FIO3001 Advanced Materials and Processing Technologies for Photonics 10.5 credits

Avancerade material och processteknik för fotonik

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

Establishment

Course syllabus for FIO3001 valid from Spring 2010

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Language of instruction

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

Intended learning outcomes

· To understand 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

The 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 of 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.

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

24 x 2 lectures

Discussion sessions (at least 80% attendance) also will be a basis of evaluation

Student seminars (targeted to enlarge the scope of the lecture-topic) - compulsory and will form the basis of evaluation.

Student driven lab sessions

Course literature

Lecture notes, review articles and/or selected key references

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.

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.