

GANPATUNIVERSITY				
FACULTY OF DIPLOMA ENGINEERING				
Programme	Diploma in Civil Engineering			
Semester	IV		Version	1.0.0.0
Effective from Academic Year	2026-27		Effective for the batch Admitted in	JULY 2025
Course code	1CI4102	Course Name	Design of Steel Structure	

I. TEACHING-LEARNING AND ASSESSMENT SCHEME																			
Course Type	Course code	Course Title	Teaching & Learning Scheme									Examination Scheme							
			Credit				Actual Contact Hrs/week			SLH	Total Learning Hrs/Week	TH			PR			SLA	Total
			CL	TL	LL	Total	CL	TL	LL			CE	SEE	Total	CE	SEE	Total		
DSC	1CI4102	Design of Steel Structure	3	0	2	5	3	0	4	3	10	40	60	100	60	40	100	20	220

Abbreviation:	CL-ClassroomLearning	TL-TutorialLearning	LL- LaboratoryLearning
	SLH-SelfLearningHours	NLH-NotionalLearningHours	SLA-SelfLearningAssessment
	FA-Formative Assessment(Termwork+MidSemExam+Attendance)		SA-SummativeAssessment

II. PRE-REQUISITES
Basic knowledge of Mechanics of Solids, Structural Analysis-I & II, Elementary Structural Design

III. INDUSTRY/EMPLOYER EXPECTED OUTCOMES
Demonstrating expertise in structural analysis, understanding safety codes, using digital tools, and ensuring occupant experience in sectors like high-rises, bridges, and infrastructure.

IV. COURSE LEARNING OUTCOMES
At the end of the course, students will be able to achieve the following course learning outcomes: CO1: Understand the basics of steel structures, their advantages, applications, and relevant IS codes. CO2: Analyze and design bolted and welded connections in steel structures as per IS 800:2007. CO3: Design tension and compression members of steel structures as per IS 800:2007. CO4: Design steel beams and purlins subjected to bending and shear loads as per relevant IS codes. CO5: Calculate and apply different loads acting on roof trusses as per IS 875-1987 for structural design

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:				
Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
Unit – 1 Introduction	TLO 1.1 Explain limit state of strength and serviceability. TLO 1.2 Explain how carbon content affects the properties of steel. TLO 1.3 Explain partial safety factors for load and materials.	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	05	02
Unit – 2 Bolted and Welded Connection	TLO 2.1 Design Bolt Connection of Angle Section to Gusset Plate. TLO 2.2. Design Welded Connection of Angle Section to Gusset Plate.	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.	16	10

		2.3 Shear Capacity of Bolt – Vdsb, Bearing Capacity of Bolt – Vdpbas 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 bolting.		
Unit -3 Tension Member & Compression Member	TLO 3.1 Analyze and Design Axially Loaded Tension Member made up of Angle Section. TLO 3.2 Solve Numerical for Analysis & Design for Single and Double Angle Sections on same side and either side of Gusset Plate. TLO 3.3 Analyze and Design Strut made up of Angle Section. TLO 3.4 Analyze and Design Axially Loaded Column. TLO 3.5 Solve Numerical on Column made up of ISHB	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 – Section 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 – fcd 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 Numerical on Column made up of ISHB, ISHB with Flange Plate, Double Channels Back to Back and Toe to Toe	20	18
UNIT-4 Design of Beam & Purlin	TLO 4.1. Design of laterally Restrained Simply Supported beam TLO 4.2 Design of Purlin made Angle Section	4.1 Main Beam, Secondary Beam, Standard I Sections, Laterally restrained and unrestrained beam 4.2 Plastic Section Modulus, Annexure H, IS-800-2007,	10	05

		Section classification as per Table 2 –IS800-2007, Shear buckling, Shear Strength and Bending Strength of Sections 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		
Unit–5 Load On Roof Truss	TLO 5.1 Calculate Dead Load, Live Load and Wind Load on panel points of a Roof Truss. TLO 5.2 List out types of Truss.	5.1 Rolled Steel Section – ISA, I & H Section, Channel Section and its application in Steel Structure 5.2 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 5.3 Dead Load of Truss per panel point Self Weight, Weight of Purlin, Wind Bracing, Weight of Roofing Material. 5.4 Live Load per panel point in Trusses per IS – 875 – Part II - 1984 when accesses not provided. 5.5 Wind Load per panel point in Truss using IS – 875 – Part III -1984	09	10

VI.LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
Sr. No.	Practical/Laboratory Learning Outcome (LLO)	Practical Titles	Relevant COs
1	LLO 1.1 Identify the relevant IS clauses related to loads from IS 875:1987	Write five IS clauses related to load from IS 875:1987.	CO1, CO2
2	LLO 1.2 Identify the relevant IS clauses related to joints in steel structures from IS 800:2007.	Write five IS clauses related to joints in steel structure from IS 800:2007.	CO2
3	LLO 1.3 Use the given data to Design a bolted connection.	Design a bolted connection for the given data.	CO3, CO4
4	LLO 1.4 Use the given data to Design of a welded connection.	Design a welded connection for the given data.	CO3, CO4
5	LLO 1.5 Identify the relevant IS clauses related to tension member and compression member steel structures from IS 800:2007	Write three IS clauses related to tension member and compression member in steel structure from IS 800:2007.	CO2, CO3
6	LLO 1.6 Write the stepwise procedure for Design of tension member.	Write the stepwise procedure for Design of tension member.	CO3, CO4
7	LLO 1.7 Write the stepwise procedure for Design of compression member.	Write the stepwise procedure for Design of compression member.	CO3, CO4

8	LLO 1.8 Inspecting the joints in Steel structures and write a detailed report on it.	Prepare a report on a site visit for joints in steel structures.	CO3,CO4
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VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

Student should maintain a separate A3 size Sketch book to solve the assignment given by course teacher. Course teacher can assign following type of assignments to students. Assignments should be solved by individual students compulsorily and corrective actions should be given by course teacher.

- Draw five standard rolled steel sections showing all details.
- Draw five commonly used built up sections showing all details.
- Draw modes of failure for bolted connections.
- Draw types of welds and types of welded joints.
- Draw types of roof truss

VIII. LIST OF INSTRUMENTS / EQUIPMENT /TRAINER BOARD

1	Computer system with Internet Connection
2	Auto-CAD Software

IX. LIST OF REFERENCE BOOKS

Sr.No.	Title	Author	Publication
1	Design of Steel Structures	Dayarathnam, P.	S. Chand and Company, Delhi. ISBN-13: 978-8121923200
2	Design Of Steel Structures (Edition3)	S K. Duggal	McGraw Hill Education (India) Private Limited 978-93-5532-503-7
3	Shah. L. Karve, S. R.	Limit State Theory and Design of Reinforced Concrete Structures	Structures Publications, Pune. ISBN13: 9788190371711
4	BIS New Delhi	IS:800-2007 Indian Standard code of practice for use of structural steel in general building construction	BIS New Delhi
5	BIS New Delhi	IS:875-1987 Part-1 to 5: Indian Standard Code for Loading Standards	BIS New Delhi
6	BIS New Delhi	IS hand book No. 1 Properties of structural steel rolled section.	BIS New Delhi

X. LINK OF LEARNING WEB RESOURCE

1	https://nptel.ac.in/courses/105105162
2	https://youtu.be/ruuKvu5QtkI
3	https://youtu.be/KwDrEN5EPeY
4	https://youtu.be/u9j04q6h4ww
5	https://youtu.be/U1fOSARv6u4
6	https://youtu.be/bIITXe3MJzs

