

Module Name Seminar Modern Techniques and Approaches in Genetics, Aging and Regeneration Research						
Type of Module ○ Basic Module				Module Code Aging Seminar		
Identification Number MN-B-A 2	Workload 180 h	Credit Points 6 CP	Term 1 st term of studying	Offered Every Winter term	Start Winter term only	Duration 1 term
1	Course Types Seminar (incl. Tutorial)		Contact Time 45 h		Private Study 135 h	
2	Module Objectives and Skills to be Acquired Students who successfully completed this module <ul style="list-style-type: none"> • have acquired detailed knowledge about the concepts of state-of-the-art methods of functional genomics, genetics, cell and molecular biology and imaging, and their applications to study and understand cell and tissue functions in physiology and disease. • have acquired detailed knowledge of molecular genetics and the cellular repertoire to respond to stress, environmental signals and other stimuli, operating at different levels in the cell from gene expression to protein function and signaling • have learned how to present research results in oral and written form on a professional level. • have learned how to analyze scientific problems and critically discuss scientific publications related to the topics of the module on a professional level. • are able to develop strategies on how to solve scientific questions in the field of genetics, aging and regeneration research including choice of accurate methods, appropriate data analysis and processing of data for publication. • are able to transfer and apply knowledge and skills acquired in this module to wet-lab settings and related scientific fields. 					
3	Module Content <ul style="list-style-type: none"> • Cloning strategies and generation of stable cell lines • Principles of genome engineering (CRISPR-Cas, CRE-Lox, TALENs) • Regulation of nuclear and chromatin architecture (3C, HiC) • Epigenetic regulation of gene expression (repurposed Cas9 and Cas13) • Transcriptional and post-transcriptional regulation, post-translational regulation by protein modification • Principles of translational control (Polysome profiling and riboseq) • Selective proteolysis and protein quality control • Fate decisions and functional identity (hESC/iPSC, clonal analysis lineage tracing techniques) • Principles of transcriptional regulation (ChIP-seq, ATAC-seq, DamID...) • Functional genetics, genetic screens and mutant selection in model organisms (haploid screens, genetic epistasis) • Methods for genomic and proteomic analyses (RNA-seq, scRNA-seq, snRNA-seq, Mass-spec...) 					

3	<p>Module Content (continued)</p> <ul style="list-style-type: none"> • Optogenetics and chemogenetics in model organisms • Spatial control of protein localization • Microscopy techniques (Light and Superresolution microscopy), immunological staining methods • Quantitative Imaging
4	<p>Teaching Methods</p> <ul style="list-style-type: none"> • Interactive tutorials; Seminar; Group discussions; Guidance to critical interpretation of literature; Training on presentation techniques in oral and written form
5	<p>Prerequisites (for the Module)</p> <p>Enrollment in the Master's degree course "Master of Science in Genetics and Biology of Aging and Regeneration"; Simultaneous participation in the lecture module Principles of Molecular Genetics, Development and Aging</p>
6	<p>Type of Examination</p> <p>Oral presentation with written elaboration (100 % of the total module mark)</p>
7	<p>Credits Awarded</p> <p>Regular and active participation; Oral presentation with written elaboration at least "sufficient"</p>
8	<p>Compatibility with other Curricula</p> <p>None</p>
9	<p>Proportion of Final Grade</p> <p>7.5 %</p>
10	<p>Module Coordinator</p> <p>Prof. Dr. Niels Gehring, phone 470 3873, e-mail: ngehring@uni-koeln.de</p>
11	<p>Further Information</p> <p>Participating faculty: Professors, Group Leaders and scientists of the Cologne Excellence Cluster on Cellular Stress Responses in Aging-Associated Diseases (CECAD), Institutes for Genetics and Zoology, and invited guest speakers</p> <p>Literature:</p> <ul style="list-style-type: none"> • 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). <p>General time schedule: Weeks 1-14: Seminars/tutorials and oral presentations (starting at 2:00 p.m. usually on Tuesdays and Thursdays, more details will be given in the introduction to the module).</p> <p>Introduction to the module: October 14, 2025 at 2:00 p.m., lecture hall 4th floor (room 4.30), CoMB building, Zuelpicher Str. 47a, 50674 Cologne (in person). If you are not able to participate in person, please contact the coordinator in advance. For preparation before the introduction, please refer to the ILIAS link under Literature.</p>