



LUNDS UNIVERSITET  
Lunds Tekniska Högskola

*Course syllabus*

# Nanomaterial - Termodynamik och kinetik

## Nanomaterials - Thermodynamics and Kinetics

**FFFN05, 7,5 credits, A (Second Cycle)**

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED F/Pi

Date of Decision: 2023-04-18

### General Information

**Main field:** Nanoscience.

**Elective for:** F4, K5-m, MNAV2, N4-m

**Language of instruction:** The course will be given in English

### Aim

The course objective is that the student, on completion of the course, shall be well familiar with thermodynamic phenomena and kinetic processes important for material science and that can be used in nanomaterials.

### Learning outcomes

*Knowledge and understanding*

For a passing grade the student must

- be able to give an account of basic thermodynamic concepts
- be able to explain the equilibrium concept for nanomaterials
- be able to explain phase diagrams
- be able to describe reaction processes in systems with several components
- be able to explain fundamental mass and heat transport equations.

*Competences and skills*

For a passing grade the student must

- be able to use thermodynamic equations for materials science problems
- be able to discuss and solve chemical reaction problems

- be able to define and solve diffusion problems.

#### *Judgement and approach*

For a passing grade the student must

- be able to interpret binary and ternary phase diagrams
- be able to reflect on how thermodynamics and kinetics can be applied to nanomaterials.

## Contents

The course provides specialized knowledge in:

- Fundamental thermodynamics and heat engines
- Thermodynamic equilibrium
- Phase equilibria, phase stability and phase transitions
- Phase diagrams (single component - multi component)
- Reactions and reaction kinetics
- Mass transfer - diffusion in solid phase, diffusion in liquids
- Heat transport
- Size effects.

## Examination details

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)

**Assessment:** Written examination. It is mandatory to attend the first lecture in order to be admitted to the course.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

## Admission

**Assumed prior knowledge:** Basic course in thermodynamics.

**The number of participants is limited to:** No

## Reading list

- DeHoff, R.: Thermodynamics in Materials Science. CRC, 2nd edition, 2006. ISBN: 0849340659 (preferred textbook).

## Contact and other information

**Course coordinator:** Jonas Johansson, [jonas.johansson@ftf.lth.se](mailto:jonas.johansson@ftf.lth.se)

**Course homepage:** [http://www.ftf.lth.se/education/elective\\_courses/](http://www.ftf.lth.se/education/elective_courses/)

**Further information:** It is mandatory to attend the first lecture in order to be admitted to the course.