

COURSE CONTENT

DESIGN OF STEEL STRUCTURES LABORATORY								
VI Semester: CE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACED40	Core	L	T	P	C	CIA	SEE	Total
		0	0	2	1	40	60	100
Contact Classes: Nil	Total Tutorials: Nil	Total Practical Classes: 45				Total Classes: 45		
Prerequisite: Strength of materials, Structural Analysis								

I. COURSE OVERVIEW:

Design of Steel structures laboratory intended to provide knowledge of design and analysis related to steel structures and components. Students apply their knowledge from statics, mechanics of solid, and structural analysis to gain further understanding in the relationship between analysis and design of steel structures. In this course, the design and analysis of Structural steel components like roof truss and its connections, Beams, Column, Beam-Column and Slab bases etc. that are subject to bending, shear, axial, or a combination of these forces will be done according to IS code 800:2007. The lab reports and structural drawings will be prepared manually and in the AutoCAD. The course gives a solid basis for the understanding and application of Structural designing and detailing, which will be essential to subsequent studies.

II. COURSE OBJECTIVES:

The student will try to learn:

- I. The fundamental principles of structural steel design and receive training in contemporary methodologies used in the design and analysis of steel structural elements.
- II. The concept of buckling, shear, bending of members subjected to combined forces according to the Indian Standard codal provisions.
- III. The presentation of their conclusions in writing in a discipline-appropriate format.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

- CO 1 Calculate wind forces on the roof trusses for the design of industrial buildings.
- CO 2 Identify the different failure modes of bolted and welded connections and determine their design strengths.
- CO 3 Explain the concept of limit state design, design strengths, deflection limits and serviceability requirements for the designing of steel structural elements.
- CO 4 Analyze and design tension members, compression members and beams according to IS 800:2007 codal provisions
- CO 5 Solve and analyze the column bases and its connections for the transfer of loads.
- CO 6 Evaluate the Design of plate girders for designing bridge structures and large span beams.

IV. COURSE CONTENT:

Week- 1: DESIGN OF BOLTED JOINTS

Determine design strength of bolted connections.

Week- 2: DESIGN OF WELDED JOINTS

Design strength of butt Weld.

Design strength of fillet Weld.

Week- 3: DESIGN OF TENSION MEMBERS

Determine the Design Strength of Tension Member.

Week- 4: DESIGN OF COMPRESSION MEMBERS

Design strength of Compression members

Week- 5: DESIGN OF BUILT - UP LACED COLUMNS

Design Procedure of Laced Columns

Week- 6: DESIGN OF BATTENED COLUMNS

Design Procedure of battened columns.

Week- 7: DESIGN OF COLUMN BASES

Design of slab bases.

Design of Gusseted bases.

Week- 8: DESIGN OF BEAMS

Design of laterally supported beams.

Design of laterally unsupported beams

Week- 9: DESIGN OF BRACKET CONNECTIONS

The moment force is in the plane of the connection, parallel to the support. (Type-1).

The moment force is normal to the plane of the connection, perpendicular to the support. (Type-2)

Week- 10: DESIGN OF BOLTED SEATED CONNECTIONS

Design of Unstiffened seat connections.

Design of Unstiffened seat connections.

Week- 11: DESIGN OF A WELDED PLATE GIRDER

Design a welded plate girder with all the stiffeners.

Week- 12: DESIGN OF A BOLTED PLATE GIRDER

Design of Bolted plate girder with all the stiffeners.

Week- 13: DESIGN OF A GANTRY GIRDER

Design a gantry girder to be used in an industrial building with all connections.

Week- 14: ANALYSIS OF ROOF TRUSS

Determine the design forces in the members of a roof truss.

V. TEXT BOOKS:

1. S. K. Duggal, "Limit State Design of Steel Structures", Tata McGraw-Hill, 3rd Edition, 2019.
2. N. Subramanian, "Design of Steel Structures", Oxford University Press, 2nd Edition, 2018.
3. S.S. Bhavikatti, "Design of Steel Structures", IK International Publication House, New Delhi, 4th Edition, 2014.

VI. REFERENCE BOOKS:

1. K. S. Sai Ram, "Design of Steel Structures", Pearson Education, 2nd Edition, 2015
2. Dr. Ramachandra and Virendra Gehlot, "Design of Steel Structures Volumes 1 and 2", Standard Publications, 2nd Edition, 2010.
3. Edwin H. Gaylord, Jr. Charles N. Gaylord and James Stallmeyer, "Design of Steel Structures", Tata McGraw Hill Education Private Limited, 3rd Edition, 2010.

VII. ELECTRONICS RESOURCES:

1. <https://nptel.ac.in/courses/105105162>
2. <https://programs.online/swayam/design-of-steel-structures>

VIII. MATERIALS ONLINE:

1. Course Template
2. Laboratory manual