

M. Tech. I Semester II

Subject Name: Advanced Design of Steel Structures

Subject Code: MTST13201

Type of course: Core-III

Prerequisite: Basic Steel Design

Rationale: The concepts of design of special steel structures must be known to the engineers. This course provides the knowledge of analysis and design of various steel structures and its applications in industries. The primary code source applies to building design, which is supplemented by a strong theoretical background in steel behavior applicable to non-typical structures.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Plastic analysis and design of steel structures: Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, Shape factor, Theorem of Plastic collapse, Methods of Plastic analysis, Collapse mechanisms, Plastic analysis of continuous beams and portal frames, Plastic design of continuous beams.	10	20%
2.	Analysis and design of industrial buildings: Introduction, selection of bay width, structural framing, purlins, girts and eave strut, Analysis and design of different types of plane trusses.	08	20%
3.	Design of cold formed sections: Type of cross section, stiffened, multiple stiffened and un-stiffened element, flat-width ratio, effective design width, local buckling and post buckling strength, shear lag and flange curling, unusually wide flange section, short span sections, design of light gauge compression, tension and flexural members as per codal provisions.	13	25%
4.	Design of steel stacks: Introduction, Proportioning of stack, codal provisions, Loads on Stacks, Load combinations, Analysis and design procedure for Guyed steel stacks.	04	10%

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5.	Design of steel chimneys: Introduction, Forces acting on chimney, Analysis & design of self-supporting chimney.	04	10%
6.	Design of composite structures: Composite Floor and Roof System Design, Composite beam, Open web steel joist / joist girder, Serviceability requirements.	06	15%

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	10	25	25	20	10

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **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 Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Design of Steel Structures-Limit States Method	Subramanian. N	Oxford University Press ISBN-10 : 9780199460915 ISBN-13 : 978-0199460915	2018.	1 st
2.	Design of Cold Formed Steel Structures,	Wie Wen Yu, Roger A. LaBoube, Helen Chen	Wiley ISBN-10 : 1119487390 ISBN-13 : 978-1119487395	2019	5 th
3.	Design of Steel Structures by Limit State Methods as Per IS 800-2007	S. S. Bhavikatti,	Dreamtech Press ISBN-10 : 9389307058 ISBN-13 : 978-9389307054	2019	5 th
4.	Limit State Design in Structural Steel	M. R. Shiyekar,	PHI Learning Private Limited ISBN-10 : 8120353501 ISBN-13 : 978-8120353503	2017	3 rd
5.	Limit State Design of Steel Structures	S. K. Duggal,	McGraw Hill Education ISBN-10 : 9353164877 ISBN-13 : 978-9353164874	2019	3 rd

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6.	Fundamentals of Structural Steel Design	M. L. Gambhir,	McGraw Hill Education. ISBN-10 : 125900676X ISBN-13 : 978-1259006760	2017	1 st
7.	Limit State Design of Steel Structures IS : 800-2007	V. L. Shah and Veena Gore,	Structure Publishers, Pune ISBN: 9788190371759.	2009	1 st
8.	Design of Steel Structures - Vol. II,	Ramchandra.	Standard Book House, Delhi. ISBN-13: 9788189401412	2016	19 th
9.	Plastic Methods of Structural Analysis,	Neal B. G.,	Chapman and Hall London. ISBN-10 : 0412154005 ISBN-13 : 978-0412154003	1977	3 rd
10.	Comprehensive Design of steel structure	Punmia and Jain,	Laxmi Publication, Delhi. ISBN-10 : 8131806456 ISBN-13 : 978-8131806456	2015	2 nd
11.	Design of steel structures	A.S. Arya. J.L. Ajamani:	Nemchand and Brothers. ISBN-10 : 8185240620	2011	1 st
12.	Structural Analysis and Design of Tall Building (Steel and Composite Construction)	B. S. Tranath:	CRC Press ISBN-10 : 1439850895 ISBN-13 : 978-1439850893	2011	1 st
13.	Design of Steel Structures	P. Dayaratnam,	S Chand Publishing ISBN-10 : 8121923204 ISBN-13 : 978-8121923200	2012	1 st
14.	Design of Steel Structures	I.C. Syal and S. Singh,	Standard Publishes ISBN-10 : 8180141276 ISBN-13 : 978-8180141270	2020	1 st

IS Codes: IS: 800-2007, IS: 875, SP: 6 and Steel Table.

IS: 801 - 1975, Code of Practice for use of cold formed light gauge steel structural members in general building construction, BIS, New Delhi.

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks weightage
CO-1	Analyze and design the structural members using plastic theory. <i>(R,U,A,N,E ...cognitive level)</i>	20%
CO-2	Analyze, design and detailing various structural components of Industrial buildings using IS codes. <i>(R,U,A,N,E ...cognitive level)</i>	20%
CO-3	Analyze and design of light gauge (Cold formed sections) compression, tension and flexural members as per codal provisions. <i>(R,U,A,N,E ...cognitive level)</i>	25%
CO-4	Analyze and design of steel stacks and steel chimneys. <i>(R,U,A,N,E,C...cognitive level)</i>	20%
CO-5	Understand steel-concrete composite structures, types of shear connectors and analysis and design of composite structures as per the IS code. <i>(R,U,A,N,E,C...cognitive level)</i>	15%

LIST OF PRACTICALS:

The students will have to solve at least three examples and related theory from each topic as an assignment/tutorial. Tutorial work shall consist of presentations / problems / preparation of learning material based on above topics.

List of Open Source/learning website:

- <https://nptel.ac.in/courses/114/105/114105031/>
 - Method of Plastic Analysis
- <https://youtu.be/jWtIDmi8YDM>
 - Industrial Buildings
- <https://nptel.ac.in/courses/105/106/105106113/>
 - Industrial Buildings, Cold form sections