

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: B.Arch.
SUBJECT CODE: 2X55004
STRUCTURE - IV
3rd Year, 5th SEMESTER

Type of course: B.Arch. (Design of steel structures)

Prerequisite: Structure - I, II, III

Rationale: This subject is applications of structural engineering principles to design basic structural elements using steel as materials. This subject is specifically aim to develop understanding of various design philosophy, Indian codal provisions, design basis used in design of basic elements of framed structures and its detailing requirement.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
2	1	0	3	50	50	0	0	100

Content:

Sr. No.	Topics	Teaching Hrs.	Weightage %
1	Introduction: Mechanical properties of Structural Steel, Structural Sections- rolled beams, channels, angles, etc. Loads & load combinations, Methods of Analysis, Codes & specifications, Design Philosophies - Working stress Method, Ultimate Load Method, Limit State Method.	04	10
2	Types of connections (Rigid and pinned connection): Bolted Connections- Definition of riveted joints, rivet strength and capacities, Design of Bolted Connections. Welded Connections - Weld shapes, types and symbols allowable stresses in weld material, Fillet and Butt weld, Design of Welded Connections. Design of simple connections such as lap and butt joints, truss joint connections.	06	20
3	Axial force design: Tension member- types of tension member, behavior, modes of failure, Slenderness ratio. Analysis and design of axially loaded tension member made up of angle section, splices, Lug angle. Compression member- behaviour, classification of sections, possible modes of failure, elastic buckling of slender member, design of compression member having single & built-up section. Importance of bracing: Objectives of lacing, single lacing, double lacing, IS-800-2007 requirement for lacing system. Objectives of batten. IS-800-2007	08	25

	requirement for battening system. Columns with lacing and battens.		
4	Design for Beams and Beam-Columns: Type of sections, classification, Lateral stability, Design strength of laterally restrained and unrestrained beams, shear strength, deflection, web buckling & crippling, Design of simply supported beam. Combined axial and flexural design of member (Beam-Column)	06	25
5	Design of Footing: Introduction to footings for steel columns, Slab based and gusseted based. Conceptual study of general connections: Beam to beam connections, Beam to column connections, Column to column connections, Column to foundation connection.	04	20

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
05	15	30	25	05	20

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. N.Subramanian; Steel Structures, Oxford Publication
2. Arya A.S. & Ajamani J.L.; Design of Steel Structures; Nemchand & Bros., Roorkee
3. Dayaratnam P.; Design of Steel Structures; Wheelor pub. co., Delhi
4. Ramamrutham S. & Narayanan R.; Design of Steel Structures; Dhanpatrai & Sons, Delhi
5. S. S. Bhavikatti, Design of Steel Structures: By Limit State Method as Per IS: 800-2007, I K International Publishing House Pvt. Ltd
6. IS 800:2007, General Construction In Steel - Code of Practice, Bureau of Indian Standards, New Delhi.
- 7 IS: 875 (Part I to V) - Code of practice for structural safety of Buildings Loading standards

Course Outcome:

Sr.No	CO Statement	Marks % Weightage
Upon completion of this course, the students should be able to:		
1	Understand various design philosophy to be used in the design of structural elements.	20
2	Evaluate the loading conditions and to calculate loads as per IS Specifications.	25
3	Explain various design philosophies understand analytical approach to be used in the design of structural elements.	25
4	Propose design of basic structural elements like connection, slab, beams, columns, truss and foundation etc. using steel as materials using limit state approach.	30

Term-Work:

The students will have to solve at least five examples and related theory from each topic as an assignment/tutorial (minimum 30 problems). Practical examinations shall consist of oral based on term work and above course. The students have to draw at least five structural components (RCC and Steel) with proper details in sketch book/A3 size sheet.

List of Tutorials:

1. Development of spread sheets for design of various structural components of steel structure.
2. Draw plan and elevation of different types of trusses with details, built up column.
3. Design and testing of steel beam section.
4. Prepare model of various connections/elements in steel structures.
5. Prepare model for detailing of beam column junction and column-footing junction or any one steel Structure of the syllabus.