

<b>Module Name</b> Mitochondria and Neurodegeneration						
<b>Type of Module</b> ○ Advanced Module				<b>Module Code</b> Mitochondria and Neurodegeneration		
<b>Identification Number</b> MN-B-SM (A 1)	<b>Workload</b> 360 h	<b>Credit Points</b> 12 CP	<b>Term</b> 2 <sup>nd</sup> term of studying	<b>Offered Every</b> Summer term, 1 <sup>st</sup> half	<b>Start</b> Summer term only	<b>Duration</b> 7 weeks
<b>1</b>	<b>Course Types</b> a) Lectures b) Practical/Lab c) Seminar		<b>Contact Time</b> 10 h 150 h 12 h		<b>Private Study</b> 80 h 80 h 40 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 gained in-depth knowledge in mitochondrial research and the role of mitochondrial dysfunction in neurodegeneration and aging.</li> <li>• have acquired experimental skills in state-of-the art methodologies in cell biology and molecular biology and can independently carry out small scientific projects related to the topic of the module.</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 mitochondrial biology including protein and membrane biogenesis, mitochondrial dynamics and inheritance, and mitochondrial genetics</li> <li>• The role of mitochondrial dysfunction for aging and disease</li> <li>• Mechanisms of mitochondrial quality control including autophagy and apoptosis</li> <li>• The role of mitochondria for neuronal activities and survival</li> <li>• Mitochondrial DNA mutations and human disease</li> <li>• Mitochondria and neurodegenerative diseases including Parkinson disease, amyotrophic lateral sclerosis, hereditary spastic paraplegia, spinocerebellar ataxia, and peripheral neuropathies</li> <li>• Analysis of subcellular localization of proteins using fluorescence microscopy and cellular fractionation</li> <li>• Molecular cloning (cloning of PCR fragments into plasmids, transfections, etc.)</li> <li>• Cell culture technology (working with human and murine cell lines)</li> <li>• Immunohistochemistry</li> </ul>					

3	<p><b>Module Content</b> (continued)</p> <ul style="list-style-type: none"> <li>Protein analysis and protein-interaction methods (Western blotting, co-immunoprecipitation of proteins, pull-down, etc.)</li> <li>Analysis of knock-out and transgenic mice</li> </ul> <p><i>Explanatory note:</i> The list above comprises techniques that are commonly used in the participating groups. Thus, every student will be confronted with a large subset of it. The exact content, however, will depend on the tutor and the research project the student will work on.</p>
4	<p><b>Teaching Methods</b></p> <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>Prerequisites (for the Module)</b></p> <p>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"</p> <p><b>Additional academic requirements</b></p> <p>Previous attendance of the lecture module Principles of Molecular Genetics, Development and Aging</p>
6	<p><b>Type of Examination</b></p> <p>The final examination consists of two parts: One hour written examination on topics of lectures and seminars (50 % of the total module mark), poster presentation (20-30 min; 50 % of the total module mark)</p>
7	<p><b>Credits Awarded</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>Optional compulsory module in the Master's degree course "Biochemistry"</p>
9	<p><b>Proportion of Final Grade</b></p> <p>12.0 %</p>
10	<p><b>Module Coordinator</b></p> <p>Prof. Dr. Elena Rugarli, phone 478 84244, e-mail: elena.rugarli@uni-koeln.de</p>
11	<p><b>Further Information</b></p> <p><b>Participating faculty:</b> Prof. Dr. M. Bergami, Dr. M. Corrado, Dr. M. Escobar, Prof. Dr. A. Garcia, Prof. Dr. T. Langer, Dr. E. Motori, Prof. Dr. J. Riemer, Prof. Dr. E. Rugarli, Dr. H. Scheiblich; Prof. Dr. A. Trifunovic.</p> <p><b>Literature:</b></p> <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> <p><b>General time schedule:</b> Week 1-5 (Mon.-Fri.): Lectures, practical/lab and preparation for the oral presentation (topic and date will be arranged individually); Week 6 (Mon.-Fri.): Oral presentation of individual research results; Week 7 (Mon.-Fri.): Preparation for the written examination</p>

<b>11</b>	<p><b>Further Information</b> (continued)</p> <p><b>Note:</b> The module contains hands-on laboratory work conducted individually 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 4, 2025 at 14:00 a.m. (CECAD Research Center, room will be communicated on the ILIAS link) 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 23, 2025, second/supplementary examination August 15, 2025; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.</p>
-----------	--