CIVIL-369 **Structural stability**

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Cursus	Sem.	Type
Civil Engineering	BA6	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	3 weekly
Exercises	1 weekly
Number of positions	

Summary

Advanced topics in structural stability. Euler and dynamic method; elastic & inelastic column buckling; beam-columns; lateral-torsional buckling of bridge girders; nonlinear geometric effects; frame stability; buckling determinant; computational formulation of stability theory; stiffness method

Content

- Week 1: Introduction & background
- Week 2: "Smart Statics" for sway frames
- Week 3: Material nonlinearity and collapse mechanisms
- Week 4: Euler and Dynamic method
- Week 5: Static and dynamic collapse of frame structures
- Week 6: Elastic buckling of planar columns
- Week 7: Buckling determinant and its applications
- Week 8: Inelastic column buckling
- Week 9: Effect of imperfections on member stability
- Week 10: Beam-column stability, elastic limit interaction relationships
- Week 11: Lateral torsional buckling
- Week 12: Lateral stability of bridge girders
- Week 13: Frame stability - Flexibility and stiffness method
- Week 14: Applications of structural stability with structural engineering software

Keywords

structural stability, static & dynamic loading, flexural and lateral-torsional buckling, nonlinear behaviour, frame stability

Learning Prerequisites

Required courses

Statics, structural analysis, mechanics of materials

Recommended courses

Design of steel structures

Learning Outcomes

By the end of the course, the student must be able to:

- Develop insights into the working of structural analysis and stability from first principles
- Assess / Evaluate the stability of structural components, frames under various types of loading
- Model nonlinear geometric effects in basic structural components and frame structures

Transversal skills

- Continue to work through difficulties or initial failure to find optimal solutions.
- Use a work methodology appropriate to the task.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Communicate effectively, being understood, including across different languages and cultures.

Teaching methods

2-hour reading, 1-hour exercises
Use of:

- Power point
- Online reading
- Tools to facilitate learning
- in-class exercises

Expected student activities

Class participation, in-class exercise solutions

Assessment methods

1. Midterm written exam, 2. Final written exam

Supervision

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

Resources

Bibliography

- Ziemian, R.D. Guide to stability design criteria for metal structures (sixth edition)
- Bazant, Z., and Cedolin, L. Stability of structures
- Chen, WF., Lui, EM. Structural stability: Theory and Implementation
- Eurocodes

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

Master projects in advanced steel design, nonlinear analysis, evaluation and testing of structural steel systems subjected to natural hazards, resilient-based steel design, Performance-Based Earthquake Engineering