Molecular Genetics					
Identification number	Workload	Credit points	Term of studying	Frequency of occurence	Duration
MN-B-SM (GB 1)	360 h	12 CP	1st or 2nd term of studying	Winter term, 2nd half	7 weeks

1	Type of lessons	Contact times	Self-study times	Intended group size*
	a) Lectures	20 h	40 h	max. 8
	b) Practical/Lab	150 h	118 h	max. 2
	d) Seminar	8 h	24 h	max. 8

2 Aims of the module and acquired skills

Students who successfully completed this module …

- 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 Contents of the module

- 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 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 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

4 Teaching/Learning methods

- Lectures; Practical/Lab (Project work);Seminar; Guidance to independent research; Training on presentation techniques in oral and written form

5 Requirements for participation

Enrollment in the Master´s degree course “Biological Sciences” or in the Master´s degree course “Biochemistry”

6	Type of module examinations The final examination consists of three parts: Two hours written examination about topics of the lectures and the practical/lab part (50 % of the total module mark), oral presentation (25 % of the total module mark) and seminar paper (= short protocol in the form of a research paper about the project work; 25 % of the total module mark)
7	Requisites for the allocation of credits Regular and active participation Each examination part at least "sufficient" (see appendix of the examination regulations for details)
8	Compatibility with other Curricula Biological subject module in the Master´s degree course "Biochemistry"
9	Significance of the module mark for the overall grade In the Master´s degree course "Biological Sciences": 15 % of the overall grade (see also appendix of the examination regulations)
10	Module coordinator Prof. Dr. Niels Gehring, phone 470-3873, e-mail: ngehring@uni-koeln.de
11	Additional information Subject module of the Master´s degree course "Biological Sciences", Focus of research: (G) Genetics and Cell Biology; (B) Biochemistry, Biotechnology and Biophysics Participating faculty: Prof. Dr. N. Gehring, Prof. Dr. D. Mörsdorf, Dr. G. Praefcke, Dr. V. Boehm Literature: • Jocelyn E. Krebs, Elliott S Goldstein, Stephen T. Kilpatrick. Lewin's Genes XII, Jones and Bartlett Publishers, Inc; 12th Revised edition edition (2017), Part III and IV • James D. Watson, Tania A. Baker, Alexander Gann, Michael Levine, Richard Losick. Molecular Biology of the Gene, Seventh Edition (2013), Part 4 and 5 • Additional subject-specific literature will be provided at the beginning of the module 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 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. The schedule and content of the module have changed compared to previous years. Introduction to the module: December 2, 2019 at 9 a.m., Center for Molecular Biosciences (COMB), seminar room 0.46 (ground floor) Written examination: January 31, 2020, second/supplementary examination March 20, 2020; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.

*7 students from the Master´s degree course "Biological Sciences" and 1 student from the Master´s degree course "Biochemistry".