ME-432

# Fracture mechanics

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| Cursus | Sem. | Type |
|---|---|---|
| Energy Management and Sustainability | MA2, MA4 | Opt. |
| Mechanical engineering | MA2, MA4 | Opt. |

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|---|---|
| Language of teaching | English |
| Credits | 4 |
| Session | Summer |
| Semester | Spring |
| Exam | Oral |
| Workload | 120h |
| Weeks | 14 |
| **Hours** | **4 weekly** |
| Courses | 2 weekly |
| Project | 2 weekly |
| **Number of positions** | **25** |

## Remark

Course reserved for Mechanical Engineering students.

## Summary

The student acquires the notions of damage and fracture in different materials; the basis of energy release rate and stress intensity factor; fracture criteria; weight functions for crack opening displacements; J integral and non-linear fracture; fatigue crack propagation.

## Content

The course presents the modern theory of fracture mechanics, stress singularities, the various fracture modes, stress intensity factors and energy release rates in linear and no-linear materials. The main chapters cover the following topics: review of the classical theories of strength and damage, singular problems in linear elasticity theory and fracture parameters, weight functions, fracture in elastoplastic materials, applications to composite materials, experimental methods in fracture mechanics.

## Keywords

Damage, Fracture

## Learning Prerequisites

### Required courses

Solid mechanics

### Recommended courses

### Important concepts to start the course

Apply the concepts of rigid and deformable body mechanics and of continuum mechanics to model and solve analytically problems of statics, structural stress analysis or simple mechanisms, S1

## Learning Outcomes

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

- Apply the principles of damage, fatigue and fracture mechanics to predict the size and localisation of critical defects and the number of cycles to failure of a real structure under complex loading conditions, S8

## Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Write a scientific or technical report.

## Teaching methods

Ex cathedra lectures, exercises sessions and TP

## Assessment methods

Oral examination 60%, project 30%, exercises 10%

## Supervision

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|---|---|
| Office hours | No |
| Assistants | Yes |
| Forum | No |

## Resources

### Bibliography

Course material