MH2052 Applied Thermodynamics and Kinetics 6.0 credits

Tillämpad termodynamik och kinetik

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

Establishment

The official course syllabus is valid from the autumn semester 2026 as decided by the Faculty Board: PA-2026-011. Decision date: 2026-08-26.

Grading scale

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

Education cycle

Second cycle

Main field of study

Materials Science and Engineering

Specific prerequisites

Basic thermodynamics for metallic materials and phase diagram theory corresponding to course MH2017 Micro- and nanostructures.

Intended learning outcomes

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

1. Explain basic concepts in thermodynamic modeling.
2. Use thermodynamic relationships for solution phases (solid phases, liquids and gas phase).
3. Model these phases with simpler models and with the sublattice formalism (Compound Energy Formalism).
4. Illustrate the relationship between thermodynamic relations, Gibbs energy and phase diagrams.
5. Perform analytical and numerical calculations of thermodynamic problems.
6. Explain the basics of diffusion in binary and multicomponent systems.
7. Perform analytical and numerical calculations of diffusion-controlled phase transformations.

For higher grades, the student must also be able to:
8. Combine thermodynamics and kinetics in problem solving.

Course contents

- Thermodynamics for phase transformations.
- Phase equilibria and phase diagrams (unary, binary and higher order systems).
- Gibbs energy and driving force.
- Modelling of solid substitutional and interstitial solutions, carbides, oxides and intermetallic phases.
- Modelling of metallic liquids and slags.
- Reference states and change of reference states and change of components.
- Driving force for diffusion, thermodynamic factor and mobility.
- Analytical and numerical methods for solving thermodynamic and kinetic problems.

Examination

- INL1 - Assignments, 2.0 credits, grading scale: P, F
- INL2 - Assignments, 2.0 credits, grading scale: P, F
- TEN1 - Written exam, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- KON1 - Partial exam, 0 credits, grading scale: P, F
- KON2 - Partial exam, 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.

KON1 och KON2 are not mandatory.

If both KON1 and KON2 are passed grade E is obtained on TEN1.

Transitional regulations

MH2052 TEN1 can be completed in MH2057; KON1 and KON2 are included in TEN1 MH2057. For other modules, please contact the course coordinator.

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.