SK2537 Fluorescence Spectroscopy in Biomedical Research 7.5 credits

Fluorescens-spektroskopi för biomedicinska studier

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

The headmaster at the SCI school has 2021-10-13 decided to establish this syllabus to apply from Autumn 2022, registration number: S-2021-1220.

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

Completed degree project at the undergraduate level in technical physics, medical technology, biotechnology or chemistry.

English B / English 6

Language of instruction

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

Intended learning outcomes

After passing the course, the student should be able to:

- Explain the basic physical mechanisms of fluorescence generation.
- Explain how the interaction between biomolecules and electromagnetic radiation as well as environmental effects can generate differences in the measured fluorescence parameters, and how these differences can be used to monitor biomolecules and their interactions.
- Explain the physical principles of the most important fluorescence techniques in the field of biomedical research, and the type of questions these techniques can be used to answer.
- Based on knowledge of these techniques and their physical principles, be able to describe and justify which factors limit their performance, and how obtained measurement results are evaluated.
- Explain, discuss and assess the potential of key parts in the latest developments in the field of fluorescence spectroscopy.

Course contents

Introduction to fluorescence, physical description of absorption and emission processes, fluorescence markers and their characteristics, environmental effects / fluorescent molecular sensors, other photo-induced non-fluorescent states of fluorophores, polarization and molecular rotation measurements, Resonance energy transfer (FRET) ultra-sensitive fluorescence spectroscopic and fluorescence microscopic techniques including single-molecule spectroscopy and fluctuation spectroscopy methods, fluorescence spectroscopic applications in biology, medicine and drug development.

Examination

- LAB1 - Laboratory work, 1.5 credits, grading scale: P, F
- PRO1 - Project, 1.0 credits, grading scale: P, F
- TEN1 - Written exam, 5.0 credits, grading scale: A, B, C, D, E, FX, 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.

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.