FSK3450 Advanced Materials and Processing Technologies for Photonics 7.5 credits

Avancerade material och tillverkningsteknik för fotonik

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

Establishment

Course syllabus for FSK3450 valid from Autumn 2018

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Enrolled as PhD student.

Language of instruction

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

Intended learning outcomes

- Be able to analyze the properties of materials and associated technologies and make judicious choice of the appropriate material/technology for a given application.
- To have a grasp of the state-of-the-art materials and technologies relevant for current and emerging topics in optics and photonics.

Course contents

he theme of the course is on materials for optics and photonics covering relevant material properties and technologies. Photonics has fundamentally influenced the way we live, with a wide range of applications examples, which include lighting, displays, optical communications, sensing, security, biology and health-care, and renewable energy (to name a few). However compared to electronics, in particular Si-technology, the scenario is rather complex with photonics. Owing to the variety of wavelength specific applications - from deep UV to far-infra red - as commonly identified in “photonics”, it is nearly impossible to identify one or even limited number of materials/technology with photonics. More often than not, a given requirement/need implies specific physical properties and hence the associated “material” and the “material specific” technologies. Besides new concepts such as photonic crystals, metal optics, meta-materials, and nanostructured optical media have emerged together with advances in nanofabrication. Thus a reasonable appreciation of optics and photonics requires a good understanding of materials (“Materials Matter”) - their optical properties and the fabrication technologies. Keeping this in view the course aims to cover relevant photonic materials and process technologies. A detailed and in-depth description of each of the materials is virtually impossible in a single course, but for some selected topics there are separate courses in the program.
TOPICS: Photonic glasses, optical fibres and speciality fibres, meta-materials, nanostructured materials including photonic crystals, non-linear materials, magneto-optical materials, low-dimensional semiconductors, state-of-the-art processing techniques, esp. nano and micro-fabrication, optoelectronic device technology, planar light wave circuits, technology for metal optics, organic materials, emerging photonic integration –materials and technologies.

Disposition

Student Seminars and discussions on selected literature. Student driven labs and lab reports. Every student designs and conducts two labs in his/her fields of expertise (e.g. measurements, fabrication/synthesis, theory/numerical simulations) and takes part in three such labs offered by other participants. The laboratories are not of the demonstration type. The expected engagement level (participants) of a lab is 2 full day (average).

Course literature

Review articles, selected key references and seminar material.

Examination

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.

SEM1: Seminars and discussions, 2.5 credits, grades: P/F
LAB1: Laboratory work, 5 credits, grades: P/F

Other requirements for final grade

Seminar: give one seminar during the course
Attend all seminar and discussion sessions
Labs: Design and conduct at least 2 labs and participation in other 3, submission of lab reports

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.