

ADVANCED STEEL DESIGN

II Semester: ST								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BSTC19	Elective	3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		

I. COURSE OVERVIEW:

This course is recommended for postgraduate students in the structural engineering program who are interested in learning the design of steel structures. This course provides relevant material properties of different types of steel material specifications and design considerations. It covers the behavior and design of structural steel components and helps to gain an educational and comprehensive experience in the design of simple steel structures. It also delivers students with a thorough understanding of the iterative nature of design and the fundamental principles on which the analyses are based. This course is mainly designed to introduce the behavior and design of tension members, compression members, laterally restrained and unrestrained beams, beam-columns and connections design. It deals with two types of connections namely welded and bolted connections. Students are expected to obtain basic knowledge about the design and failure mode of steel structural members after finishing this course.

II. COURSE OBJECTIVES:

The student will try to learn:

- I. The Design of steel structural components by using different codal procedures.
- II. Analysis and design of beam-columns for stability, strength and drift.
- III. Design of welded and bolted joint connections for high rise and bridge structures.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Learn the behavior and design of structural steel components like truss and frame structures	Understand
CO 2	Explain an educational and comprehensive experience in the design of simple steel structures	Understand
CO 3	Obtain basic knowledge about the design and failure mode of steel structural members after finished this course.	Analyze
CO 4	Analyze wind loads on buildings and design truss bridges.	Analyze
CO 5	Analyze and design of tower structures.	Analyze
CO 6	Analyze and design various welded and bolted connections	Analyze

IV. SYLLABUS:

MODULE-I: SIMPLE CONNECTIONS –RIVETED, BOLTED PINNED AND WELDED CONNECTIONS (09)

Riveted connection, bolted connections, load transfer mechanism, failure of bolted joints, specifications for bolted joints, bearing, type connections, tensile strength of plate, strength and efficiency of the joint, combined shear and tension, slip, critical connections, prying action, combined shear and tension for slip, Critical connections. Design of groove welds, design of fillet welds, design of intermittent fillet welds,

failure of welds.

MODULE-II: STRAIN AND STRESS FIELD (09)

Elementary Concept of Strain, Strain at a Point, Principal Strains and Principal Axes, Compatibility Conditions, Stress at a Point, Stress Components on an Arbitrary Plane, Differential Equations of Equilibrium, Hydrostatic and Deviatoric Components.

MODULE-III: ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS (09)

Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; design of angular roof truss, tubular truss, truss for a railway platform.

Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions.

Design of bracings.

MODULE-IV: DESIGN OF STEEL TRUSS GIRDER BRIDGES (09)

Condition of first crack, ultimate load design, shear, vertical prestressing, diagonal tension in i- section, end block, magnel's method, empirical method general design requirements, mild steel reinforcement in prestressed concrete member, concrete cover and spacing of pre-stressing steel, slender beams, composite section, propped, design of propped composite section, un propped composite section, two stage prestressing, shrinking stresses, general design requirements for road bridges

MODULE-V: DESIGN OF STEEL BUNKERS AND SILOS (09)

Introduction, jansen's theory, airy's theory, design of parameters, design criteria, analysis of bins, hopperbottom and design of bins.

V. TEXT BOOKS:

1. P. Dayaratnam, "Design of Steel Structures", S. Chand, 2012.
2. Dr. Ramachandra & Vivendra, "Design Steel Structures" Volume – II, Gehlot Scientific Publishes Journals Department, 2012.
3. S.K. Duggal, "Limit State Design of Steel Structures", McGraw Hill Education Private Ltd. New Delhi, 1994.

VI. REFERENCE BOOKS:

1. Galyord & Gaylord, "Design of Steel Structures", Tata McGraw Hill, Education, 2012.
2. Indian Standard Code – IS:800 (2007).
3. B.O. Kuzamanovic and N. Willems, "Steel Design for Structural Engineers", Prentice Hall (1997).
4. Arya & Azmani, "Analysis of Steel Structure", 1992.

VII. Web References:

1. <http://nptel.ac.in/courses/105106113/>

VIII. E-Text Books:

1. https://www.iare.ac.in/sites/default/files/lecture_notes/lec%20notes%20ASD.pdf