

ME-331

**Solid mechanics**

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Cursus	Sem.	Type
Mechanical engineering minor	E	Opt.
Mechanical engineering	BA6	Obl.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Lecture	3 weekly
Exercises	1 weekly
<b>Number of positions</b>	

**Summary**

Model the behavior of elastic, viscoelastic, and inelastic solids both in the infinitesimal and finite-deformation regimes.

**Content**

This course will articulate the behavior of elastic, viscoelastic, and inelastic solids both in the infinitesimal and finite-deformation regimes. Exact and approximate solutions to initial and boundary-value problems will be employed to analyze the stress and strain state of a finite body under different assumptions. The time/frequency dependence of viscoelastic materials will be presented. Certain constitutive models for strain and stress fields associated with permanent deformations are also analyzed.

**Keywords**

Large deformations, Elasticity, Viscoelasticity, Plasticity.

**Learning Prerequisites****Required courses**

- Mechanics of Structures II (ME-232)
- Mechanics of continuous media (ME-201)

**Recommended courses****Important concepts to start the course**

Theory of ordinary differential equations  
 Theory of partial differential equations  
 Vector/Tensor operations and properties

**Learning Outcomes**

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

- Model and analytically solve simple problems of statics and stress analysis, S1
- Identify the constitutive behaviour of a material from the results of a mechanical test and choose a suitable test standard, S5

- Model with analytical or numerical tools the nonlinear response of structures and materials, S12

### Transversal skills

- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Continue to work through difficulties or initial failure to find optimal solutions.
- Take feedback (critique) and respond in an appropriate manner.

### Teaching methods

Ex-cathedra

### Expected student activities

Exercise sessions

### Assessment methods

Final exam

### Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

### Resources

#### Ressources en bibliothèque

- [J. Botsis and M. Deville, Mechanics of Continuous Media: an Introduction, PPUR, 2018](#)
- [Applied Mechanics of Solids / Bower](#)

#### Notes/Handbook

A. Bower, *Applied Mechanics of Solids*, CRC Press, 2009

J. Botsis and M. Deville, *Mechanics of Continuous Media: an Introduction*, PPUR, 2018

#### Websites

- <http://moodle.epfl.ch>

#### Moodle Link

- <https://go.epfl.ch/ME-331>

### Prerequisite for

Computational Solid and Structural Dynamics (ME-473)

Fracture mechanics (ME-432)

Mechanics of composites (ME 430)