Summary

Advanced topics in structural steel seismic design. Frame stability; bolted and welded beam-to-column connections; beam-columns, steel braces, eccentrically braced frame links, capacity design of conventional steel-frame buildings; innovative lateral load resisting systems.

Content

- Week 1: Background and introduction, Smart Statics
- Week 2: Structural analysis for seismic loading
- Week 3: Elastic Spectrum and seismic demands
- Week 4: Steel frame stability
- Week 5: Seismic design of steel moment-resisting frames (MRFs) - General concepts
- Week 6: Steel MRFs - Welded beam-to-column connections
- Week 7: Steel MRFs - Bolted beam-to-column connections
- Week 8: Steel MRFs - Beam-to-column web panel
- Week 9: Steel MRFs - Steel columns
- Week 10: Seismic design of steel Concentric Braced Frames (CBFs) - General concepts
- Week 11: Steel CBFs - Steel braces
- Week 12: Steel CBFs - Bracing and other members
- Week 13: Steel Eccentrically Braced Frames (EBFs)
- Week 14: High-Performance Seismic Resistant Steel Systems

Keywords

steel structural systems, steel design and behaviour, moment frames, braced frames, eccentrically braced frames; capacity design; stability; P-Delta effects; ductility

Learning Prerequisites

Required courses
Structural Analysis, Structural Dynamics, Basic Course(s) in Structural Steel Design

Recommended courses
Nonlinear Analysis, Seismic Engineering

Important concepts to start the course
Basic knowledge in structural steel behaviour and design

Learning Outcomes
By the end of the course, the student must be able to:
• Describe the behaviour of various steel lateral load resisting systems and their structural components
• Design steel structures for seismic and wind loading
• Assess / Evaluate the basic behaviour of steel components under cyclic loading

Transversal skills
• Set objectives and design an action plan to reach those objectives.
• Respect relevant legal guidelines and ethical codes for the profession.

Teaching methods
2-hour lecture, 1-hour exercises
Use of:
• Powerpoint
• Online lecture recording system to facilitate learning
• Tools to facilitate learning of stability theory
• in-class exercises

Expected student activities
Class participation, in-class exercise solutions

Assessment methods
1. Midterm written exam (25%), 2. Final written exam (75%).

Supervision
Office hours Yes
Assistants Yes
Others The course lectures will be provided online 3-hours after the end of each class.

Resources
Bibliography
Eurocode 8, SIA-263, AISC-341-10, AISC-358-16, AISC-360-16, Reading material provided through Moodle

Ressources en bibliothèque
• AISC 358-10
• Eurocodes
• AISC 341-10
• AISC 360-10

Notes/Handbook
-The course lectures, list of in-class exercise problems and midterm/final exams are based on lecture notes
that are provided weekly through Moodle.
- The course does not follow a specific Handbook.

Prerequisite for
Advanced steel design, nonlinear analysis, evaluation and testing of structural steel systems, Performance-based Earthquake Engineering