

CIVIL-369

Structural stability

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| Cursus | Sem. | Type |
|-------------------|-------------|-------------|
| Civil Engineering | MA2, MA4 | Opt. |

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|----------------------------|-----------------|
| 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; elastic & inelastic column buckling; beam-columns; lateral-torsional buckling of bridge girders; nonlinear geometric effects; frame stability; computational formulation of stability theory; stiffness & flexibility methods

Content

- Week 1: Introduction & background
- Week 2: "Smart Statics" for sway frames
- Week 3: Nonlinearity and Collapse Mechanisms
- Week 4: Euler and Dynamic method
- Week 5: 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
- 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

Teaching methods

3-hour lectures, 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

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

Resources

Bibliography

- Ziemian, RD Design Guide
- Bazant, Z., and Cedolin, L. Stability of structures
- Chen, WF., Him, EM. Structural stability: Theory and Implementation
- SIA-263
- Structural Eurocodes

Ressources en bibliothèque

- [Guide to Stability Design Criteria for Metal Structures / Ziemian](#)
- [Bazant, Z., and Cedolin, L. Stability of structures](#)
- [Chen, WF., Him, EM. Structural stability: Theory and Implementation](#)
- [Sia 263](#)

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