

Course Code	Course Title	L	T	P	C
17CE009	PLASTICITY AND LIMIT STATE DESIGN OF STEEL STRUCTURES	3	0	0	3

**Course Objectives:**

1. The objectives are to provide students with advanced knowledge of steel structural design.
2. Application of the underlying principles to solve a wide range of structural steel problems.
3. This subject will provide students the basic principles of reliability based design on steel structures
4. Understanding of the relationship between structural analysis and design provisions.

**Course outcomes:**

The students will be able to

1. Gain knowledge about Plastic analysis of structures
2. Understand different types of connections in steel structures
3. Analyze industry buildings
4. Understand behaviour of Unstiffened and Stiffened Elements

**Activities:**

1. Design a 4 storey steel building in STAAD Pro using IS 800 code book
2. Conduct laboratory test of two welded plates to test strength of the connection
3. Analyse a steel tower using ETABS and do detailing
4. Design a steel industry building subjected to lateral loads such as wind or Earthquake load and analyze the structure

**Skills:**

1. Design and analysis of continuous beams for different loading systems
2. Different methods in welding the steel components
3. Design and analysis of steel towers both for gravity and lateral loads
4. Design and analysis of industry buildings

**UNIT-I: Plastic Analysis of Structures**

Introduction, Shape factor, Moment redistribution, Combined mechanisms, Analysis of portal frames, Effect of axial force - Effect of shear force on plastic moment, Connections - Requirement – Moment resisting connections. Design of Straight Corner Connections – Haunched Connections – Design of continuous beams.

**UNIT-II: Design of Connections**

Types of connections – Welded and riveted – Throat and Root Stresses in Fillet Welds – Seated Connections – Unstiffened and Stiffened seated Connections – Moment Resistant Connections – Clip angle Connections – Split beam Connections– Framed Connections.

**UNIT-III: Analysis and Design of Steel Towers**

Analysis and Design of Microwave / Transmission Line Towers - Types of bracing patterns -Sag and Tension calculations. Design of Self-supporting Chimney – Design of Base Plates, Foundations and Anchor bolts and Guyed Steel Chimney - Guy ropes - Stresses due to wind. Along with load calculation - Gust Factor Method.

#### **UNIT-IV: Design of Industrial Structures**

Design of members subjected to lateral loads and axial loads, Analysis and design of Industrial Buildings and bents, Sway and non-sway frames, Design of Purlins, Louver rails, Gable column and Gable wind girder - Design of Moment Resisting Base Plates – Analysis of Gable Frames.

#### **UNIT-V: Design of Light Gauge Steel Structures**

Behaviour of Compression Elements - Effective width for load and deflection determination – Behaviour of Unstiffened and Stiffened Elements – Design of webs of beams – Flexural members – Lateral buckling of beams – Shear Lag – Flange Curling – Design of Compression Members – Wall Studs.

#### **TEXTBOOKS:**

1. Subramanian.N, “Design of Steel Structures”, Oxford University Press, 2008.
2. Dayaratnam.P, “Design of Steel Structures”, A.H.Wheeler, India, 2007.

#### **REFERENCES**

1. Linton E. Grinter, “Design of Modern Steel Structures”, Eurasia Publishing House, New Delhi, 1996.