COURSECONTENT

ADVANCED DESIGN OF METAL STRUCTURES								
I Semester: SE								
Course Code	**Category**	**Hours/ Week**			**Credits**	**Maximum Marks**		
2512045	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100
contactClasses:45	**Tutorial Classes:Nil**	**Practical Classes:Nil**				**TotalClasses:45**		
Prerequisites:NIL.								

Course Overview:

This course provides a comprehensive understanding of steel structural design, covering metallurgy, mechanical properties, and section classification. It introduces limit state design principles and plastic analysis. Students learn load estimation and structural systems such as moment resisting and braced frames, along with connection design. The course also explores composite construction of steel and concrete members. Advanced topics include fatigue behavior under repeated loading and cold-formed steel design, including buckling and post-buckling behavior. Overall, it equips learners to design safe, efficient, and economical steel structures for practical engineering applications.

Course Objectives:

1. To understand steel metallurgy, mechanical properties, section classification, and limit state design including plastic analysis.
2. To estimate loads and study structural systems, connections, and components used in multi-storey and industrial steel buildings.
3. To understand composite construction and design steel–concrete composite slabs, beams, and columns.
4. To learn fatigue behaviour of steel structures and apply S-N curve–based design for variable repeated loading.
5. To understand and design cold-formed steel members using effective width and direct strength methods.

Course Outcomes: After Completion of the Course, Students should be able to

1. Categorize structural steel sections based on metallurgical characteristics, mechanical properties, limit state concepts, and plastic behavior.
2. Differentiate structural systems and connection types used in multi-storey, industrial, and pre-engineered buildings under various loading conditions.
3. Justify the use of steel–concrete composite slabs, beams, and columns considering shear interaction and structural performance.
4. Conclude fatigue performance of steel structures subjected to variable repeated loading using S–N curve–based assessment.
5. Formulate cold-formed steel member behavior accounting for buckling, post-buckling, and strength prediction methods.

SYLLABUS:

UNIT–I:

Steel metallurgy – mechanical properties – section classification - limit state method of design for structural steel – plastic analysis and design

UNIT–II:

Estimation of loads – structural systems for multi-story and industrial buildings - moment resisting frame, concentrically and eccentrically braced frame – pre-engineered building systems – moment resisting connections – base plate connections

UNIT–III:

Composite construction – shear connector – behaviour and design of steel concrete composite slabs, beams and columns

UNIT–IV:

Fatigue behaviour and design – S-N curve approach – design category classification – design for variable repeated loading - fatigue assessment

UNIT–V:

Cold formed steel design – buckling and post-buckling behaviour of members – effective width method and direct strength method for design of cold-formed steel beams, columns, beam-columns.

TEXTBOOKS:

1. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2008.
2. Bhavikatti, S.S., Design of Steel Structures, I.K. International Publishing House Pvt. Ltd., New Delhi, 2010.

REFERENCEBOOKS:

1.Punmia B.C., Comprehensive Design of Steel Structures, Lakshmi Publications, Delhi, 2000.

2.Lynn S. Beedle, Plastic Design of Steel Frames, John Wiley and Sons, 1990.

3. Wie Wen Yu, Design of Cold Formed Steel Structures, McGraw Hill Book Company, New York, 1996.

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Definitions and terminology
4. Assignments
5. Model question paper–I
6. Model question paper–II
7. Lecture notes
8. E-Learning Readiness Videos(ELRV)