Module Name
Advanced Light and Electron Microscopy

Type of Module	**Module Code**
o Advanced Module	Advanced Light and Electron Microscopy

Identification Number	**Workload**	**Credit Points**	**Term**	**Offered Every**	**Start**	**Duration**
MN-B-SM (P 2)	360 h	12 CP	2nd term of studying	Summer term	summer term only	7 weeks

1	**Course Types**	**Contact Time**	**Private Study**	**Planned Group Size**
	a) Lectures	40 h	80 h	max. 6
	b) Practical/Lab	80 h	133 h	max. 2-3
	c) Seminar	3 h	24 h	max. 2

2 Module Objectives and Skills to be Acquired

Students who successfully completed this module

- have acquired theoretical and experimental skills in state-of-the art light and electron microscopy methodologies.
- are able to plan, carry out and evaluate a project using advanced light and electron microscopy.
- are able to perform quantitative image analysis independently.
- have learned how to present research results in oral and written form and to critically discuss scientific publications related to the topic of the module on a professional level.
- are able to transfer skills acquired in this module to other fields of biology.

3 Module Content

Advanced Light microscopy:

- Optical principles of light microscopy
- Different kinds of fluorescent microscope types and their strength
- Advanced fluorescence techniques (including FCS, FRET and FLIM)
- Multi Photon microscopy including other non-linear techniques (SHG, CARS)
- Superresolution microscopy (STED, SIM, dSTORM and Minflux)

Electron microscopy (EM):

- Principles of transmission and scanning electron microscopy
- Basic EM preparation techniques (embedding, cutting, contrasting)
- Advanced EM preparation techniques (Tokuyaso with Immunogold, negative staining)
- Electron Tomography
- Correlative light and electron microscopy
- *Explanatory note:* To gain insight into state-of-the art methodologies the course will start with a combination of a lecture series and hands-on experience introducing different techniques (two weeks LM, two weeks EM). Three days are dedicated to Image Analysis and Data handling. An oral presentation will be given on dedicated techniques.

4	**Teaching Methods** Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form
5	**Prerequisites (for the Module)** Enrollment in the Master's degree course "Biological Sciences", in the Master's degree course "Biochemistry" or in the Master's degree course "Chemistry"
6	**Type of Examination** The final examination consists of two parts: written examination on topics of lectures, seminars and the practical/lab part (1 hour; 50 % of the total module mark), oral presentation (20-30 min; 25 % of the total module mark), seminar paper (25% of the total module mark)
7	**Credits Awarded** Regular and active participation Each examination part at least "sufficient" (see appendix of the examination regulations for details)
8	**Compatibility with other Curricula** Biochemical subject module in the Master's degree course "Biochemistry"
9	**Proportion of Final Grade** In the Master's degree course "Biological Sciences": 12 % of the overall grade (see also appendix of the examination regulations)
10	**Module Coordinator** Dr. Astrid Schauss, phone 478-84027, e-mail: aschauss@uni-koeln.de
11	**Further Information** **Subject module** of the Master's degree course "Biological Sciences", **Participating faculty:** Dr. A. Schauss, Math.-Nat. faculty, CECAD **Literature:** • Information about textbooks and other reading material will be given on the ILIAS representation of the course (https://www.ilias.uni-koeln.de/ilias/goto_uk_cat_2815610.html) **General time schedule:** Week 1-6 (Mon.-Fri.): Lectures and practical/lab and preparation for the seminar talk (topic and date will be arranged individually); Week 7 (Mon.-Fri): Preparation for the written examination **Note:** The module contains hand-on laboratory work conducted by small groups of students and is taught in research laboratories. Only if the Corona situation permits it, the module will be held in an online format. **Introduction to the module:** March 31st, 2023 at 10:00 a.m., CECAD Building (Joseph-Stelzmann-Str. 26), Room 0.037/0.038 or online (in this case, further information/link will be sent to your Smail-Account). **Written examination:** May 19, 2023, second/supplementary examination August 05, 2023; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.

* 5 students from the Master's degree course "Biological Sciences" and 1 student from the Master's degree course "Biochemistry".