



**Karolinska
Institutet**

Course syllabus for

Bioinformatics, 7.5 credits

Bioinformatik, 7.5 hp

This course syllabus is valid from autumn 2022.

Please note that the course syllabus is available in the following versions:

Autumn2021 , Autumn2022

Course code	4BI109
Course name	Bioinformatics
Credits	7.5 credits
Form of Education	Higher Education, study regulation 2007
Main field of study	Biomedicine
Level	AV - Second cycle
Grading scale	Pass with distinction, Pass, Fail
Department	Department of Cell and Molecular Biology
Participating institutions	<ul style="list-style-type: none">• Department of Microbiology, Tumor and Cell Biology
Decided by	Programme committee for study programmes in biomedicine
Decision date	2021-02-25
Revised by	Programme committee for study programmes in biomedicine
Last revision	2022-03-11
Course syllabus valid from	Autumn 2022

Specific entry requirements

A Bachelor's degree or a professional degree worth at least 180 credits in biomedicine, biotechnology, cellular and molecular biology, medicine, or the equivalent. Proficiency in English equivalent to the Swedish upper secondary school course English 6/English B.

Objectives

On completion of the course, the student should be able to:

Knowledge and understanding:

- Demonstrate knowledge and understanding of the scope of the field of bioinformatics
- Describe research questions and problems in biomedicine where bioinformatics analyses are employed, and how bioinformatics tools can contribute to the general knowledge of biological systems
- Explain the theoretical background and the rationale underlying basic bioinformatics methods
- Relate bioinformatics analysis to a systems biology approach to biomedical research questions
- Describe basic principles in good research practice and Health Data Management

Competence and skills

- Define biomedical research questions involving the use of bioinformatics data, and design a bioinformatics based approach for data collection and analysis
- Critically assess and evaluate different approaches and methods employed in bioinformatics analyses of data
 - Plan experimental designs and critically evaluate the appropriateness of the different methods and technologies (such as different sequencing methods for nucleic acids) for collecting data for bioinformatics analysis
- Apply and integrate bioinformatics resources and tools to answer a biomedical question
- Apply basic programming skills in analysing datasets

Judgement and approach

- Critically reflect on the opportunities, limitations and ethical challenges posed by advances in bioinformatics as part of health data science
- Demonstrate knowledge of the emerging challenges and opportunities of bioinformatics in a societal context, for example in a global health or sustainable development perspective

Content

This course covers central knowledge and skills in bioinformatics used in biomedical research, including critical analysis and application of different approaches and tools to collection and data analysis. Bioinformatics is discussed as a field that combines a broad set of knowledge and tools from different disciplines, with the aim of understanding complex biological and biomedical systems by analysing and understanding different types of data produced in biological and biomedical research. The focus is very much on the basic practical tools for analysis of sequence and gene expression data including basic programming skills, genomics and general bioinformatics-based structure and structural and functional analysis of biomolecules. Biomedical applications include simulated DNA- and RNA-sequencing processes and simulated design and analysis of CRISPR-modified organisms. Definition of research problems and evaluation of different research methods and approaches are studied in the context of research ethics, GDPR, good scientific practice, scientific communication and public and global health perspectives. Basic concepts of teamwork and project membership and management are integrated in the Team Based Learning parts of the course.

Teaching methods

The learning and teaching activities include hybrid learning activities and Team Based Learning activities, including small and large group sessions. There are lectures, lessons, demonstrations, data practicals, written and oral communication exercises. The parts of the course with Team Based Learning include peer learning and team work elements.

Examination

The examination consists of three parts:

- individual ethical reflection, written assignment
- individual analysis of unknown sequence data, "Mystery DNA sequence", written assignment
- individual written exam, summative examination

To pass the whole course all three parts must have been passed. All three parts contribute to the course grade, graded Fail/Pass/Pass with distinction.

Compulsory participation

Participation in data practicals and TBL modules is obligatory. The course examiner assesses if and, in that case, how absence from compulsory components can be compensated for. A student's study results cannot be finalised/registered until the student has participated in the compulsory components or compensated for their absence in accordance with the examiner's instructions. Absence from a

compulsory component may mean that the student cannot compensate for absence until the next time the course is given.

Limited number of examinations or practical training sessions

Students who have not passed the regular examination are entitled to participate in five more examinations. If the student is not approved after four examinations, he/she is recommended to retake the course at the next regular course date, and may, after that, participate in two more examinations. If the student has failed six examinations/tests, no additional examination or new admission is provided. The number of times that the student has participated in one and the same examination is regarded as an examination session. Submission of a blank examination is regarded as an examination. An examination for which the student registered but not participated in, will not be counted as an examination.

If there are special grounds, or a need for adaptation for a student with a disability, the examiner may decide to deviate from the syllabus's regulations on the examination form, the number of examination opportunities, the possibility of supplementation or exemptions from the compulsory section/s of the course etc. Content and learning outcomes as well as the level of expected skills, knowledge and abilities may not be changed, removed or reduced.

Other directives

The course is given in English, and examination is in English.

Course evaluation will be carried out in accordance with the guidelines established by the Committee for Education.

Literature and other teaching aids

Course literature

Specific study material and reference articles will be provided during the course.