MH1004 Engineering Materials 6.0 credits

Materiallära

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

Establishment

Course syllabus for MH1004 valid from Autumn 2019

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

Language of instruction

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

Intended learning outcomes

After passing the course, the student should be able to:

- Specify and illustrate the structure of materials with respect to the type of interatomic bonding and atomic structure and describe the influence of different atomic defects.
- Describe deformation mechanisms of materials and their influence on the mechanical properties of materials, especially for metallic materials.
- Describe and use phase diagrams to interpret diffusion-controlled phase transformations and couple and explain structural formation in metallic materials using these.
- Explain and illustrate various hardening mechanisms as well as secondary structural formation (recrystallization / grain growth) of metallic materials.
- Describe the Fe-C system (steel and cast iron), interpret and explain both diffusion controlled and non-diffusion controlled structures (martensite) in this as well as the influence of time-temperature (isothermal transformation diagram TTT diagram) on phase transformation and structure formation.
- Specify the most common construction metals, including cast iron, in general the production processes of metallic materials and especially for the casting the concept of micro segregation.
- Describe and explain fracture mechanisms, different types of fractures and the most common corrosion and degradation mechanisms of materials.
- Specify the relationship between microstructure and properties of ceramics, polymeric materials and composites and their production processes.

In order to:

- Independently motivate and make choice of materials when designing structures and products based both on the properties of the material and on sustainability and recycling aspects.

Course contents

Material history and material classes.
Atomic and molecular structure of metals, ceramics and polymeric materials.
Relationships between structure and properties.
Dislocations and other lattice defects in metallic materials.
Mechanical properties, elastic and plastic deformation.
Hardening mechanisms for metallic materials.
Fracture and time-dependent deformation.
Binary phase diagrams.
Phase changes on solidification.
Phase changes in solid state.
Diffusionless phase transformations.
Corrosion and time-dependent degradation of metals.
Composition of composites.

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.