

### Course analysis Microscopy SK2500/SK2501/FSK3500/FSK3501 HT 2019

- 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: Anna Burvall and Ilaria Testa, both on lectures and labs  
Other teachers: This year Ilaria was on maternity leave so Francesca Pennachietti gave lectures 12-13, lab 3b and the seminars, while Anna did the rest. -  
Teaching hours: 26h lectures, 16 h labs, 4 h seminar (SK2501/FSK3501 only)  
Number of registered students: 2 on SK2500, 16 on FSK3501, 2 on FSK3501 and 2 on FSK3500  
Number of pass at exam or re-exam: 2 on SK2500, 15 on SK2501, 2 on FSK3501  
Levels of pass: 100% on SK2500, 94% on FSK3501, 100% on SK2501 on exam after first re-exam  
19 students (95%) pass on labs  
17 students (94%) pass on seminar (FSK3501 and SK2501)  
Total pass level: In total 95% pass after first re-exam  
Number or answers to course evaluation: 4 (20%)

### Course objectives:

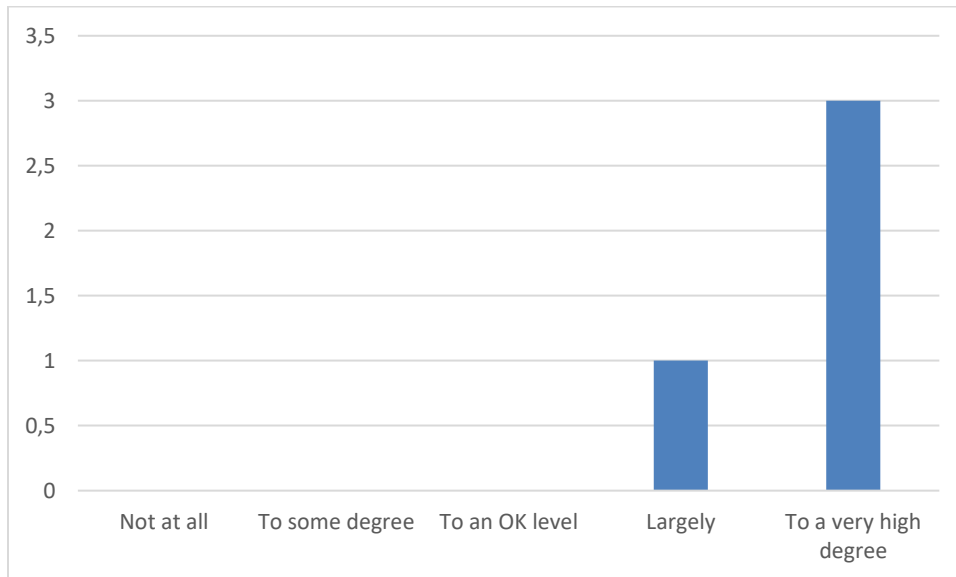
After completing the course the student should be able to:

- 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

- **Did the course, as a whole, allow you to develop useful knowledge or skills?**



- **What was good (i.e., should not be changed)?**

- I liked that the lectures had different components (e.g. questions on mentimeter, regular slides and problem solving parts). I also liked that the lectures were very tightly connected to the Light Microscopy and Imaging Physics compendiums, so that it was easy to read up on parts that you didn't understand during the lecture.
- The labs were good.
- The labs ! I learned a lot during lab sessions !
- Very interesting lectures and the labs.

- **What can be improved?**

- More similar questions to be solved during lectures like the ones on the exam. I thought that the exam questions were quite much more difficult than the problems to be solved during lecture.
- Maybe introduce exercises into the course to get more opportunities to work with the course content (not only read it).
- It might be great to do exercise sessions altogether in class (I mean not during lectures but extra specific hours).
- There should be more time scheduled for the confocal microscopy lab and the STED lab, was very much to do during so short period of time.

There were also some additional questions on the hybrid format.

### Couse analysis

Judging both from the course evaluation and from the exam results, the course was appreciated and met the objectives.

Due to the pandemic Sars-Cov2 recommendations (e.g. limited number of students per room, stay at home if you have symptoms) we tested running the course in a hybrid format, using the smaller rooms D31 and D37 on campus that are specifically prepared for hybrid. In addition, the students had filmed material from last year as a back-up.

#### Lectures and Exercise:

In general, this hybrid approach has worked really well. Personally I (Anna) have found that setting up your own hybrid equipment limits your lecture quite severely. But in D31 and D37 equipment was good enough that you could give your lecture as usual, not creating extra difficulties. The exception was one lecture when the equipment was down and didn't work at all, despite quick help from it-support.

This is also confirmed by the four students who filled out the course evaluation. Some care should be taken when interpreting these answers, as these students all preferred to be there in person and only used the distance option if they were unable to come to campus. In general, the hybrid format would be interesting for this kind of master courses even after corona, as the students come from such diverse groups and attend so many different courses. Anything that helps them make their schedule work is probably appreciated

#### Exam:

We kept the exam format from last year (oral exam for pass, additional home exam for higher grade), even though we could have been allowed a campus exam. The format works well enough that we consider keeping it permanently. We just need to create a bit more variation on the oral questions.

#### Labs:

Then major course development this year was that the normal lab 3a on confocal microscopy was reduced to two hours and some material removed. Instead lab 3b was added, a 2-hour lab at SciLife using a STED system. In general, this seems to have worked well. The students appreciate the chance of using a STED system! Some details still need to be worked out, for example reducing lab 3a a bit further and working on the instructions for lab 3b (in particular how to download the necessary software, this info is currently on the canvas page but not in the instructions).

### Next year's course

For next year we need to implement Ilaria's suggestion: that the confocal lectures could be somewhat shortened and other material included instead. The plan is to shorten the confocal lectures (lectures number 9-11) into two, and turn the extra lecture into a combination of a problem-solving session and introduction to STED. This will allow to dedicate additional time during lecture 12 and 13 - at the end of the course- to additional sync problem-solving and general comparisons within the techniques discussed in the whole course. On this line, mentimeter type of questionnaire followed by live discussions and reflections will be introduced. This was planned for HT21 but put on hold for family reasons (parental leave).

Lab 3, using the confocal microscope, worked fine in its shortened version but will eventually not work as the confocal microscope at AlbaNova is growing old. We still need to figure out how to make this work.

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 hasn't been realistic given the circumstances.