Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE5660 - Advanced design of metal structures

Credit Distribution: C:10 L:3 T:1 P:0 E:0 O:6 TH:0

Course Type: Theory

Description: To provide an understanding of the concepts and issues such as strength, stiffness, stability, plastic behaviour and ductility of steel structures made of hot- rolled or cold-formed members, and steel-concrete composite construction.

Course Content: Basics of Steel Design: Limit state design, Design of tension, compression and bending members, plate girders, beam-columns, welded and bolted connections. 2. Analysis: Linear elastic, plastic, linear buckling and non-linear and advanced analysis methods. Stability analysis of columns, plates and frames, Flexural-torsional buckling of beams, Plastic analysis and design, Analysis and Design of Semi-rigid Frames. 3. Structural Systems for Multi-storey and Industrial Buildings; Braced and moment resisting frames, Portal and truss moment frames, Design for wind and Earthquake Forces: Design for ductility, concentrically and eccentrically braced frames, Pre-engineered Building (PEB) Systems. 4. Fatigue and Fire Behaviour and Design: Fatigue Behaviour, Detail classification for design, design for variable repeated loading, introduction to fire design. 5. Composite Construction: Behaviour and design of steel concrete composite slabs, beams and columns. 6. Cold-Formed Steel Members: Effective width and direct strength methods of design for cold-formed steel beams, columns and beam-columns, Connections in cold-formed steel systems

Text Books :

- NPTEL web courses on Design of Steel Structures - I and II, www.nptel.ac.in/courses/IIT-Madras.
- Teaching Resources for Structural Steel Design, Volume 1, Institute for Steel Development and Growth.
- Horne, M.R., Plastic Theory of Structures, MIT Press, 1972.
- Gambhir, M.L., Stability Analysis and Design of Structures, Springer, 2004. 5. Bruneau M., Uang C.M. and Sabeli R., Ductile Design of Steel Structures, Mc-Graw Hill, 2011.

Reference Books :

- IS 800, IS 801, IS 11384, Bureau of Indian Standards.
- SP 6 Handbook for Structural Engineers, (1) Structural Steel Sections, (6) Plastic Analysis, Bureau of Indian Standards.
- Eurocode 3, Eurocode 4, European Committee for Standardization, Brussels.
- Steel Designers Manual, 7th Ed., Edited by Davison B. and Owens, G.W., SCI, Blackwell, UK, 2012.
- Guide to Stability Design Criteria for Metal Structures, 6th Ed., Edited by Ziemian, R.D., John Wiley & Sons, Inc. 2010.

Prepared in January 2021

Prerequisite: NIL