CIVIL-238 **Structural mechanics (for GC)**

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Cursus	Sem.	Type
Civil Engineering	BA4	Obl.
HES - GC	E	Obl.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

The course discusses the basic principles of structural mechanics, analyzing the performance of materials and structures against loading and focuses on the stress strain relationships and the effect of axial, bending, shear and torsional loadings on engineer structures.

Content

Week 1. Introduction to basic concepts
Week 2. Forces and moments - idealization of structures
Week 3. Body equilibrium - statically determinate beams
Week 4. Axial and shear forces
Week 5. Torsion and bending moments
Week 6. Tension, compression and shear/stresses
Week 7. Stresses in composite sections
Week 8. Stress-strain relationships - Theory of elasticity of isotropic media #1
Week 9. Stress-strain relationships - Theory of elasticity of isotropic media #2
Week 10. Stress transformations Mohrs circle
Week 11. Deformation/beam deflections/deformation of trusses
Week 12. Principle of virtual work
Week 13. Introduction to stability
Week 14. Statically indeterminate beams

Keywords

Mechanics of materials, stresses in structures, stress-strain relationships, theory of elasticity for isotropic media, beam theory, deflections in beams, principle of virtual work, stability

Learning Prerequisites

Required courses

- Statics

Recommended courses

Structures

Learning Outcomes

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

- Develop Capacity for critical thinking.
- Establish objectives and create plans to achieve them.
- Assess / Evaluate problems and act for solutions.
- Analyze situations and prioritize decisions.
- Demonstrate capacity for creativity.

Transversal skills

- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Assess progress against the plan, and adapt the plan as appropriate.
- Use a work methodology appropriate to the task.
- Communicate effectively, being understood, including across different languages and cultures.

Teaching methods

Ex cathedra 2 hours lecture and 2 hours exercises (flexible schedule to present exercises during lectures and theory during exercises sessions to digest the content)
Use of:

- Power point presentations
- Blackboard
- In-class exercises
- Computational tools to facilitate learning

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Expected student activities

- Weekly in-class exercises

Assessment methods

- Final written exam

Supervision

Office hours	No
Assistants	No
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

Popov E. Mechanics of Materials
Gere, JM., and Timoshenko, SP. Mechanics of Materials
Bedenik, B, Besant, C. Analysis of engineering structures
And other books on mechanics of materials â#Š

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Ressources en bibliothèque

- Popov E. Mechanics of Materials
- Bedenik B, Besant C. Analysis of engineering structures
- Gere JM, Goodno BJ. Mechanics of Materials (2013)
- Gere JM, Timoshenko SP. Mechanics of Materials

Notes/Handbook

- The course lectures, list of in-class exercise problems, problem sets and exams are provided weekly through Moodle.
- The course does not follow a specific textbook.

Moodle Link

- https://go.epfl.ch/CIVIL-238

Prerequisite for

- Design of steel structures
- Design of concrete structures
- Geoetechnical engineering
- Structural analysis
- Advanced steel design
- Structural stability
- Structural dynamics
- Seismic engineering
- Continuum mechanics