

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

INSTRUCTION DIVISION

SECOND SEMESTER 2015-16

Course Handout Part II

Date: 13/1/2016

In addition to part -I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CE F343
Course Title : Design of Steel Structures
Instructor-in-charge : SHAMSHER BAHADUR SINGH
Instructor : Dr. Dipendu Bhunia

1. Scope and Objective of the Course

The course intends to impart adequate analysis and design skills to common type of Civil Engineering Steel Structures as found in practice. An understanding of theory, loads and stresses to be used as per Indian standards for steel design work will be developed. The course deals with designing of tension, compression, and flexural members of steel. Bolted and welded connections will be designed. Limit State Method of design will be pursued. In addition, design of steel trusses; plate girder, Gantry girder, and Purlins will be covered. Plastic design of steel structures will also be introduced.

At the end of the semester, students will be able to analyze and design the tension members, compression members, flexural members of the framed structures such as trusses and rigid-jointed plane frame members using both the Limit State Design Approach and Plastic Design Approach. Most, importantly, students will be exposed to compute based design problems on Industrial Building structures.

2. Text Book

- (i) N. Subramanian, "Design of Steel Structures", Oxford University Press, 2015.
- (ii) Teaching Resource for Structural Steel Design, Volume 1, 2 & 3. Institute for Steel Development & Growth, ISPAT Niketan 52/1A Ballygunge, Circulow Road, Calcutta 700019.

Reference Book

- i) S. K. Duggal, "Limit State Design of Steel Structures," McGraw Hill Education (India) Ltd., New Delhi, 2014.
- ii) A S Arya and Ajmani "Design of Steel Structures" Nemi Chand & Bros.
- iii) P. Dayaratnam "Design of Steel Structures", Wheeler Pub. 1992.
- iv) E H Gaylord and C N Gaylord "Design of steel structures" McGraw Hill
- v) P. Dayaratnam, "Handbook on design and detailing of structures", Wheeler Publishing 1994.
- vi) IS 800:2007 "Code of practice for General construction in steel "B.I.S.?"
- vii) IS 875 :1987 "Code of practice for design Loads"
- viii) Design of Steel Structures- S Ramamrutham & R. Narayanan, Dhanpat Rai, Publishing co., (P) Ltd, New Delhi 110002, 2000.
- (ix) B.C. Punmia, "Design of Steel Structures Volume I and II", Laxmi Publications (P) Ltd., New Delhi, 1998 (Eight edition).

3. Course Plan:

Lecture Nos.	Learning Objectives	Topics to be covered	Reference* Chap./Sec. #(Book)
1-5	Steel Design Specifications	Introduction, loads, structural elements, connections, structural framing, structural metals, factor of safety, load factors, steel vs. concrete, standard specifications, introduction to limit states and working stress design.	TB, Ch.1-2
6-9	Design of Tension Members	Introduction, Types of sections, Net area, Net effective section for angles and Tees in tension, Design, Bolted End Connections, Lug Angles, Tension Splice, Welded Connections, Shear Lag, Example Problems	TB, Ch. 3
10-15	Plastic and Local Buckling Behaviour	Plastic theory, Plastic collapse load, Conditions of plastic analysis, Theorems of plastic collapse, Methods of plastic collapse, Plastic design of portal frames, special considerations, Local buckling of plates, Cross-section Classification	TB, Ch.4
16-21	Design of Compression Members	Behaviour of compression members, Elastic buckling of compression members, Sections used for compression members, Effective length of compression members, Design of compression members, Built-up compression members, Column bases and caps example problems	TB, Ch. 5
22-27	Design of Beams	Beam types, Lateral stability of beams, Effective lengths, Design strength of laterally supported beams in bending, Design strength of laterally unsupported beams, Shear strength of steel beams, Maximum deflections, Design for web buckling and crippling, Design of purlins, Design of beams	TB, Ch.6
28-32	Design of Plate Girders	General considerations, Preliminary design procedure, Web panel subjected to shear, Behaviour of transverse web stiffeners, Design of plate girders	TB, Ch.7
33-36	Design of Gantry Girders	Loading considerations, Maximum load effects, Fatigue effects, Selection of Gantry girder, Design of Gantry girder	TB, Ch.8
37-42	Design of Connections	Design of bolted connection, Design of welded connections, Simple beam and end connections, design of framed connections, design of stiffened seat connection, eccentric connections	TB, Ch. 10 -11

Note: Assignments will be regularly given in the class and they must be submitted on or before the due date. If assignments are not submitted on due date, they will not be evaluated.

4. Evaluation Scheme

Sr. No.	Evaluation Component	Duration	Percentage weightage	Date & Time	Remarks
1	Mid-term Examination	90 minute	25	17/3 2:00 -3:30 PM	
2	Tutorials plus regular take home assignments	-	10		
3	Design Project (Excel Based) and Computer Projects	To be announced in the class	20		
4	Surprise tests and Quizzes	-	05		
5	Comp. Exp.	3 Hrs.	40	11/5 FN	

5. **Chamber Consultation Hour:** To be announced in the class. Students must adhere to the Announced timing.

6. **Notice:** Notice if any, concerning this course will be displayed on the Notice Board of Civil Engineering Departments or communicated through registered e-mail.

Instructor-in-charge
CE F343