LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Kontinuumsmekanik
Continuum Mechanics

FMEN21, 7,5 credits, A (Second Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED M
Date of Decision: 2023-04-11

General Information

Elective for: F4, F4-bem, I4, M4-bem, Pi4-bem
Language of instruction: The course will be given in English

Aim

The purpose of this course is to presents the classical theory of the mechanics of deformable bodies, i.e. continuum mechanics for solid, fluid and gaseous material bodies. The general concepts and principles of continuum mechanics are presented in the formulation of the conservation and balance equations combined with constitutive relations for material bodies. The course also gives an introduction to the algebra and analysis of Cartesian tensors.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to explain and apply fundamental conception as the deformation gradient, displacement gradient, material and local time derivatives, rate of deformation and stress tensor
- describe the fundamental balance equations and conservation laws for a deformable body
- be able to explain the fundamental results in the general theory of constitutive relations
- describe and apply the general equations for some kind of fluid and elastic bodies and be familiar with some advanced constitutive relations

Competences and skills

For a passing grade the student must

- be able to describe the motion of a deformable body and solve simple dynamic problems of deformable bodies using the fundamental balance equations and conservation laws
- apply and analyze different kind of constitutive relations.
- be able to formulate and solve some simple cases of flow and elastic problems
- be able to present a solution of a continuum mechanical problem in a technical report

Judgement and approach
For a passing grade the student must

- be able to evaluate the physical consistence of the obtained results
- be able to evaluate constitutive relations by calibrating and validating to experimental data

Contents

Deformation and the kinetics of the deformation of bodies, force and stresses in deformable bodies. General equations of conservation and balance for mass, momentum, linear momentum, force, energy and entropy.The relationship between global and local equations of balance. The theory of constitutive equations. Elastic solids and viscous fluids. Mixture theory. Examples of practical applications.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: The examination of the course consists of written exam, compulsory hand in exercises and project work.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Admission requirements:

Assumed prior knowledge: Basic courses in Mechanics, Linear Algebra and Calculus in One Variable and Several Variables.
The number of participants is limited to: No
The course overlaps following course/s: FMEF01, FMEN20

Reading list

- A.Ahadi: Lecture notes, Continuum mechanics.
- Ellad B Tadmor: Continuum mechanics and thermodynamics. ISBN: 9781107008267.
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- Ellad B Tadmor: Continuum mechanics and thermodynamics. ISBN: 9781107008267.

Contact and other information

Course coordinator: Prof. Aylin Ahadi, Aylin.Ahadi@mek.lth.se

Course homepage: http://www.mek.lth.se
Further information: The course might be offered in English.