



MH1005 Structural Materials

6.0 credits

Konstruktionsmaterial

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for MH1005 valid from Autumn 2009

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

SE1010 Solid Mechanics, Basic Course with Project, or similar
SG1130 Mechanics I, or similar

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course the student should be able to:

- Describe the influence of crystal structure and binding forces in solid material
- Describe the most common crystal structures in metallic materials
- Describe vacancies and dislocations and their influence on plastic deformation
- Describe interstitial and substitutional diffusion
- Describe mechanical behavior and mechanical testing
- Describe different hardening mechanisms
- Use binary phase diagrams – the lever rule
- Describe what happens during phase transformations and how the micro structure is developed
- Describe the relationship between micro structure and properties
- Describe recovery, recrystallization and grain growth
- Describe the main types of steel and other alloys, their properties and applications
- Describe different types of fracture: tough and brittle fracture, creep and fatigue fracture
- Describe/Explain heat treatment of alloys
- Use isothermal cooling transformation diagrams
- Discuss material questions with as well material specialist as non-specialists

Course contents

The atomic and molecular structure of metals, ceramics and polymer materials.
Relationship between structure and properties.
Dislocations and other lattice defects in metallic materials.
Mechanical properties, elastic and plastic deformation.
Hardening mechanisms in metallic materials.
Fracture and time dependent deformation.
Phase diagrams.
Phase transformations during solidification.
Phase transformations in solid state.
Diffusionless phase transformations.
Structural transformations.
Properties of metallic, ceramic and polymer materials.
Composite materials.
Corrosion and time dependent degradation of metals.

Course literature

"Materials Science and Engineering, an Introduction", 7th ed. William, D. Callister, Jr., John Wiley & Sons Inc., (2007), ISBN(13): 978-0-471-73696-7.

Examination

- TEN1 - Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 2.0 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.