FSK3560 Nanophotonics and Bionanophotonics 7.5 credits

Nanofotonik och bionanofotonik

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 FSK3560 valid from Autumn 2018

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Admitted to PhD education

Recommended prerequisites:

SK1102 Classical Physics 12.0 credits, or equivalent knowledge

SI1151 Quantum Physics 6.0 credits, or equivalent knowledge

Language of instruction

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

Intended learning outcomes

- Master quantum mechanical knowledge of electrons and photons in nanostructures such as quantum dots and photonic crystals, fundamental concepts behind nanophotonics
- Understand the science of nanobiophotonics to generate and harness light (photons) to image, detect and manipulate biological materials
- Follow the very front of research and development of nanobiophotonics for optical sensing and diagnostics
- Extend and expand the knowledge and ability of theoretical analysis for the PhD student in the context of the PhD student's own study and research activities

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:

Disposition

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 2013

Lecture notes (including the latest research developments) and handouts

Documents of Hand in tasks

Instructions to laboratory experiments

Couse reference book

Y. Fu, Physical Models of Semiconductor Quantum Devices, Second edition, Spinger, 2013

Examination

- INL1 - Assignments, 1.0 credits, grading scale: P, F
- LAB1 - Laboratory work, 2.5 credits, grading scale: P, F
- TEN1 - Written exam, 4.0 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

Course examination through:

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

2. passed lab experiments (LAB1&2; 2,5 credits, grading scale P/F), and

3. written exam (TEN1; 4 credits, grading scale P/F), alternatively an extended report for Lab 2, alternatively an oral presentation of the course contents in the context of PhD student's own study and research activities.

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.