MH1004 Engineering Materials 6.0 credits

Materiallära

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

Establishment

On 2024-10-14, the Director of First and Second Cycle Education of ITM school has decided to establish this official course syllabus to apply from autumn term 2025 (registration number M-2024-2018).

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Basic eligibility.

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 participant should be able to:

- Describe the structure of materials with regard to bonding type, atom and microstructure, and effects of various atomic defects.
- Describe deformation mechanisms of various materials and the effect of these on the material's mechanical and other properties, especially for metallic materials.
- Describe and use phase diagrams to interpret diffusion controlled phase transformations and explain structure formation in metallic materials.
- Explain and illustrate different hardening mechanisms and recrystallisation and grain growth in metallic materials.
- Explain the concept of diffusion and in the Fe-C system interpret and describe diffusional and non-diffusional structure formation and apply TTT diagrams at phase transformation and structure formation.
- State the most common design metals including cast iron, production processes of metallic materials on a general level, and especially for the process of moulding the concept of microsegregation.
- Describe and explain fracture mechanisms and different types of fractures and the most common corrosion and decomposition mechanisms of material.
- State relationships between microstructure and properties of ceramics, polymeric materials and composites and production processes of these on a general level.

Course contents

Material history and material classes.
Atomic and molecular structure of metals, ceramics and polymeric materials.
Relations 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 transformations at solidification.
Phase transformations in solid state.
Diffusionless phase transformations.
Corrosion and time-dependent degradation of metals.
The structure 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.