Advanced Material and Computational Mechanics

Programme course

6 credits

Avancerad material- och beräkningsmekanik

TMHL19

Valid from: 2017 Spring semester

Determined by
Board of Studies for Mechanical Engineering and Design

Date determined
2017-01-25

Main field of study
Mechanical Engineering

Course level
Second cycle

Advancement level
A1X

Course offered for
- Mechanical Engineering, M Sc in Engineering
- Mechanical Engineering, Master's programme

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Multivariable analysis, fundamental solid mechanics (including FEM analysis) and fundamental materials technology. Deformation and fracture behaviour of materials (material and computational aspects), introduction to computational mechanics.

Intended learning outcomes
This course in advanced mate¬rial mechanics aims at the understanding and computational use of materials that are elastically anisotropic, flow plastically or show creep behaviour. After the course the students will be able to:

- handle multiaxial stress and deformation states and understand how they are represented in Cartesian and polar reference systems,
- understand and apply elastically anisotropic material properties and understand the principles of the mechanics of composite mechanics,
- understand time-independent elastoplastic and time-dependent creep material behaviour and perform simple manual elastoplastic analyses in a ‘conceptual-design’ context, and
- perform elastoplastic and creep analyses in a modern FEM environment and understand the particular computational implications and difficulties inherent in such analyses.

Course content
Continuum mechanical basis
Elastic anisotropy
Composite mechanics
Plasticity
Viscoplasticity/creep
Computational assignments
Elastic anisotropy
Plasticity; analysis of bending specimen
Plasticity: analysis of component
Plasticity: LCF-analysis of notched geometry
Creep: analysis of component

Teaching and working methods
Lectures, teaching classes, FEM laboratory work (computational assignments)

Examination

PRA2	Written reports of the computational assignments	5 credits	U, 3, 4, 5
KTR1	Written examination	1 credits	U, G

Grades
Four-grade scale, LiU, U, 3, 4, 5

Department
Institutionen för ekonomisk och industriell utveckling

Director of Studies or equivalent
Daniel Leidermark

Examiner
Daniel Leidermark

Course website and other links

Education components
Preliminary scheduled hours: 82 h
Recommended self-study hours: 78 h

Course literature

Gudmundson P: Material Mechanics, dept. of Solid Mechanics, KTH, Stockholm, Sweden, 2006. Gudmundson P: Material Mechanics, Exercises with solutions, dept. of Solid Mechanics, KTH, Stockholm, Sweden, 2006. Alternativ litteratur Stouffer D C, Dame L T: Inelastic deformation of metals, John Wiley & Sons, New York, USA, 1996. Ottosen N S, Ristinmaa M: The mechanics of constitutive modeling, Elsevier Ltd, Oxford, UK, 2005. Hertzberg R W, Vinci R P, Hertzberg J: Deformation and Fracture Mechanics of Engineering Materials, John Wiley & Sons, New York, USA, 2012.

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.