

Engineering Materials Metals

Programme course

6 credits

Konstruktionsmaterial

TMKM12

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

First cycle

Advancement level

G1X

Course offered for

- Mechanical Engineering, M Sc in Engineering

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.

Intended learning outcomes

This course aims at presenting students fundamentals in the field of materials science and engineering with emphasis on explaining the relationship between the structure of a material, its mechanical properties and its manufacturing process. Upon successful completion of the course, the student shall be able to:

- Describe and explain the structure of a material from atomic to macroscopic scale.
- Discuss the mechanical properties of polymers and metallic material based on their structure.
- Explain the relationship between the structure of a material and its mechanical properties as well as discuss the possibilities to modify the structure with help of different processes to obtain desired properties.
- Determine and explain the microstructure obtained after phase transformation under equilibrium as well as non-equilibrium condition.
- Describe the influence of temperature and aggressive environment on the use of material.
- Analyze and discuss selection of materials for structure based on the knowledge introduced in this course.

Course content

Main engineering material classes, atomic bonding, mechanical properties and testing methods.

Metallic materials: crystal structure, defects in crystals, mechanisms and methods for strengthening, diffusion and case hardening, fracture, solidification, phase diagram, phase transformation in solid state, heat treatment, steel, cast iron, light alloys, superalloys, corrosion and prevention.

Material selection

Teaching and working methods

The course consists of lectures, tutorials and laboratory work. A written examination is given at the end of the course.

Examination

LAB1	Laboratory work	3 credits	U, G
TEN1	Written examination	3 credits	U, 3, 4, 5

Grades

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

Other information

Supplementary courses: Industrial material selection, Engineering materials - Deformation and fracture, Polymer materials, Engineering materials - New materials, Engineering materials for lightweight applications, Engineering Materials, Welding and Manufacturing Technology

Department

Institutionen för ekonomisk och industriell utveckling

Director of Studies or equivalent

Mikael Segersäll

Examiner

Mikael Segersäll

Course website and other links

<http://www.iei.liu.se/kmt/education/undergraduatecourses-tmkm12>

Education components

Preliminary scheduled hours: 56 h

Recommended self-study hours: 104 h

Course literature

The Science and Engineering of Materials, SI edition, Donald R. Askeland,
Pradeep P. Fulay, Wendelin J. Wright, Sixth Edition, Cengage Learning, 2011

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.