



SK2700 Mesoscopic Physics

8.0 credits

Mesoskopisk fysik

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 SK2700 valid from Autumn 2008

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics, Physics

Language of instruction

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

Intended learning outcomes

The goal of this course is to communicate a basic understanding of electron transport in systems that are “coherent” in the quantum mechanical sense. With this understanding you should be able to:

- Compare new concepts of nano-electronics with the present-day technique, and understand their fundamental limits.
- Use simple models to calculate the basic energy and length scales for mesoscopic phenomena which are physically relevant.
- Identify various basic device concepts in a variety of physics systems.

Course contents

Classical transport and diffusion, ballistic transport and conductance quantization, Landauer formalism and coherent transport, gauge invariant phase and Aharonov-Bohm effect, weak and strong localization, Coulomb blockade, Mesoscopic superconductors, decoherence of a quantum system in its environment. Nano-electronics, Nano-mechanics, experimental methods and demonstrations..

Specific prerequisites

Recommended prerequisites: Basic courses in electro-magnetism and quantum mechanics are required. Basic course in solid state physics (Kittel level) is recommended.

Course literature

Supriyo Datta, *Electron Transport in Mesoscopic Systems*, Cambridge University Press.

Diverse articles

Examination

- INL1 - Assignments, 6.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 2.0 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.

Other requirements for final grade

The examination will be through home project assignments (INL1; 6 credits, grading scale A-F) and lab exercises (LAB1; 2 credits, grading scale P/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.