Course analysis Microscopy SK2500/SK2501/FSK3500/FSK3501 HT 2023

Number of credits: 6p for SK2500/FSK3500, 7.5 p for SK2501/FSK3501 (4 p exam A-F, 2 p labs P/F, 1.5 p seminar P/F on SK2501)
Course responsible: Ilaria Testa
Other teachers: Anna Burvall (lectures, labs) and Franchesca Pennachietti (lectures, labs). This year Ilaria was on sabbatical in the US so she gave her lectures over zoom.
Teaching hours: 26h lectures, 16 h labs, 4 h seminar (SK2501/FSK3501 only)
Number of registered students: 5 on SK2500, 4 on SK2501, 2 on FSK3501
Number of pass at exam or re-exam: All registered students passed
Levels of pass: 100% on SK2500, 100% on FSK3501, 100% on SK2501 on exam after first re-exam
Total pass level: In total 100% pass after first re-exam
Number or answers to course evaluation: 2 (20%)

Course objectives:

After completing the course the student should be able to:

- adjust the illumination system to obtain optimal performance in transmission microscopy.
- select a suitable light source and optical filters, and correctly adjust the illumination system for fluorescence microscopy.
- select a suitable objective (correction, immersion etc) for various types of microscopic investigations.
- select a suitable contrast method (phase contrast, DIC, fluorescence, darkfield etc) and correctly use this technique to obtain high-quality images.
- calculate the expected image quality regarding resolution and signal-to-noise ratio for different practical imaging situations.
- understand and be able to describe the physical limitations for microscope performance concerning resolution and signal-to-noise ratio.
- describe performance for different types of microscopes by using (and in some simple cases calculating) optical transfer functions.
- select a suitable sampling density for digital image recording in microscopy.
- do computer processing of microscopic images to visualise three-dimensional structures.
- perform quantitative measurements in microscopic images using a computer.

Feedback from students: course evaluation

Only 2 students answered the digital course evaluation. They were positive to the course, as were the students we talked to during the course.

Couse analysis

Judging from the course evaluation, student contact, and exam results, the course was appreciated and met the objectives. However we encountered a major difficulty during the course. After the pandemic we have posted recorded materials that roughly correspond to the lecture material. This year, we found this led to a dramatic drop in student attendance. As the students still did the work and learnt what they needed this is not a problem in itself. However, it is a waste of teacher time to spend so much time preparing and giving on-campus lectures that so few students attend. It is also depressing for the teacher. Hence for next year we propose a new format for the lectures.

Also, the confocal microscope used for lab 3 is getting very old and cranky, and it's hard to tell when it will die. Hence it would be better to move the confocal lab to more modern equipment at SciLife.

Next year's course

The plan for next year is to split the lectures into digital lectures that use recorded material (we can re-use a lot from the pandemic) and physical on-campus sessions. The digital lectures will cover the lecture material, while the on-campus sessions will be more collaborative and focus on discussing and implementing the material learnt from the recordings.

This means the recorded materials from two of the previous lectures will be combined into one digital lecture, while other activities (problem solving, mentimeter questions) from the same lectures will be combined into one on-campus session. The exceptions are the very first lecture (course info and introduction to microscopy) which will be given as before, and the very last lecture which already is a problem-solving session. Hence the teachers and students will meet once a week on campus, in addition to the mandatory labs. This is very much in line with the active learning concepts currently promoted at KTH.

Labs one and two will run as usual in AlbaNova. Lab 3 will be moved completely to SciLife. As the equipment differs it will need to be changed, with new lab tasks and instructions.

The exam will be given in the same way as last year. However, by active participation in the on-campus sessions, students can earn bonus points for the exam.

In a longer perspective, the imaging physics compendium should be updated including single molecule localization theory and exercise. This has been planned for some years, but this year the "flipped-classroom" re-make descrobed above takes precedence.