Module Name
Lecture Principles of Molecular Genetics, Development and Aging

Type of Module	**Module Code**
o Basic Module	Aging Lecture

Identification Number	**Workload**	**Credit Points**	**Term**	**Offered Every**	**Start**	**Duration**
MN-B-GA 1	180 h	6 CP	1st term of studying	Winter term	Winter term only	1 term

1	**Course Types**	**Contact Time**	**Private Study**
	Lecture	49 h	131 h

2 Module Objectives and Skills to be Acquired

Students who successfully completed this module

- have acquired an understanding of principles and mechanisms of molecular and cellular biology and key concepts in modern genetics and aging research.
- have acquired in-depth knowledge of molecular, cellular and systemic mechanisms that orchestrate development and organismal homeostasis and how their malfunctions contribute to aging and aging-associated diseases.
- can solve problems and develop strategies to answer questions related to molecular genetics and mechanisms underlying organismal development and aging.

3 Module Content

- Hallmarks of Aging
- DNA stability, damage and repair, DNA replication and recombination
- Regulation of gene expression, transcription, RNA processing
- Epigenetics
- Regulation of translation, protein folding and posttranslational modification of proteins
- Proteostasis and ER stress
- Mitochondria biology and function
- Cell cycle and its regulation
- Cellular senescence
- Immunity and defense mechanisms
- Organization and function of the cytoskeleton, cellular mechanics
- Microbiome in physiology, aging and disease
- Autophagy – principles and role in health and disease
- Stem cell biology and regeneration
- Signal transduction, inter- and intra-cellular communication

4 Teaching Methods

- Lecture

5	**Prerequisites (for the Module)** Enrollment in one of the Master's of Science degree courses of the Department of Biology **Additional academic requirements** The knowledge of cell, molecular and developmental biology as well as genetics on the level of general biology text books (*e.g.* Alberts, Lodish or Watson) is required.
6	**Type of Examination** Two hours written examination about topics of the lectures (100 % of the total module mark)
7	**Credits Awarded** Written examination at least "sufficient"
8	**Compatibility with other Curricula*** Obligatory lecture module in the Master's Degree course Computational Biology, Optional module for the second (or third) obligatory lecture module in the other Master's of Science degree courses of the Department of Biology
9	**Proportion of Final Grade** 7.5 %
10	**Module Coordinator** Prof. Dr. Mirka Uhlirova, e-mail: mirka.uhlirova@uni-koeln.de Dr. Esther Wollert, phone 478 84332, ewollert@uni-koeln.de
11	**Further Information** **Participating faculty**: Prof. Dr. Filipe Cabreiro, Prof. Dr. Niels Gehring, Prof. Dr. Kay Hofmann, Prof. Dr. Natalia Kononeko, Prof. Dr. Marcus Krüger, Prof. Dr. Carien Niessen, Dr. Stephanie Panier, Prof. Dr. Manolis Pasparakis, Prof. Dr. Elena Rugarli, Prof. Dr. Mirka Uhlirova, Dr. Esther Wollert **Literature:** • Information about textbooks and other reading material will be given on the ILIAS representation of the course (see https://www.ilias.uni-koeln.de/ilias/goto_uk_cat_2815610.html). **General time schedule:** Weeks 1-14: Mon. from 11:15 to 12:30 a.m. and Thur. from 10:00 to 11:45 a.m.; Week 15 (Mon.-Fri.): Preparation for the written examination. **Introduction to the module: October 12, 2026, at 11:00 a.m.,** in-person; Location – t.b.a. information will be provided via ILIAS, for preparation to the module before this introduction see ILIAS (https://www.ilias.uni-koeln.de/ilias/goto_uk_cat_2815610.html) **Written examination: February 12, 2026,** second/supplementary examination **March 12, 2026**; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.