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.

Establishment

Course syllabus for SK2521 valid from Autumn 2008

Grading scale

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

Education cycle

Second cycle

Main field of study

Physics, Engineering Physics, Biotechnology

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.

Language of instruction

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

Intended learning outcomes

This course covers methods in fluorescence spectroscopy that are used to study biomolecules and their interactions. After this course the students are expected to be able to:

- explain the fundamental physical mechanisms involved in the generation of fluorescence light
- explain how interactions between biomolecules and electromagnetic radiation and environmental effects can generate changes in the measured fluorescence parameters, and how these changes can be exploited for monitoring of biomolecules and their interactions
- Mention the most important fluorescence techniques in the biomedical research field, and explain what type of questions these techniques can address
- Describe the physical principles of these fluorescence techniques,.
- Based on knowledge on these techniques and their physical principles, describe and motivate what the factors are that limit their performance, and how the obtained measurements data are evaluated
- Follow, report on, and discuss relevant parts of the latest development 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 / fluorescence molecular sensors, other photo-induced non-fluorescent states of fluorophores, polarization and rotational measurements of molecules, resonance energy transfer (FRET) and molecular distance measurements with fluorescence, ultra-sensitive fluorescence spectroscopic and microscopic techniques, including single molecule spectroscopy and methods based on fluctuation analysis, applications of fluorescence spectroscopy in biology, medicine and drug development.

Lectures (20 h), laborations (12 h), 1 project task with oral presentation, 1 control exam

Course literature

JR Lakowicz ”Principles of fluorescence spectroscopy” Kluwer Academic.

B Valeur, Molecular fluorescence. Principles and applications, Wiley-VCH.

(the editions used will be announced on the course home page at least four weeks prior to the start of the course).

Scientific articles.

Laboratory instructions

Examination

- PRO1 - Project, 1.0 credits, grading scale: P, F
- TEN1 - Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 1.0 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.

If the course is discontinued, students may request to be examined during the following two academic years.

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.