

Advanced Light and Electron Microscopy					
Identification number	Workload	Credit points	Term of studying	Frequency of occurrence	Duration
MN-B-SM (Z 1)	360 h	12 CP	1 <sup>st</sup> or 2 <sup>nd</sup> term of studying	Summer term, 1 <sup>st</sup> half	7 weeks
1	<b>Type of lessons</b>		<b>Contact times</b>	<b>Self-study times</b>	<b>Intended group size*</b>
	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	<b>Aims of the module and acquired skills</b> Students who successfully completed this module ... <ul style="list-style-type: none"> <li>• have acquired theoretical and experimental skills in state-of-the art light and electron microscopy methodologies.</li> <li>• are able to plan, carry out and evaluate a project using advanced light and electron microscopy.</li> <li>• are able to perform quantitative image analysis independently.</li> <li>• 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.</li> <li>• are able to transfer skills acquired in this module to other fields of biology.</li> </ul>				
3	<b>Contents of the module</b> <u>Electron microscopy (EM):</u> <ul style="list-style-type: none"> <li>• Principles of transmission and scanning electron microscopy</li> <li>• Basic EM preparation techniques (embedding, cutting, contrasting)</li> <li>• Advanced EM preparation techniques (Tokuyaso with Immunogold, negative staining)</li> <li>• Electron Tomography</li> <li>• Correlative light and electron microscopy</li> </ul> <u>Advanced Light microscopy:</u> <ul style="list-style-type: none"> <li>• Optical principles of light microscopy</li> <li>• Different kinds of fluorescent microscope types and their strength</li> <li>• Advanced fluorescence techniques (including FCS, FRET and FLIM)</li> <li>• Multi Photon microscopy including other non-linear techniques (SHG, CARS)</li> <li>• Atomic Force microscopy</li> <li>• Superresolution microscopy (STED, SIM, dSTORM and Minflux)</li> </ul> <p><i>Explanatory note:</i> 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 EM, two week LM). Three days are dedicated to Image Analysis and Data handling.</p>				
4	<b>Teaching/Learning methods</b> <ul style="list-style-type: none"> <li>• Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form</li> </ul>				

5	<p><b>Requirements for participation</b></p> <p>Enrollment in the Master's degree course "Biological Sciences", in the Master's degree course "Biochemistry" or in the Master's degree course "Chemistry"</p>
6	<p><b>Type of module examinations</b></p> <p>The final examination consists of three parts: Two hours written examination about topics of the lectures (50 % of the total module mark), oral presentation (25 % of the total module mark) and seminar paper (25 % of the total module mark)</p>
7	<p><b>Requisites for the allocation of credits</b></p> <p>Regular and active participation; Each examination part at least "sufficient" (see appendix of the examination regulations for details)</p>
8	<p><b>Compatibility with other Curricula</b></p> <p>Biological subject module in the Master's degree course "Biochemistry"</p>
9	<p><b>Significance of the module mark for the overall grade</b></p> <p>In the Master's degree course "Biological Sciences": 15 % of the overall grade (see also appendix of the examination regulations)</p>
10	<p><b>Module coordinator</b></p> <p>Dr. Astrid Schauss, phone 478-84027, e-mail: aschauss@uni-koeln.de</p>
11	<p><b>Additional information</b></p> <p><b>Subject module</b> of the Master's degree course "Biological Sciences"</p> <p><b>Participating faculty:</b> Dr. A. Schauss, Prof. Dr. B. Maier, Dr. F. Nitsche</p> <p><b>Literature:</b></p> <ul style="list-style-type: none"> <li>Information about textbooks and other reading material will be given on the ILIAS representation of the course (<a href="https://www.ilias.uni-koeln.de/ilias/goto_uk_cat_2815610.html">https://www.ilias.uni-koeln.de/ilias/goto_uk_cat_2815610.html</a>)</li> </ul> <p><b>General time schedule:</b> Week 1-6 (Mon.-Fri.): Lectures and practical/lab, writing seminar paper and preparation for the seminar talk (topic and date will be arranged individually); Week 7 (Mon.-Fri): Preparation for the written examination</p> <p><b>Note:</b> The module contains hand-on laboratory work conducted by small groups of students and is taught in research laboratories. The module does not contain computer-based practicals/research as a main component.</p> <p><b>Introduction to the module:</b> April 09, 2021 at 10:30 a.m., CECAD Building (Joseph-Stelzmann-Str. 26), seminar room (first floor) or online (in this case, further information/link will be sent to your Smail-Account); for preparation to the module before this introduction see ILIAS link under literature.</p> <p><b>Written examination:</b> May 31, 2021, second/supplementary examination August 06, 2021; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.</p>

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

**Corona note!** Depending on the Corona situation during the summer term, practical work may be skipped either totally or in part. In this case, some or all practical parts will be replaced by adequate alternatives so that (i) the workload and (ii) the principle content of the modules remained unchanged.