Advanced Bioinformatics						
Identification number	Workload	Credit points	Term of studying		Frequency of occurence	Duration
MN-B-SM (C 2)	360 h	12 CP	1st or 2nd term of studying		Summer term, 2nd half	7 weeks
1	Type of lessons		Contact times	Self-study times		Intended group size
	a) Lectures		18 h	36 h		max. 12
	b) Practical/Lab		99 h	159 h		max. 12
	c) Seminar		12 h	36 h		max. 12

2 Aims of the module and acquired skills

Students who successfully completed this module …

- have acquired detailed knowledge about the experimental background of advanced methods in Bioinformatics and Computational Biology.
- have gained insight into contemporary topics of bioinformatic and biostatistical research and application to high-throughput data analysis.
- are able to use the above mentioned systems to analyse genome-scale data, conduct downstream analyses, and to interpret and document their research.
- can independently carry out small scientific projects related to the topic 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

- Modern bionformatic methods for genome, transcriptome and proteome data analysis
- Multi-variate and high-dimensional data analysis
- Advanced regression methods, such as regularized linear models
- Application of these methods to molecular biology and for understanding disease mechanisms
- Handling of Unix based computer systems
- Scientific programming

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””

Knowledge and understanding of the content of the theory module “Computational Biology (C)“ and basic programming skills in “R“ are absolutely required for participation in the course. In cases of doubt, please contact the module coordinator (see 10).

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 written seminar paper (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 None
9	Significance of the module mark for the overall grade 15 % of the overall grade (see also appendix of the examination regulations)
10	Module coordinator Prof. Dr. Andreas Beyer, phone 478-84429, e-mail: andreas.beyer@uni-koeln.de
11	Additional information Subject module of the Master´s degree course "Biological Sciences", Specialization: (C) Computational Biology Specialization: Prof. Dr. A. Beyer, Prof. Dr. A. Tresch, Prof. Dr. T. Wiehe Literature: • Information about textbooks and other reading material will be given on the ILIAS representation of the course (https://www.ilias.uni-koeln.de/ilias/goto_uk_cat_2815610.html) General time schedule: Week 1-6 (Mon.-Fri.): Lectures, practical/lab, preparation for the seminar talk (topic and date will be arranged individually) and writing seminar paper; Week 7 (Mon.-Fri.): Preparation for the written examination Note: The module does not contain hands-on laboratory work. The module contains computer-based practicals/research as a main component, using RStudio Server Pro. Introduction to the module: June 07, 2021 at 9:15 a.m., Center for Molecular Biosciences (COMB), Computer pool (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. Written examination: July 23, 2021, second/supplementary examination August 27, 2021; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.

Corona note! Depending on the Corona situation during the summer term, practical work may be skipped either totally or in part. In this case, some or all practical parts will be replaced by adequate alternatives so that (i) the workload and (ii) the principle content of the modules remained unchanged.