

Module Name Molecular Genetics						
Type of Module ○ Advanced Module				Module Code Molecular Genetics		
Identification Number MN-B-SM (G 1)	Workload 360 h	Credit Points 12 CP	Term 2 nd term of studying	Offered Every Summer term, 1 st half	Start Summer term only	Duration 7 weeks
1	Course Types a) Lectures b) Practical/Lab c) Seminar		Contact Time 20 h 150 h 8 h		Private Study 40 h 118 h 24 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 of molecular genetics, the function of RNA-binding proteins and the different steps of eukaryotic gene expression, including pre-mRNA processing, RNA export, translation and RNA degradation. • have acquired experimental skills in state-of-the art methods in molecular biology and can and can independently design and perform small scientific projects related to the 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 <ul style="list-style-type: none"> • Analysis of co- and post-transcriptional steps of human gene expression, with focus on regulation conferred by RNA-binding proteins • Applying recombinant DNA technologies, e.g. cloning, DNA preparation, etc. • Cell culture using immortalized human cell lines, transfection of plasmid DNA, expression of gene products (RNA/protein) and stable cell line generation • Functional characterization of RNA-binding proteins by siRNA-mediated knockdown, degran-induced protein depletion and complementation assays • Extraction of nucleic acid and protein samples from cultured cells • Analysis of abundance and sub-cellular localization of proteins using immunofluorescence and/or western blotting • Techniques for monitoring alternative splicing and RNA degradation (RT-PCR, etc.) • Basic workflows for producing, analyzing and interpreting high-throughput RNA-sequencing data (focus on differential gene expression analysis, alternative splicing, isoform switches) • Addressing and solving scientific problems 					

3	Module Content (continued) <i>Explanatory note:</i> The list above comprises state-of-the art molecular methods with emphasis on RNA biology that are commonly used in the field of molecular cell biology. Every student participating in this module will apply a subset of it. The exact content will depend on the research project the student will work on.
4	Teaching Methods <ul style="list-style-type: none">• 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 of Science degree course "Genetics and Biology of Aging and Regeneration" or in the Master's degree course "Biochemistry" Additional academic requirements Previous attendance of the lecture module Principles of Molecular Genetics, Development and Aging
6	Type of Examination 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)
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 "Biochemistry"
9	Proportion of Final Grade 12.0 %
10	Module Coordinator Prof. Dr. Niels Gehring, phone 470 3873, e-mail: ngehring@uni-koeln.de

11	<p>Further Information</p> <p>Participating faculty: Dr. V. Boehm, D. Wallmeroth, Prof. Dr. N. Gehring</p> <p>Literature:</p> <ul style="list-style-type: none">Information on recommended 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: Week 1-6 (Mon.-Fri.): Lectures, Practical/Lab (daily from approximately 9 a.m. to 5 p.m. including lunch break, times may vary depending on project's tasks) as well as preparation for the seminar talk (held at the end of week 6); Week 7 (Mon.-Fri.): Preparation for the written examination</p> <p>Note: The module contains hand-on laboratory work conducted individually or by small groups of students and is taught mainly in course rooms. The module does contain computer-based practicals/research as a minor component.</p> <p>Introduction to the module: April 7, 2025 at 10:00 a.m., Center for Molecular Biosciences (COMB, Zülpicher Str. 47a), seminar room 0.46 (ground floor) 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>Written examination: 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>
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