

<b>Module Name</b> Advanced Light and Electron Microscopy						
<b>Type of Module</b> ○ Advanced Module				<b>Module Code</b> Advanced Microscopy		
<b>Identification Number</b>	<b>Workload</b>	<b>Credit Points</b>	<b>Term</b>	<b>Offered Every</b>	<b>Start</b>	<b>Duration</b>
MN-B-SM (GA 1)	360 h	12 CP	2 <sup>nd</sup> term of studying	Summer term, 1 <sup>st</sup> half	Summer term only	7 weeks
<b>1</b>	<b>Course Types</b>		<b>Contact Time</b>		<b>Private Study</b>	
	a) Lectures		40 h		80 h	
	b) Practical/Lab		80 h		133 h	
	c) Seminar		3 h		24 h	
<b>2</b>	<b>Module Objectives and Skills to be Acquired</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>					
<b>3</b>	<b>Module Content</b> <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 Advanced Light microscopy:</li> <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>• 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 weeks LM). Three days are dedicated to Image Analysis and Data handling. An oral presentation will be given on dedicated techniques.</p>					
<b>4</b>	<b>Teaching 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>					

<b>5</b>	<b>Prerequisites (for the Module)</b> Enrollment in the Master's of Science degree course "Genetics and Biology of Aging and Regeneration" or in the Master's degree course "Biochemistry and Molecular Medicine" <b>Additional academic requirements</b> Previous attendance of the lecture module Principles of Molecular Genetics, Development and Aging
<b>6</b>	<b>Type of Examination</b> The final examination consists of two parts: One hour written examination on topics of lectures, seminars and the practical/lab part (50 % of the total module mark), oral presentation (20-30 min; 50 % of the total module mark)
<b>7</b>	<b>Credits Awarded</b> Regular and active participation; Each examination part at least "sufficient" (see appendix of the examination regulations for details)
<b>8</b>	<b>Compatibility with other Curricula*</b> Optional compulsory module in the Master's degree course "Biochemistry and Molecular Medicine"
<b>9</b>	<b>Proportion of Final Grade</b> 12.0 %
<b>10</b>	<b>Module Coordinator</b> Dr. Astrid Schauss, phone 478 84027, e-mail: aschauss@uni-koeln.de
<b>11</b>	<b>Further Information</b> <b>Participating faculty:</b> Dr. A. Schauss, Math.-Nat. faculty, CECAD <b>Literature:</b> <ul style="list-style-type: none"><li>Information on recommended textbooks and other reading material will be given on the ILIAS representation of the course (see <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> <b>General time schedule:</b> Week 1-6 (Mon.-Fri.): Lectures, practical/lab and preparation for the oral presentation (held at the end of week 6); Week 7 (Mon.-Fri.): Preparation for the written examination <b>Note:</b> The module contains hands-on laboratory work conducted by small groups of students and is taught in research laboratories. <b>Introduction to the module:</b> April 9, 2026 at 1 p.m., CECAD Building (Joseph-Stelzmann-Str. 26), Room 0.037/0.038. <b>Written examination:</b> June 05, 2026, second/supplementary examination August 14, 2026; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.