

ME-412

Experimental methods in engineering mechanics

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Cursus	Sem.	Type
Mechanical engineering minor	H	Opt.
Mechanical engineering	MA1, MA3	Opt.
Mechanics		Opt.

Language of teaching	English
Credits	4
Withdrawal Session	Unauthorized Winter
Semester Exam	Fall During the semester
Workload	120h
Weeks	14
Hours	4 weekly
Lecture	1 weekly
Practical work	3 weekly
Number of positions	30

Summary

This course gives an advanced treatment of experimental methods in the context of mechanics by way of example. Students will construct significant components of experimental apparatus, use their apparatus to collect data, interpret the resulting data, and write reports on the experiments.

Content

Typically three experimental modules comprise the class, with techniques drawn from analog electronics and image processing, in order to probe the mechanics. Typical example modules include contact mechanics, fracture mechanics, large deformation of neo-Hookean solids and diffusion in fluids.

Keywords

Solid mechanics
Large deformation
Image processing
Analog electronics

Learning Prerequisites**Required courses**

ME 331, ME 201, ME 232

Recommended courses

EE 280

Learning Outcomes

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

- Analyze and design assemblies of simple mechanical elements in the framework of static and buckling, S2
- Characterize experimentally the steady-state or dynamic response of solids, fluids, S11
- Describe in scientific terms and apply the principles of tribology and contact mechanics, S13
- Analyze a linear dynamical system (both time and frequency responses), A3
- State the conserved quantities in a given flow and link them to a physical-mathematical description, AH13

Transversal skills

- Take responsibility for health and safety of self and others in a working context.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Continue to work through difficulties or initial failure to find optimal solutions.
- Manage priorities.
- Collect data.

Teaching methods

Students will be involved in each experimental module from the construction of the experiment through the writing of the report on the data. Students could be involved in assessing the reports of others in a 'peer-review' process.

Expected student activities

Participation in collecting, analyzing and compiling experimental data; involvement in writing the reports.

Assessment methods

During the semester, reports will be a key component of student assessment. Quality of writing, thoroughness of data collection and analysis, and clarity of presentation are key parameters. Further details and a comprehensive rubric are offered in the course materials.

Resources**Bibliography**

Horowitz & Hill: the art of electronics
Lecture notes in the class
Related documentation provided with each module

Ressources en bibliothèque

- [The art of electronics / Horowitz](#)

Moodle Link

- <https://go.epfl.ch/ME-412>