

Branch Name:	Civil engineering
Program Code:	ET401
Course Name:	Design Of Steel Structure
Course Code:	2ET4010601
Pre-requisite Course:	---

COURSE OBJECTIVE:

The content should be taught and implemented with the aim to develop skills so that students are able to acquire following competencies:

1. Design of Tension & Compression members of Steel Structure along with Foundation, Steel Beam and Welded and Bolt Connection as per IS 800-2007.
2. Structure Detailing of Steel Roof Truss and Different Steel Structure Component

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous assessment
03	-	04	05	60	40	40	60

DETAILS OF COURSE CONTENTS:

S.NO.	TOPIC	Total Hrs.	WEIGHTAGE
1	INTRODUCTION 1.1 Properties of steel 1.2 Stress-strain curve for mild steel 1.3 Types of steel structures 1.4 Limit state method 1.5 Partial safety factors	2	8%
2	BOLTED AND WELDED CONNECTION 2.1 Rigid connection, pinned connection, semi rigid connection, black bolts, turned bolts, HSFG bolts, grade of bolts. 2.2 Lap and Butt Joint, Minimum and Maximum Pitch, Tack Bolting, Edge Distance, Gauge Distance, Bolt Hole 2.3 Shear Capacity of Bolt – V_{dsb} , Bearing Capacity of Bolt – V_{dps} as per IS-800-2007, Bolt Value, Efficiency of Joint 2.4 Numerical on bolted connection of angle section to gusset plate and for efficiency of joint having chain 2.5 Related Numerical.	10	18%

3	TENSION MEMBER & COMPRESSION MEMBER 3.1 Examples of Tension Members in Civil Engineering Structures. 3.2 Design Strength of Tension Member, Design Strength due to Yielding of Gross Section, Design Strength due to Rupture of Critical Section for Angle Section, Design Strength due to Block Shear in Angle Section as per IS – 800-2007. 3.3 Slenderness ratio of Tension Member as per IS – 800 – 2007 3.4 Numerical for Analysis & Design of Single and Double Angle Sections on same side and either side of Gusset Plate 3.5 Strut, Maximum Slenderness Ratio, Classification of Cross – Sections and Buckling Class as per IS-800-2007. 3.6 Angle Strut as per Cl. 7.5, IS- 800-2007 . 3.7 Design Compressive Stress – f_{cd} according to Tables of IS-800- 2007. 3.8 Numerical on Strut made up of Single Angle, Double Angle same and either side of G.P as per 1.2 & 1.3 Built up Column, Effective Length of Column as per Table 11, IS-800-2007. 3.9 Design Compressive Stress – f_{cd} according to Tables of IS-800- 2007. 3.10 Numerical on Column made up of ISHB, ISHB with Flange Plate, Double Channels Back to Back and Toe to Toe.	10	22%
4	DESIGN OF BEAM & PURLIN 4.1 Main Beam, Secondary Beam, Standard I Sections, Laterally restrained and unrestrained beam 4.2 Plastic Section Modulus, Annexure H, IS-800-2007, Section classification as per Table 2 – IS800-2007, Shear buckling, Shear Strength and Bending Strength of Section as per Cl. 8.4.1 and Cl. 8.2.1.2 of IS-800-2007, Deflection as per Table-6 of IS-800-2007, Shear Leg Effect, Web Crippling	6	12%
5	COLUMN BASE & FOUNDATION 5.1 Slab Base, Gusseted Base, Base plate and its Thickness as per IS800-2007, Concrete Block, SBC of Soil, Anchor Bolt, Cleat and Dummy Angle 5.2 Numerical on Slab Base Foundation under Column made up of Single H Section	4	12%
6	LOAD ON ROOF TRUSS 6.1 Rolled Steel Section – ISA, I & H Section, Channel Section and its application in Steel Structure 6.2 Types of Truss, Pitch of Truss, Rise, Spacing of Truss, Purlin, Principal Rafter, Main Tie, Sag Tie, Members of Truss, Roofing material- GI and AC Sheets 6.3 Dead Load of Truss per panel point Self Weight, Weight of Purlin, Wind Bracing, Weight of Roofing Material 6.4 Live Load per panel point in Truss as per IS – 875 – Part II - 1984 when access is not provided 6.5 Wind Load per panel point in Truss using IS – 875 – Part III	5	16%

7	MASONRY STRUCTURES 7.1 Introduction to IS 1905-1987 7.2 Column, pier and buttress 7.3 Types of walls 7.4 Design considerations 7.5 Workmanship Column to Footings (Clause 34).	5	12%
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LIST OF PRACTICAL:

SR. No.	Experiment / Exercises
1	Find Forces in given Truss Members using Graphical Method due to D.L, L.L and W.L and Design Forces in the Members – Drawing Sheet – No: 01, A1 Size.
2	Draw Plan & c/s Elevation of Eaves Level Joint, Ridge Joint and Two Other Joints of a Truss Selected in Sheet No:01 with all design details like Size of Angle Section, G.P, Connection Details, Purlin, Roofing Material – Drawing Sheet – No: 02, A1 Size.
3	Draw Plan and c/s Elevation of Built up column made up of Double Channel provided back to back with Single or Double Lacing. Draw Plan and c/s Elevation of Slab Base Foundation under column made up of H section Sheet No:03 – A1 Size.
4	Prepare following Neat sketches in Sketch Book 1. Different Types of Truss 2. Truss Details – Spacing of Truss, Principal Rafter, Main Tie, Members, Ridge, span, Roof Covering, Purlin etc... 3. Eaves Level Joint of Truss 4. Ridge Level Joint of Truss 5. Beam to Beam Connection at Same Level 6. Beam to Beam Connection at Different Level 7. Column to Beam Seated Connection (Weld & Bolt Connection) 8. Column to Beam framed Connection (Weld & Bolt Connection) 9. Slab base Foundation, Gusseted Base Foundation

LIST OF REFERENCES:

Sr. no.	Title	Author	Publication
1	Design of Steel Structures	L.S.Negi	Mc Graw Hill
2	Design of Steel Structures	S.K.Duggal	Tata Mcgraw Hill Education Private Limited
3	Design of Steel Structures: Theory And Practice	N. Subramanian	Oxford University Press (2010)
4	Design of Steel Structures (By Limit State Method As Per Is: 800—2007)	S S Bhavikatti	I. K. International Pvt Ltd
5	***IS-800 – 2007	--	Bureau of Indian Standard
6	***Handbook on Steel – SP-6	--	Bureau of Indian Standard
7	***IS – 875 – 1984, Part – I, II, III	--	Bureau of Indian Standard

*** Students are permitted to appear in theory & practical examination with these IS codes.

LIST OF OPEN SOURCE SOFTWARE/LEARNING WEBSITE:

- 1) <https://nptel.ac.in>
- 2) www.steel-insdag.org
- 3) www.springer.com

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Basics of steel structures.	1 Remembering 2 Understanding
CLO2	Design Bolt Connection of Angle Section to Gusset Plate & Welded Connection of Angle Section to Gusset Plate	6 Creating 4 Analyze 3 Applying
CLO3	Analyze and Design Axially Loaded Tension Member made up of Angle Section, Analyze and Design of Compression members	4 Analyze 3 Applying
CLO4	Lacing System (Single or Double) for Built up Column, Batten System for Built up Column.	6 Creating 4 Analyze 3 Applying
CLO5	laterally Restrained Simply Supported beam, Purlin made up Angle Section.	4 Analyze 3 Applying
CLO6	Slab Base Foundation under Axially Loaded Column made up of Single H Section	4 Analyze 3 Applying

Course Learning Outcomes	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CLO1	M											
CLO2	H							H				
CLO3	H			H			H			I		
CLO4	M		H			I				H	L	
CLO5	I	I		H			L					
CLO6	H	I		I				H				L

H: High, M: Medium, L: Low