ME-104

Solid mechanics I : intro to structural mechanics

Kim Sangwoo

Cursus	Sem.	Type
Mechanical engineering	BA2	Obl.

Language of teaching	English
Coefficient	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	3 weekly
Exercises	1 weekly
Number of positions	

Summary

The student will acquire the basis for the analysis of static structures and deformation of simple structural elements. The focus is given to problem-solving skills in the context of engineering design.

Content

The course presents the fundamental basis for the analysis of static structures. The course material is presented with an emphasis on abstraction, formulation, and solution of simplified mathematical models, which make it possible to design and analyze real structures and mechanisms, rationally. Concrete engineering examples and demonstrations are provided throughout the course. Through a combination of lectures, example problems, practical demonstrations and hands-on activities, the student will be introduced to structural analysis and learn how to calculate internal loads and the deformation of simple structural systems. The course also serves as an introduction to the more advanced engineering mechanics curriculum that EPFL students will be exposed to later in their degree, including structural mechanics, continuum mechanics, and solid mechanics.
The course may cover, but not exclusively, the following topics:

- System of forces;
- Equilibrium of a rigid body;
- Simple structures (trusses, frames, and machines);
- Distributed loads;
- Energy methods to analyze structures;
- Deformation of simple structural elements;
- Mechanical instabilities: Buckling.

Keywords

Statics, Equilibrium, Mechanism, Structure

Learning Prerequisites

Required courses

There are no pre-requisites for this course.

Recommended courses

PHYS-101 General Physics: Mechanics (Physique générale: mécanique).

Important concepts to start the course

Familiarity with vector calculus, linear algebra and ordinary differential equations.

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
- Analyze and design assemblies of simple mechanical elements in the framework of static and buckling S2

Transversal skills

- Use a work methodology appropriate to the task.
- 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.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.

Teaching methods

Lectures, example problems, homework, practical demonstrations and hands-on activities.

Assessment methods

Final written exam (100% of the final grade)

Supervision

Office hours	No
Assistant.e.s	Yes
Forum	Yes
Others	The teachers are happy to answer students' questions, in person, during the break, or after lectures, or during office hours (by appointment).

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

Recommended Books:
D. Gross, W. Hauger, J. Schröder, W.A. Wall, N. Rajapakse (2012) "Engineering Mechanics 1: Statics" 2nd Edition, Springer
D. Gross, W. Hauger, J. Schröder, W.A. Wall, J. Bonet (2017) "Engineering Mechanics 2: Mechanics of Materials" 2nd Edition, Springer
J.L. Meriam and L. G. Kraige (2004) "Statique : mécanique de l'ingénieur." Wiley (French version)
J.L. Mariam, L.G. Kraige, and J.N. Bolton (2018) Engineering Mechanics: Statics. Wiley (English version)

Références suggérées par la bibliothèque

- Find the references at the Library

Notes/Handbook

PDF lecture notes and handwritten notes during the lectures will be provided with material that enhances and complements recommended books.

Websites

- https://moodle.epfl.ch

Moodle Link

- https://go.epfl.ch/ME-104

Prerequisite for

Mécanique des structures, Systèmes mécaniques.