GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3170618
SUBJECT NAME: DESIGN OF STEEL STRUCTURES
B.E. SEM-VII

Type of course: Professional Elective Core

Prerequisite: Structural Analysis, Design of structure

Rationale: Many civil engineering structures are made up of steel. Knowledge of designing and detailing of steel structures is very important for civil engineers in order to make structures safe and serviceable during its life span. Limit State design philosophy is currently used worldwide for design of steel structures and its various components. Also precise and correct detailing of structural drawing is necessary in order to get the correct behavior of structures and leads to smooth construction of structures. This course will provide detailed knowledge of design and detailing of steel structures as per Indian standards.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Note: IS:800 (2007), SP 6(1), IS-1893-1(2016), IS-875 (Part 3) are permitted in the examination.

Content:

Sr. No.	Content	Total Hrs
1	**Unit-1: Introductions** **Loads & Load combinations:** Appraisal of loading standards such as I.S, I.R.C., Effect of wind and earthquake on structure **Connections:** Stiffened and unstiffened, moment & shear resisting structural connections, design and detailing of various connection - roof truss to column, column to beam, beam to beam and truss to bed block.	**10**
2	**Unit-2: Design of Plate Girder** Modes of failure : Elastic buckling, Bending in the plane of web, Local buckling, Buckling in the plane of web, Vertical buckling of the compression flange, Shear buckling Design of bolted, welded plate girder by Tension field Method & Simple Post Critical Method including design of vertical & horizontal stiffeners, Splices, Curtailment. Detailing of various elements of Plate girder.	**12**
3	**Unit-3: Design of foot-over bridge** Structural system of through & deck type bridges, design of foot-over bridge & its Supporting system. Detailing of Various elements of Foot over bridge.	**10**

4	**Unit-4: Plastic Design** Introduction to plastic method of analysis, Design of continuous beams and portal frame using plastic design approach.	**08**
5	**Unit-5: Design of Gantry Girder** Gantry girder – static and moving loads selection & design of section. Detailing of Gantry girder.	**05**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
05	**10**	**30**	**30**	**20**	**5**

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. Subramaniam, Design of Steel Structures, Oxford University Press
2. S. S. Bhavikatti, Design of Steel Structures: By Limit State Method as Per IS: 800-2007, I K International Publishing House Pvt. Ltd
3. P. Dayaratnam, "Design of Steel Structures", S. Chand Group
4. IS 800:2007, General Construction In Steel - Code of Practice, Bureau of Indian Standards, New Delhi.
5. SP 6 (1) – handbook for Structural Engineers – Structural Steel sections
6. IS: 875 (Part I to V) - Code of practice for structural safety of Buildings Loading standards
7. IS: 1893 - Criteria for earthquake resistant design of structures

Course Outcome:

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	Determine various types of loads acts of the framed structures and design the connections of Steel framed structure & Industrial structures.	20
CO-2	Prepare structural lay-out, determined loads & designed forces for different structures of the syllabus	30
CO-3	Apply the design principles, procedures and current Indian codal provisions for design & detailing of different structures of syllabus.	30
CO-4	Apply the principles of plastic design in steel beams & portal frames	20

Term Work :

Term work shall consist of satisfactory completion and submission of following list of Practicals/Tutorials.

List of Practicals /Tutorials:

1. Full Design of at least 01 structure from the following with detailing in A2 size drawing sheet covering all required details in structural drawing.
   (1) Rivetted/Welded Plate girder
   (2) Foot over bridge
   (3) Gantry Girder
2. Solve at least 05 design examples from the topics covered in the syllabus.
3. Software applications of Connection design of Steel Framed structures & Industrial structures.
4. Preparation of EXCLE Worksheets for the design of various structural components of Plate Girder/ Gantry Girder/ Foot Over bridge.
5. Prepare at least one drawing in any CAD software (like AutoCAD) for design of structures conducted in the syllabus.

Practical examinations shall consist of oral based on the term-work and above course.

Major Equipment/Software:

1. Any professional software of Structural analysis such as STAAD-pro, SAP, ETABS

List of Open Source Software/learning website:

www.nptel.iitm.ac.in/courses/