Engineering Materials

Programme course

6 credits

Konstruktionsmaterial

TMMI18

Valid from: 2018 Spring semester

Determined by
Board of Studies for Mechanical Engineering and Design

Date determined

Main field of study
Mechanical Engineering

Course level
First cycle

Advancement level
G1X

Course offered for
- Mechanical Engineering, B 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 as well as industrial use of materials. 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 metallic and polymer material based on their structure.
- Explain how the mechanical properties of a metallic material can be modified with the help of different manufacturing processes which change the material's structure.
- 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.
Polymer materials: structure and typical properties, glass transition of thermoplastics.
Group work to analyze an already made 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 and project work	3 credits	U, G
TEN1	Written exam	3 credits	U, 3, 4, 5

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

Department
Institutionen för ekonomisk och industriell utveckling

Director of Studies or equivalent
Mikael Segersäll

Examiner
Ru Lin Peng

Course website and other links
http://www.iei.liu.se/kmt/education/undergraduatecourses-tmmi18

Education components
Preliminary scheduled hours: 60 h
Recommended self-study hours: 100 h

Course literature

The Science and Engineering of Materials, Donald R. Askeland, Pradeep P. Phule, Wendelin J. Wright, Sixth Edition, SI, 2011.
Laborationsanvisningar.