

Module Name Molecular Genetics						
Identification Number	Workload	Credit Points	Term	Offered Every	Start	Duration
MN-BC-BSM11	360 h	12 CP	1 st or 2 nd term of studying	Summer term	summer term only	7 weeks
1	Course Types		Contact Time	Private Study	Planned Group Size*	
	a) Lectures		20 h	40 h	max. 8	
	b) Practical/Lab		150 h	118 h	max. 2	
	c) Seminar		8 h	24 h	max. 8	
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 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"> • Project planning • Analysis of co- and post-transcriptional steps of human gene expression, with focus on regulation conferred by RNA-binding proteins • Evaluation of potential protein-protein interactions involving the analysis of published structural information or the prediction via computational approaches such as AlphaFold. • 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 knockdown, knockout or degron-induced protein depletion • 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 • Addressing and solving scientific problems <p>Explanatory note: 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.</p>					
4	Teaching Methods					
	Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form					

5	<p>Prerequisites (for the Module)</p> <p>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".</p> <p>Additional academic requirements</p> <p>The RNA-related lessons of the lecture "Principles of Molecular Genetics, Development and Aging (A/D/G)" are a prerequisite for the theoretical and practical work in the module and the exam. These are provided via ILIAS for self-study.</p> <p>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)".</p>
6	<p>Type of Examination</p> <p>The final examination consists of two parts (Type BC1): Written examination on topics of lectures, seminars and the practical/lab part (1 hour; 50 % of the total module mark), oral presentation (20-30 min; 50 % of the total module mark)</p>
7	<p>Credits Awarded</p> <p>Regular and active participation; Each examination part at least "sufficient" (see appendix of the examination regulations for details)</p>
8	<p>Compatibility with other Curricula*</p> <p>Biological subject module in the Master's degree course "Genetics and Biology of Aging and Regeneration"</p>
9	<p>Proportion of Final Grade</p> <p>In the Master's degree course "Biochemistry and Molecular Medicine": 10 % of the overall grade (see also appendix of the examination regulations)</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: Prof. Dr. N. Gehring, Dr. V. Boehm</p> <p>Literature: Information about textbooks and other reading material will be given on the ILIAS representation of the course</p> <p>General time schedule: Week 1-6 (Mon.-Fri.): Lectures, Practical/Lab (Project work); (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.-Thu.): Preparation for the written examination</p> <p>Note: The module contains hands-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.</p>

* 6 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".