

4024 - DESIGN OF STRUCTURES (STEEL) - I									
Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)				
Lectures	Practical	Credits			Theory		Practical Ex.	Total	
4	3	7	25	50	3Hrs.	100	25/or	200	
Pre-requisite		Source	Semester	Theory	Test	Total	TW	PR	Gr Total
4232		CIVIL FAB		75	25	100	50	25	175

Rationale: -With the rapid industrial growth and development in transportation system, the construction of complicated industrial structures, railway bridges and stations, airport hangars, transmission towers became imperative. Steel with proven quality, lightweight sections, ease and speed of fabrication became most appreciated structural material. The course content has been designed to enable the students to acquire the knowledge of fundamental principles of steel structures and relevant Indian standard codes of practice for design and detailing of steel structures.

COURSE CONTENTS	Hrs	Mks
1. STEEL STRUCTURES	5	10
Properties of structural steel – Mild steel and high tensile. Fields of applications of steel structures. Advantages and disadvantages of steel structures. Analysis of loads-dead loads, live loads, wind load, seismic loads and other secondary loads as per IS 875-1987.		
Different structural steel shapes, their properties and applications. Use of I.S. handbook for structural Engineers. Introduction of plate Girders, components and application.		
2. WELDED JOINTS	8	18
Axially loaded welded joints, types of weld, weld size, throat thickness. Welding symbols, and permissible stress in welds, recommended size of weld (I. S. 816). Strength of welded joint, determination welded lengths and minimum length of weld. Eccentric welded joints. Types of eccentrically loaded welded joints. Stresses in welds subjected to eccentric load producing moment and torque. (No numerical problems eccentric loaded member).		
3. TENSION MEMBERS	7	18
Sections used as tension members under axial loading, single and built-up section. Net sectional area for angles and tees, permissible stress in tension and computation of safe load. Design of tension member for a given load. Design of end connections for tension member and welded to gusset plates.		
4. COMPRESSION MEMBERS	8	18
Sections used as compression members under axial loading, single and built-up sections. Effective length and least radius of gyration. Effective length for different end conditions of compression members. Slenderness ratio of a compression member, maximum slenderness ratio as per I.S. 800-1984. Permissible stress in compression and determination of safe axial load. Design of compression member for a given load using specified section. Necessity of laced systems – single lacing and double lacing battens. Columns-bases – slab base gusseted, base with plain concrete pedestal. No problems on design of lacing and battens.		
5. BEAMS	10	18
Sections suitable for beams – single and built up sections. Factors governing the design of beams, bending moment, shear force, deflection.. Web bucking and web crippling. Lateral restraint – types and their effectiveness. Permissible stresses in bending and shear limiting deflection. Design of simply supported beam. Concept		

of beam to beam & beam to column connection, design of S.S. beam. Concept of beam to beam and beam to column

10 18

6. ROOF TRUSSES

Type of steel roof trusses for different spans, pitch and span of trusses, spacing of purlins, necessity of bracing. Analysis of roof truss for dead load, live load and wind load, calculation of panel point loads. Methods of joints and computation of design loads. Design of tension and compression members – continuous and welded. Design of purlins and connections. Design of base plate at support. Provision of sliding joint, concrete bed block and holding down bolts. Trusses with tubular and box sections- advantages and disadvantages.

48 100

Total

TERM-WORK

1) Term work shall consist of sketchbook and elementary design of the structural components.

- 2) Emphasis should be given on using I.S.I. Hand book and relevant I.S. codes
- 3) Sketch book shall comprise of following items :- Structural steel sections and their properties angles, tee channels and I-sections, tension members, tension members with welded and connection, single-lacing system for compression members, double lacing system for compression members, slab base for steel stanchion, gusseted-base for steel stanchion, compound beam with welded connections, framed connection framed connections welded.
- 4) Two Imperial size sheets with report of calculations on:- Design and detailing of steel roof truss, connections of column to truss & column to base (foundation), fixing of purlins to truss & columns.

REFERENCE BOOKS

1. S. K. Duggal. "Design of steel structures", by Tata Mc graw Hill Publishing Co. Ltd. 1993.
2. Araya A.S. & Ajmani J.L.. "Design of Steel structures. By Nemchand & Bros. Roorkee- 1989.
3. Dr. Ramachandra. "Design of steel structures, Vol. I" Standard Book House, Delhi 1986.
4. ISI Hand book of structural engineers No. 6
5. P. Dayaratnam. "Design of steel structures," by wheeler - 1990
6. IS 800 – 1984 "Code of practice for General Construction in Steel."
7. IS 875 – 1987 (part I to part 4) "code of practice for Design Loads for Buildings and structures"
8. Fundamentals of Reinforced concrete by N. C. Sinha (published by S. Chand & Co. Ltd.)
9. Design of Steel Structure by P. Dayaratnam (published by S. Chand & Co. Ltd.)