SK2560 Nanophotonics and Bio-nanophotonics 7.5 credits

Nanofotonik och bionanofotonik

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

Establishment

Course syllabus for SK2560 valid from Autumn 2013

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

Recommended prerequisites:

SK1102 Classical Physics, or similar course

SI1151 Quantum Physics, or similar course

Language of instruction

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

Intended learning outcomes

1. Master quantum mechanical knowledge of electrons and photons in nanostructures such as quantum dots and photonic crystals, fundamental concepts behind nanophotonics.
2. Understand the science of nanobiophotonics to generate and harness light (photons) to image, detect and manipulate biological materials.
3. Follow the very front of research and development of nanobiophotonics for optical sensing and diagnostics.

Course contents

This course has been developed in parallel with the fast-advancing multidisciplinary research and technological developments in the field of nanophotonics and bionanophotonics, and addresses three main areas:

1. Quantum mechanical description of light-matter interaction in nanostructure

- Localization of photons and electrons
- Light source and photodetector

2. Nanophotonics

- Subwavelength light control
- Numerical simulation of light-matter interaction in nanostructure

3. Nanobiophotonics: Nanotechnology for Biophotonics

- Ultra-fast, ultra-intensive, ultra-sensitive optical imaging
- Quantum dots in biosensing, bioimaging, and drug delivery

Course literature

Y. Fu, Physical Models of Semiconductor Quantum Devices, Second edition, Springer

P. N. Prasad, Introduction to Biophotonics, John Wiley & Sons 2003

P. N. Prasad, Nanophotonics, John Wiley & Sons 2004

Lecture notes (including the latest research developments) and handouts.

Documents of Hand in tasks.

Instructions to laboratory experiments.

Course reference bokks.

Examination

- INL1 - Hand-in Tasks, 1.0 credits, grading scale: P, F
- TEN1 - Written Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Experiments, 2.5 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.

Other requirements for final grade

Written exam (TEN1; 4 credits, grading scale A-F)

Hand-in assignments (INL1; 1 credit, grading scale P/F)

Passed lab experiments (LAB1; 2,5 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.