Module Name
Applied Bioinformatics – From Sequence Analysis to Publication

Type of Module	**Module Code**
o Advanced Module	Applied Bioinformatics

Identification Number	**Workload**	**Credit Points**	**Term**	**Offered Every**	**Start**	**Duration**
MN-B-SM (C 4)	360 h	12 CP	2nd term of studying	Summer term, 2nd half	summer term only	7 weeks

1	**Course Types**	**Contact Time**	**Private Study**	**Planned Group Size**
	a) Lectures	18 h	36 h	max. 6
	b) Practical/Lab	90 h	156 h	max. 6
	c) Seminar	24 h	36 h	max. 6

2 Module Objectives and Skills to be Acquired

Students who successfully completed this module

- have gained in-depth knowledge in advanced sequence analysis and its application to real-life problems in the experimental biosciences.
- have acquired skills to identify bioinformatically tractable problems relevant for experimental projects and are familiar with the selection and application of appropriate bioinformatical tools.
- have learned how large-scale databases (genomics, transcriptomics, proteomics etc.) can be mined for information useful to solve biological problems, and how bioinformatical tools can be used to extract and process data obtained from these repositories.
- Have learned how to write a scientific publication (or similar text), using the bioinformatical results obtained in this course as an example.
- 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

- Methods of biological sequence analysis, predicting the function, structure and other properties of a protein based on its sequence.
- Public databases containing genomics, transcriptomics, proteomics and other large-scale data.
- Integration of multiple data sources, including directed and unbiased screens.
- Protein evolution, analysis of conservation patterns and their application to structure and function prediction.
- Assessment and validation of bioinformatical predictions
- Writing scientific publications.

4	**Teaching Methods** The module will be centered around a topical biological problem, suitable for being addressed by bioinformatical methods. Guided by the instructors, the students will be working in small groups on various aspects of the problems, covering a wide range of bioinformatical methods and databases. Twice weekly, the results obtained by the groups will be presented, discussed and analyzed in the plenum. Also, new tasks will be assigned. In the last two weeks, the focus will be on documenting the line of reasoning and the results as scientific figures, tables and text. In a joint effort, the results and analyses will be converted into a manuscript-style document – suitable for publication on BioRxiv. Teaching forms: Lectures (biological background, selected methods) Practical/Lab & Guidance to independent research (supervised project work performed in small groups) Seminar/Oral presentation techniques (Presentation of group results) Protocol/Written presentation techniques (Generation of a manuscript-style document)
5	**Prerequisites (for the Module)** Enrollment in the Master's degree course "Biological Sciences". **Additional academic requirements** Previous attendance of the lecture module "Computational Biology (C)". Previous attendance of the seminar module "Computational Biology (C)" is highly desirable, but lack of attendance can be compensated by some familiarity with the LINUX operating system and the application of sequence analysis methods. Programming skills are not required for this module.
6	**Type of Examination** The final examination consists of two parts: oral presentation (20-30 min; 50 % of the total module mark), written report (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** None.
9	**Proportion of Final Grade** 12 % of the overall grade (see also appendix of the examination regulations)
10	**Module Coordinator** Prof. Dr. Kay Hofmann, phone 470-1701, e-mail: kay.hofmann@uni-koeln.de

11	**Further Information** **Subject module** of the Master's degree course "Biological Sciences", **Specialization:** (C) Computational Biology **Participating faculty**: Prof. Dr. Kay Hofmann, Dr. Karsten Klopffleisch. **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 1-5 (Mon.-Fri.): Lectures, practical/lab and seminar presentation of group results (topic and date will be arranged individually); Week 6 (Mon.-Fri.): Seminar talks and finalization of the result document; Week 7 (Mon.-Fri): Preparation and finalisation of written report. **Note:** The module does not contain hands-on laboratory work. The module contains computer-based practicals/research as a main component. **Introduction to the module:** May 22, 2023 at 10:00 a.m., Center for Molecular Biosciences (COMB), Seminar room 2.17 (2nd floor) or online (in this case, further information/link will be sent to your Smail-Account); **Oral examination:** More details will be given at the beginning of the module.