Module Name
Mitochondria and Neurodegeneration

Identification Number	Workload	Credit Points	Term	Offered Every	Start	Duration
MN-BC-BSM09	360 h	12 CP	1st or 2nd term of studying	Summer term	summer term only	7 weeks

1	Course Types	Contact Time	Private Study	Planned Group Size*
	a) Lectures	24 h	80 h	max. 10
	b) Practical/Lab	150 h	80 h	max. 1
	c) Seminars	6 h	20 h	max. 2

2 Module Objectives and Skills to be Acquired

Students who successfully completed this module

- have gained in-depth knowledge in mitochondrial research and the role of mitochondrial dysfunction in neurodegeneration and aging.
- have acquired experimental skills in state-of-the art methods in cell biology and molecular biology (see contents of the module) and are able to independently design and perform small scientific projects related to topics of the module.
- 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

- Principles of mitochondrial biology including protein and membrane biogenesis, mitochondrial dynamics and inheritance, and mitochondrial genetics
- The role of mitochondrial dysfunction for aging and disease
- Mechanisms of mitochondrial quality control including autophagy and apoptosis
- The role of mitochondria for neuronal activities and survival
- Mitochondrial DNA mutations and human disease
- Mitochondria and neurodegenerative diseases including Parkinson disease, amyotrophic lateral sclerosis, hereditary spastic paraplegia, spinocerebellar ataxia, and peripheral neuropathies
- Analysis of subcellular localization of proteins using fluorescence microscopy and cellular fractionation
- Molecular cloning (cloning of PCR fragments into plasmids, transfections, etc.)
- Cell culture technology (working with human and murine cell lines)
- Immunohistochemistry
- Protein analysis and protein-interaction methods (Western blotting, co-immunoprecipitation of proteins, pull-down, etc.)
- Analysis of knock-out and transgenic mice

Explanatory note: 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.

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 "Genetics and Biology of Aging and Regeneration" or in the Master´s degree course "Biochemistry and Molecular Medicine". **Additional academic requirements** For Students of Master "Genetics and Biology of Aging and Regeneration": Previous attendance of the lecture module "Principles of Molecular Genetics, Development and Aging (A/D/G)".
6	**Type of Examination** The final examination consists of two parts (Type BC3): Written examination on topics of lectures and seminars (1 hour; 50 % of the total module mark), oral presentation of the research performed in the lab in a poster session with questions (20-30 min; 50 % 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*** Optional compulsory module in the Master´s degree course "Genetics and Biology of Aging and Regeneration".
9	**Proportion of Final Grade** In the Master´s degree course "Biochemistry and Molecular Medicine": 10 % of the overall grade (see also appendix of the examination regulations)
10	**Module Coordinator** Prof. Dr. Elena Rugarli, phone 478-84244, e-mail: elena.rugarli@uni-koeln.de
11	**Further Information** **Participating faculty**: 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, Prof. Dr. A. Trifunovic. **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 1-5 (Mon.-Fri.): Lectures, practical/lab and preparation for the poster presentation (topic and date will be arranged individually); Week 6 (Mon.-Fri.): Scientific poster presentation of individual research results; Week 7 (Mon.-Fri): Preparation for the written examination **Note:** The module contains hand-on laboratory work conducted individually and is taught in research laboratories. The module does not contain computer-based practicals/research as a main component.

* 8 students from the Master´s degree course "Genetics and Biology of Aging and Regeneration" and 2 students from the Master´s degree course "Biochemistry and Molecular Medicine".