



SI2635 Introductory Condensed Matter Theory 7.5 credits

Introduktion till kondenserade materiens teori

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 SI2635 valid from Spring 2011

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

After completed course you will be able:

- Use and apply the concept of direct and reciprocal lattice
- Calculate various properties of wave diffraction
- Characterize solids by the nature of binding
- Calculate properties of thermally excited lattice, phonons, apply Debye model
- Understand and apply the concept of free electron Fermi gas
- Solve wave equation for simple periodic potentials
- Estimate energy gaps for simple models
- Estimate diamagnetic and paramagnetic susceptibilities
- Explain the structure of noncrystalline solids
- Understand the physics of first order transitions

Course contents

Condensed matter theory: Crystal structure. Wave diffraction. Bragg law. Laue equations. Crystal binding. Elasticity. Reciprocal lattice. Brillouin zone. Crystal vibration. Quantization of elastic waves. Thermal properties. Debye model. Free electron gas. Energy bands. Bloch theorem. Kronig-Penney model. Fermi surfaces and metals. Calculation of energy bands. Magnetism. Noncrystalline solids. Nanostructures.

Specific prerequisites

Statistical physics.

Vektor analys.

Quantum mechanics

Mathematical physics methods.

Course literature

Kittel, Introduction to Solid State Physics, 8th edition.

Holgate, Understanding Solid State Physics

Examination

- TEN1 - Written Examination, 7.5 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.

Written examination.

Other requirements for final grade

TEN1 – Theory questions and problem solving,

7,5 hp, grade scale: A, B, C, D, E, FX, F

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.