CIVIL-435

Advanced steel design

Lignos Dimitrios

Cursus	Sem.	Type
Civil Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Written
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

Advanced topics in seismic steel design; bolted and welded connections; steel moment resisting frames; steel frames with concentric & eccentric bracings; capacity design; buckling-restrained bracings; friction dampers; seismic retrofitting of existing structures with supplemental damping

Content

- Week 1: Introduction & smart statics
- Week 2: Seismic action and behaviour factors
- Week 3: Frame stability
- Week 4: Seismic design of steel moment resisting frames (MRFs)
- Week 5: Seismic design of welded beam-to-column connections
- Week 6: Seismic design of bolted beam-to-column connections
- Week 7: Column web panel and steel columns
- Week 8: Steel frames with concentric bracings (CBFs) - P1
- Week 9: Bracing connections and other members - P2
- Week 10: Steel frames with eccentric bracings (EBFs)
- Week 11: Eccentric brace links - replacable links
- Week 12: Buckling restrained bracings (BRBs)
- Week 13: Seismic design of BRB connections
- Week 14: Supplemental damping systems for seismic retrofitting

Keywords

steel structural systems, moment frames, braced frames, eccentrically braced frames; supplemental damping systems; buckling restrained bracings; capacity design; seismic retrofitting with dampers

Learning Prerequisites

Required courses

- Structural Analysis
- Structural Dynamics
- Basic Course(s) in Structural Steel Design

- Mechanics of Materials and/or Structural Mechanics

Recommended courses

- Nonlinear Analysis
- Seismic Engineering
- Structural Stability

Important concepts to start the course

Basic knowledge in structural steel behaviour and design as well as structural dynamics

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
- Recognize different damage mechanism
- Visualize the behaviour of structural elements

Transversal skills

- Set objectives and design an action plan to reach those objectives.
- Respect relevant legal guidelines and ethical codes for the profession.
- Use a work methodology appropriate to the task.
- Communicate effectively, being understood, including across different languages and cultures.
- Continue to work through difficulties or initial failure to find optimal solutions.

Teaching methods

2-hour lecture, 1-hour exercices
Use of:

- Powerpoint
- Online lecture recording system to facilitate learning
- Tools to facilitate learning of advanced steel design
- in-class exercises

Expected student activities

- Class participation
- In-class exercises

Assessment methods

- Graded assignments (30%)
- Final written exam (70%)

Supervision

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

Resources

Bibliography

- SIA-263
- Eurocode 8
- Reading material provided through Moodle

Ressources en bibliothèque

- SIA-263
- Eurocodes

Notes/Handbook

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

Prerequisite for

- Master projects in:
- Seismic design and evaluation of conventional structures
- Seismic retrofitting of structures with supplemental damping
- Use of seismic isolation
- Nonlinear analysis of new and existing structures
- evaluation and testing of structural steel systems

"Le contenu de cette fiche de cours est susceptible d'être modifié en raison du covid-19"