MH2055 Materials Structures I 7.5 credits

Materials strukturer I

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

Establishment

The official course syllabus is valid from the autumn semester 2023 in accordance with the decision by the Dean of the ITM School: M-2022-1729. Date of decision: 2022-10-14.

Grading scale

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

Education cycle

Second cycle

Main field of study

Materials Science and Engineering

Specific prerequisites

In total 90 higher education credits in the main field of study of Technology.

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:

1. Use and apply basic terminology and concepts for the microstructure of metallic materials and transformations of metallic materials.
2. Identify and analyse characteristic structural elements in the microstructure of materials, draw conclusions about how the material has been treated and justify for phase transformations that have taken place by means of binary phase diagrams.
3. Describe and analyse the most common transformations and the structures in the most used metallic materials and the effects of factors such as composition and temperature, and explain and justify which basic chemical and physical units, e.g. surface energy and diffusion, that are of importance.
4. Motivate reasonable assumptions and carry out calculations of microstructure development.
5. Explain and illustrate the geometric meaning of concepts that are central for phase transformations in Gibbs energy diagrams and relate its connection to phase diagrams.
6. Analyse and explain phase transformation and structure formation in a material by means of TTT and CCT diagrams.

Course contents

The course deals with:

- Equilibria and transformations in metallic materials
- Basic theory of phase transformations
- Basic thermodynamics and application of binary phase diagrams
- Development of micro and nanostructures through nucleation and growth
- Crystalline and amorphous solidification
- Transformations in solid phase
- Recrystallisation, grain growth and coarsening
- TTT and CCT diagrams
- Calculations of the effect of surface energy on equilibrium, driving force for initial precipitation, critical radius for nucleation, growth speed, segregation during solidification, grain growth and transformation speed

Examination

- TEN1 - Written exam, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- INL1 - Hand-in assignment, 2.0 credits, grading scale: P, F
- LAB1 - Laboratory work, 1.5 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.

Other requirements for final grade

- Attendance and passed tests on all labs
- All assignments are passed
- All intended learning outcomes are satisfied to at least level E

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.