

Mechanics of materials

Lecturers

Stephane GODET (Coordinator) and Thierry MASSART

Course mnemonic

CHIM-H416

ECTS credits

3 credits

Language(s) of instruction

English

Course period

Second term

Campus

Solbosch

- > 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 (multidisciplinary) 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
- > An integrated insight in chemical process and materials' technology

Course content

Elastic Behaviour

- > microscopic level
- > macroscopic level : solid mechanics-reminders
- > introduction to the finite element method in the framework of linear elasticity

Plastic Behavior

- > microscopic level : dislocation mechanics
- > macroscopic level : yield criteria, multiaxial loading, J2 flow theory, Drucker postulate
- > implementation of non-linear behaviour in FEM

Introduction to linear and non-linear fracture mechanics (Griffith Criterion, stress intensity factor, Critical Tip Opening displacement, Critical Energy Release rate, R-curves, J Integral)

Visco-elastoplastic behaviour (Creep, Polymer materials)

Objectives (and/or specific learning outcomes)

- > Understand the link between the plasticity phenomena at the microstructural scale and their translation at the macroscopic scale
- > Understand the computational methods allowing to solve problems related to mechanics of materials

Teaching method and learning activities

[[table]]

Contribution to the teaching profile

This teaching unit contributes to the following competences:

References, bibliography and recommended reading

G.E. Dieter, Mechanical Metallurgy

Course notes

Université virtuelle

Other information

Place(s) of teaching

Solbosch

Contact(s)

Thierry J. Massart - Thierry.J.Massart@ulb.be

Stéphane Godet - Stephane.Godet@ulb.be

Evaluation method(s)

Oral examination and Written report

Evaluation method(s) (additional information)

Written and oral examination at the end of the course and assessment of the exercises during the exercise sessions and through written reports.

Determination of the mark (including the weighting of partial marks)

The final grade is calculated as follows: If the oral examination grade is equal to or above 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.

Main language(s) of evaluation

English

Programmes

Programmes proposing this course at the
Brussels School of Engineering

MA-IRMA | **Master of Science in Chemical and Materials
Engineering** | finalité Professional/unit 1

