: Euler's Theory, Effective Length, Slenderness Ratio, Design Formula: I.S. Code Formula, Design of Compression Members, Design of Built-Up Compression Members: Laced and Battened Columns.

Beams

Design Procedure, Built-Up Sections, Plate Thickness, Web Crippling, Web Buckling, Connections nd Curtailment of Flange Plates.

Beam-Column

Eccentricity of Load, Interaction Formulae, Design Procedure, Eccentrically Loaded Base Plates.

Column Base

Design of base plates, load transfer mechanism, design of slab base, gusseted base and anchorage.

Text Books:

1. *Subramanian, N., "Design of Steel Structures",* Oxford University Press.
2. *Negi, L. S., "Design of Steel Structures",* Tata McGraw Hill.

References:

1. *Raz, S. A., "Structural Design in Steel",* New Age International Publisher.
2. *Edwin, M., Gaylord, J., and Stallmeyer, J. E., "Design of Steel Structures",* McGraw-Hill.
3. *Dayaratnam, P., "Design of Steel Structures",* Chand S. & Co..
4. *Kazimi, S. M. A., and Jindal, R. S., "Design of Steel Structures",* Prentice Hall of India Pvt Ltd.

Expected outcome: The student will be able to: Understanding of the ASD and LRFD design philosophies and behavior of structural steel; Ability to analyze and design of tension members, columns, beams, beam-columns; Ability to analyze and design of simple bolted and welded connections; Ability to design steel framing system and connections of a building in a team setting; Familiarity with structural steel fabrication process and construction through field trip and/or speaker presentation; Familiarity with professional and ethical issues and the importance of lifelong learning in structural engineering.
