



FSK3534 New Super-resolution, Light-sheet, and FCS methods at Scilifelab 3.0 credits

Nya metoder inom superupplösning, ljusplansmikroskopi och FCS vid Scilifelab

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

Establishment

The course plan applies from HT 2024 according to faculty board decision: X-2024-0934.
Decision date: 2024-06-10.

Grading scale

P, F

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

After completed course the student should be able to:

- Describe theory and method behind the techniques STED-, MoNaLISA-, and MINFLUX microscopy, light-sheet and lattice light-sheet imaging, the fluctuation method FCS, and the basics of FCCS, FRET-FCS, STED-FCS, and line-scan FCS.
- Explain how these techniques can be applied in their own project and how the central questions in these projects thereby can be answered.
- Compare the capability of the super-resolution techniques, with each other and with diffraction-limited techniques. Compare the different FCS-techniques.
- Analyze images from the super-resolution and light-sheet techniques. Analyze measurements from the different FCS-techniques.
- Calculate quantities such as field of view, light-sheet thickness, resolution given a certain STED-power, and concentration and molecular brightness in the FCS-techniques.

Course contents

- Introduction to fluorescence spectroscopy and imaging
- Principles of super-resolution microscopy
- STED- and RESOLFT-based super-resolution microscopy
- The imaging-technique MoNaLISA
- The imaging- and tracking-technique MINFLUX
- Light-sheet imaging
- Lattice light-sheet imaging
- Introduction to Fluorescence Correlation Spectroscopy (FCS)
- Variants of FCS such as FCCS, STED-FCS, FRET-FCS, and line-scan FCS

Examination

- PRO1 - Project description, 3.0 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.

- Project description where at least one of the techniques covered in the course is central for the project. 3.0 hp. Grades: P, F. The project description should be handed in no later than Wednesday the second week of the course, and is presented orally to the group and teachers on Friday week two.

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.