

GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL AND INFRASTRUCTURE ENGINEERING

Design of Steel and Masonary Structure

SUBJECT CODE:2174003

B.E. 7th Semester

Type of course: Core

Prerequisite: Mechanics of Solids & Fundamentals of Structural analysis

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE	PA(M)		PA(V)		PA (I)		
PA	ALA	ESE		OEP						
3	2	0	5	70	20	10	30	0	20	150

Concepts:

Sr. No.	Topics	Hrs.	%
1	Introduction: Properties of steel, structural steel sections, limit state design concepts, loads on structures, connections using rivets, welding & bolting, design of bolted and welded joints, eccentric connections, efficiency of	6	15
2	Tension Members: Types of sections, net area, net effective sections for angles and tee in tension, design of connections in tension members, use of lug angles, design of tension splice, concept of shear lag	8	20
3	Compression Members: Types of compression members, theory of columns, basis of current codal provision for compression member design, slenderness ratio, design of single section and compound section compression members, design of laced and battened type columns, design of column bases. gusseted base.	8	20
4	Beams: Design of laterally supported and unsupported beams, built up beams, beams subjected to uniaxial and biaxial bending, design of plate girder, flange and web splices.	4	10
5	Roof Trusses and Industrial Structures: Roof trusses, Roof and side coverings, design of purlin and elements of truss, end bearing, design of gantry	6	15

6	Earthquake Resistant Design of Masonry Structures: Introduction to Earthquake Resistant Features of un-reinforced & reinforced masonry Structure, Basic structural behavior and design of low-rise masonry buildings; Good construction practice, Earthquake resistant features: bands and vertical reinforcement, design of unreinforced masonry elements, Building Code Requirements for Masonry Structures (IS 4326, IS 13827, IS 13828), lateral load analysis, Design of two storeyed masonry buildings.	8	20
		40	

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N	E Level	C
10	25	20	20	15	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above

Course Outcomes:

After learning the course, the students should be able to:

- Prepare structural layout of Industrial steel structures, plate girder, foot-over bridge.
- Determine the loads acting on it and identify the typical failure modes.
- Apply the principles, procedures and current Indian codal provisions to the analysis and design of Industrial structures, plate girder.
- Understand behavior of steel structures under the different loadings and various load combinations
- Become familiar with basic masonry materials, including clay brick, concrete block, mortar, grout, and reinforcing accessories.
- Understand the behavior of reinforced masonry structures under flexure, shear, axial forces, combined flexure and axial forces, and in-plane shear forces.
- Learn the methods of masonry construction and detailing practices

Reference Books:

- N. Subramanian, Design of Steel Structures, Oxford University Press, 2008.
- Bhavikatti S. S., Design of Steel Structures, Oxford University Press.
- Segui W T, Design of Steel Structures, Cengage Learning.
- S K Duggal, Design of Steel Structures, Tata McGraw Hill
- S. A. Raz, Structural Design in Steel, New Age International Publisher, 2002.
- M. Edwin, J. Gaylord and J. E. Stallmeyer, Design of Steel Structures, McGraw-Hill, 1991.
- P. Dayaratnam, Design of Steel Structures, S. Chand & Co., 2003.

- S. M. A. Kazimi and R. S. Jindal, Design of Steel Structures, Prentice Hall of India Pvt Ltd, 1988.
- Building Code Requirements for Masonry Structures (TMS 502-08/ACI 530-08/ASCE 5-08)
- Specifications for Masonry Structures (ACI 530.1-08/ASCE 6-08/TMS 602-08) and Commentary.

Term-Work:

The students will have to

- Carry out full design of Industrial structure/ plate girder and prepare design report & detailed drawings in A2 size drawing sheet
- Solve at least five design examples from remaining topics (not covered in full design) and draw sketches of various structural components with proper detailing in sketch book/A3 size sheet.
- Practical examinations shall consist of oral based on term work and above course. Design based problem/ Open ended problem may also considered as a part of Term-work.

Design based Problems (DP)/Open Ended Problem:

(Below mentioned problems are for reference only. Similar problems may be designed by the concerned faculty.)

- Prepare model of any one steel structure of the syllabus.
- Development of spread sheets for design of various structural components of steel structure.
- Design of any steel structure from the course using any open-source / professional software and/or self developed spread sheet/programs.
- Site visit related to construction stages and report preparation
- Failure study : during and/or after construction
- Prepare model of any one masonry building with seismic resistance provision.

List of Open Source Software/learning website: www.nptel.iitm.ac.in/courses/

Active learning Assignments (AL) : Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The Power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.