

# Mechanics of materials

## Titulaires

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## Mnémonique du cours

CHIM-H416

## Crédits ECTS

3 crédits

## Langue(s) d'enseignement

Anglais

## Période du cours

Deuxième quadrimestre

## Campus

Solbosch

## Contenu du cours

The part related on the link on the links between microstructure and mechanical properties focuses on

- > Elasticity, viscoelasticity and anelasticity
- > Dislocation dynamics
- > Yield surface and yielding criterion
- > Hardening by grain size, work hardening and precipitation
- > Creep

The part related to the use of numerical methods to solve problems in mechanics of materials focuses on:

- > Continuum Mechanics
- > Linear FEM
- > Non linear problems
- > Numerical implementation of plasticity
- > Homogenization

## Objectifs (et/ou acquis d'apprentissages spécifiques)

This course aims at illustrating how plasticity/visco-elasticity mechanisms at the microstructural scale translate into the macroscopic behaviour. It also helps the student apprehend how numerical methods can be used to solve problems in mechanics of materials.

At the end of this course, the students should be able to:

- > Understand and explain how elementary mechanisms lead to various visco-elastic behaviours
- > Understand and explain in a quantitative way how the microstructural features are translated into a macroscopic mechanical behaviour

- > Understand, master and explain the notions of stress, strain and yield surface
- > Understand and explain how discretization methods can be used to solve linear and non linear problems on the basis of the virtual work principle
- > explain the principle of a newton raphson scheme in such a context

## Méthodes d'enseignement et activités d'apprentissages

2 ECTS cours - 1 ECTS lab session where a commercial code is used to solve some practical cases

## Contribution au profil d'enseignement

This teaching unit contributes to the following competences:

- > In-depth knowledge and understanding of exact sciences with the specificity of their application to engineering
- > Conceive, plan and execute a research project, based on an analysis of its objectives, existing knowledge and the relevant literature, with attention to innovation and valorization in industry and society
- > Correctly report on research or design results in the form of a technical report or in the form of a scientific paper
- > Present and defend results in a scientifically sound way, using contemporary communication tools, for a national as well as for an international professional or lay audience
- > Collaborate in a team
- > A creative, problem-solving, result-driven and evidence-based attitude, aiming at innovation and applicability in industry and society
- > The flexibility and adaptability to work in an international and/or intercultural context

## Références, bibliographie et lectures recommandées

G.E. Dieter, Mechanical Metallurgy, ISBN-13: 978-0070168930

## Support(s) de cours

Université virtuelle

## Autres renseignements

### Lieu(x) d'enseignement

Solbosch

### Contact(s)

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## Méthode(s) d'évaluation

Examen oral et Rapport écrit

### Méthode(s) d'évaluation (complément)

The mark is based on an Oral exam and on the quality of the reports of the lab sessions

### Construction de la note (en ce compris, la pondération des notes partielles)

The final grade is calculated as follows: If the oral examination grade is equal to or above over 8/20: 2/3 of the mark is given for

the oral examination grade, 1/3 is given for the project grade. If the oral examination grade is below 8/20: the final grade is the oral examination grade.

## Langue(s) d'évaluation principale(s)

Anglais

## Programmes

Programmes proposant ce cours à l'école polytechnique de Bruxelles

MA-IRMA | **Master : ingénieur civil en chimie et science des matériaux** | finalité Spécialisée/bloc 1

