

# 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 material 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://stydokument.liu.se/Regelsamling/Innehall/Utbildning\\_pa\\_grund-\\_och\\_avancerad\\_niva](http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva).