



Lok Jagruti Kendra University
University with a Difference

Diploma in Civil Engineering



Subject Code: 025050601

Design of Steel Structures

Programme / Branch Name			Diploma in Civil Engineering			
Course Name	Design of Steel Structures			Code	025050601	
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
 ESC: Engineering Science Courses PCC: Program Core Courses
 OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week				Evaluation Scheme			
L	T	P	Total Credit	CCE	SEE (Th)	SEE (Pr)	TOTAL
4	0	2	5	50	50	100	200

Legends:

L: Lectures T: Tutorial P: Practical
 CCE: Continuous & Comprehensive Evaluation
 SEE (Th): Semester End Evaluation (Theory)
 SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ Structural Mechanics

3. Rationale

Structural steel has been prevailing in the construction industry and marked an important component of modern buildings and housing. 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. Design of steel structure includes the load calculation, design and drawing details. This course will provide detailed knowledge of design and detailing of steel structures such as beam, column, slab base and gusset base, steel roof truss and their connections as per Indian standards. Students will be able to read drawing and can supervise the welding and bolting process at construction site.

4. Objectives

- ✓ To impart thorough knowledge of IS code for general construction in steel.
- ✓ To study the loads and its effect on steel structures.
- ✓ To learn basic concepts of bolted and welded connections and their efficiency.
- ✓ To learn design criteria of steel members subjected to tension and compression force.
- ✓ To understand the use of different types of roof truss.



5. Contents

Unit No.	Topics	Sub-Topics	Learning Outcomes	% Weightage	Hours
1.	Introduction	1.1. Common Steel Structures 1.2. Advantages and Disadvantages of Steel Structures 1.3. Types of Steel 1.4. Properties of Structural Steel 1.5. Rolled Steel Sections 1.6. Special Considerations in Steel Design 1.7. Loads 1.8. Load Combinations 1.9. Structural Analysis 1.10. Design Philosophy 1.11. Limit States 1.12. Actions (Loads) 1.13. Deflection Limits 1.14. Other Serviceability Limits	<ul style="list-style-type: none"> Explain the Importance and Basics of Steel Structures. Understand the importance of IS 800 – 2007 in Steel Structure. 	15	8
2.	Connections	2.1. Bolted Connections 2.1.1. Riveted Connection 2.1.2. Bolted Connections 2.1.3. Classification of Bolted Based on Type of Load Transfer 2.1.4. Advantages and Disadvantages of Bolted Connections 2.1.5. Terminology 2.1.6. IS 800-2007 Specifications for Spacing and Edge Distance of Bolt Holes 2.1.7. Types of Bolted Connections 2.1.8. Types of Actions on Fastners 2.1.9. Assumptions in Design of Bearing Bolts 2.1.10. Principles Observed in the Design	<ul style="list-style-type: none"> Knowledge of types of connections used in steel structures. Understand the design of bolted connections. 	30	14

		<p>2.1.11. Design Tensile Strength of Plates in a Joint</p> <p>2.1.12. Design Strength of Bearing Bolts</p> <p>2.1.13. Design Procedure with Bearing Bolts Subject to Shearing Forces</p> <p>2.1.14. Efficiency of a Joint</p>			
		<p>2.2. Welded Connections</p> <p>2.2.1. Advantages and Disadvantages of Welded Connections</p> <p>2.2.2. Types of Welded Joints</p> <p>2.2.3. Important Specifications for Welding</p> <p>2.2.4. Design Stress in Welds</p> <p>2.2.5. Reduction in Design Stresses for Long Joints</p>	<ul style="list-style-type: none"> • Explain different types of weld, throat thickness, size of weld. • Understand the design of welded connections. 		
3.	Design of Tension Members	<p>3.1. Design Strength of a Tension Member</p> <p>3.2. Design Procedure</p> <p>3.3. Tension Member Splice</p> <p>3.4. Lug Angles</p>	<ul style="list-style-type: none"> • Learn design criteria of tension members. 	15	8
4.	Design of Compression Members	<p>4.1. Buckling Class of Cross Section</p> <p>4.2. Slenderness Ratio</p> <p>4.3. Design Compressive Stress and Strength</p> <p>4.4. I.S. Tables for Design Stress</p> <p>4.5. Shape of Compression Members</p> <p>4.6. Design of Compression Members</p> <p>4.7. Laced and Battened Columns</p> <p>4.8. Design of Laced Columns</p> <p>4.9. Column Bases</p>	<ul style="list-style-type: none"> • Knowledge of column & strut and their importance in steel structure. • Learn design criteria of compression members. • Understand the concept of built-up members and their detailing. 	20	12
5.	Design of Roof Trusses	<p>5.1. Bracings</p> <p>5.2. Types of Roof Trusses</p>	<ul style="list-style-type: none"> • Knowledge on different types of 	20	14

	5.3. Nomenclature of Members of Trusses 5.4. Pitch of Trusses 5.5. Spacing of Trusses 5.6. Purlins 5.7. Sheetings 5.8. Loads 5.9. Load Combinations 5.10. Loads on Trusses 5.11. Analysis of Trusses 5.12. Grouping of Members 5.13. Design of Members 5.14. Design of Joints 5.15. End Bearing	trusses used in industries. • Conceptual design of roof truss. • Design of purlin and its connections.		
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Total Hours **56**

6. List of Practicals / Exercises

The practicals/exercises have been properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/program outcomes. Following is the list of practicals/exercises.

Sr. No.	Practical / Exercises	Key Competency	Hours
1.	Sketch Work: Types of lap joints and butt joints, Types of welds, Shapes of tension members, Slab base foundation, Single and double laced system, Types of Trusses, Bracing system	Develop the Skill of Detailing of Drawing of Steel Structures.	6
2.	Solve examples based on bolted and welded connections.	Understand the Design of Bolted and Welded Connections.	4
3.	Solve examples based on tension and compression members.	Learn the Design of Tension and Compression Members.	4
4.	Draw a sheet showing detailing of loads acting on roof truss.	Understanding of Load Calculation and Detailing of Truss.	6
5.	Prepare a report on typical photographs of steel structures showing different joint details.	Knowledge on Detailing of Joints on Construction Site.	4
6.	Visit a construction site to get practical exposure of bolted and welded connections.	Idea about Connections of Steel Structures.	4
Total Hours			28



7. Suggested Specification Table with Hours

Unit No.	Chapter Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1.	Introduction	40	30	10	0	0	20
2.	Connections	30	30	10	0	0	30
3.	Design of Tension Members	20	30	10	0	10	30
4.	Design of Compression Members	30	20	20	0	10	20
5.	Design of Roof Trusses	20	30	20	0	10	20

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Textbooks

- 1) Design of Steel Structures – Limit State Method as per IS: 800 – 2007 by S.S. Bhavikatti, I.K. International Publishing House Pvt. Ltd.

9. Reference Books

- 1) Design of Steel Structures by N. Subramanian, Oxford University Press.
- 2) Design of Steel Structures by P. Dayaratnam, S. Chand Group.

10. List of Publications

- 1) IS 800 – 2007, General Construction in Steel – Code of Practice, Bureau of Indian Standards, New Delhi.
- 2) IS 875 (Part I to V): Latest version, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Bureau of Indian Standards, New Delhi.
- 3) SP: 6(1), Steel Structural Hand Book.

11. Open Sources (Website, Video, Movie)

- 1) www.nptel.ac.in
- 2) www.easyengineering.net
- 3) <http://www.youtube.com/@civilopedia7459>

