# SK2773 Nanothermodynamics 7.5 credits

## Nanotermodynamik

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

If the course is discontinued, students may request to be examined during the following two academic years

## Establishment

Course syllabus for SK2773 valid from Spring 2019

## Grading scale

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

## Education cycle

Second cycle

## Main field of study

Engineering Physics

## Language of instruction

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

## Intended learning outcomes

On completion of this course the student should be able to:

1. Define fundamental thermodynamic parameters, their interrelation for chemical processes, and compute thermodynamic relations for a defined process,
2. Explain and demonstrate the use of the Ellingham and Pourbaix diagrams,
3. Apply thermodynamics to defects, phase equilibria, phase diagrams, and phase transitions in nano systems,
4. Explain the basic principles of statistical thermodynamics,
5. Explain the thermodynamics properties of colloidal dispersed systems, reflect differences from classical thermodynamics.

# Course contents

This course looks at thermal energy transfer from both macroscopic and microscopic perspectives based on the fundamental principles and laws of thermodynamics and statistical mechanics. The course aims to provide an in-depth understanding on the principles of thermodynamics of materials and applications to production of inorganic materials (thin films, bulk), selection of materials for hostile environments, adsorption and chemisorption processes, surfaces and interfaces, phase equilibria and phase transformations, statistical and nonequilibrium thermodynamics, capillary processes and colloidal system. An important aspect is the introduction of nanothermodynamics, the thermodynamics of phenomena and processes at the nanometre scale.

# Specific prerequisites

Bachelor's degree in Physics, Electrical Engineering, Materials science, Chemistry or equivalent, including courses in mathematics corresponding to at least 20 ECTS credits and courses in physics corresponding to at least 30 ECTS credits.

# Course literature

• Thermodynamics of Materials, D V Ragone, Vols 1 & 2, John Wiley & Sons, 1994

In addition, relevant course information can be added with chosen project assignments.

# Examination

- INL1 - Assignment, 1.0 credits, grading scale: P, F
- INL2 - Assignment, 2.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, 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.

# Other requirements for final grade

All assignments and exam are obligatory for the completion of the course.

# 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.