

CIVIL-238

Structural mechanics (for GC)

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Cursus	Sem.	Type
Civil Engineering	BA3	Obl.
HES - GC	H	Obl.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	4 weekly
Lecture	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 ### Mohr###s cycle
- Week 11. Deformation/beam deflections/deformation of trusses
- Week 12. Principle of virtual work
- Week 13. Introduction to stability
- Week 14. Statically indeterminate beams

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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
- Mechanics

Recommended courses

Structures I

Structures II

Learning Outcomes

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

- Assess / Evaluate a loaded structure
- Analyze /Compute- stresses, strains and deformations

Transversal skills

- Assess progress against the plan, and adapt the plan as appropriate.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Set objectives and design an action plan to reach those objectives.
- Use a work methodology appropriate to the task.

Teaching methods

Ex cathedra 2 hours lecture and 2 hours exercises (flexible exercises during lectures and theory during exercises to digest the content)

Use of:

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

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Expected student activities

- Weekly in-class exercises

Assessment methods

- Final written exam

Supervision

Office hours	No
Assistants	Yes
Forum	Yes

Resources**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

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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.

Prerequisite for

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