



SK2521 Fluorescence Spectroscopy for Biomolecular Studies 6.0 credits

Fluorescens-spektroskopi för biomolekylära 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 Head of School at the SCI School has decided on April 15, 15, to adopt this syllabus to apply from HT2020 diary number: S-2020-0281.

Grading scale

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

Education cycle

Second cycle

Main field of study

Biotechnology, Engineering Physics, Physics

Language of instruction

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

Intended learning outcomes

After completing the course the student should be able to:

- explain the basic physical mechanisms of fluorescence.
- 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 utilized for the observation of biomolecules and their interaction.
- explain the physical principles of the most important fluorescence techniques in the biomedical research field, and what kind of questions these techniques can be used to answer.
- describe and motivate which factors limit the performance of fluorescence techniques, and how measurement results obtained are evaluated.
- describe, discuss and assess the potential of key elements in the latest developments in the fluorescence spectroscopic field.

Course contents

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

Specific prerequisites

Mathematics corresponding to B2, D2, E2, F2, M2, T2. Fundamental knowledge of Physics, Course SK2520 (Experimental methods in molecular biophysics).

Recommended previous knowledge:

Fundamental knowledge in quantum mechanics and optics advantageous, but not absolutely required.

Examination

- LAB1 - Laboratory Work, 1.0 credits, grading scale: P, F
- PRO1 - Project, 1.0 credits, grading scale: P, F
- TEN1 - Examination, 4.0 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.

One written examination (TEN1, 4hp, grades A-F), one oral project presentation (PRO1; 1hp, grades P/F), laborations, exercises (LAB1; 1hp, grades 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.