UNIVERSITY OF SKÖVDE

TRANSLATION FROM SWEDISH

PROGRAMME SYLLABUS

Artificial Intelligence for Bioinformatics – Master's programme

60 credits

Programme code: AIBIA
Version number: 2
Valid from: Spring term 2026
Ratified by: Curriculum Committee for Bioscience
Date of ratification: 22 May 2025

1. General information about the study programme

The study programme is provided by the University of Skövde and is named Artificial Intelligence for Bioinformatics – Master's programme (Artificiell intelligens för bioinformatik - magisterprogram). It comprises 60 credits and is a second-cycle programme. The main field of study is Bioinformatics.

2. Entry requirements

A Bachelor's degree equivalent to a Swedish kandidatexamen of 180 credits, with a major in the subject areas of biology, biomedicine or computer science (or the equivalent). The biological area can be defined as e.g. Bioinformatics, Systems Biology, Molecular Biology or Microbiology.

Additionally, passed courses of at least 7.5 credits in Bioinformatics, 7.5 credits in Cell Biology and 15 credits in Programming are required (or the equivalent).

An additional requirement is proof of skills in English equivalent of studies at upper secondary level in Sweden, known as the Swedish course English 6 or English level 2. This is normally demonstrated by means of an internationally recognized language test, e.g. IELTS or TOEFL.

The entry requirements above are applicable for admission to the study programme. For further studies within the programme, the entry requirements for each course must be met. These entry requirements are specified in each separate course syllabus.

3. Study programme content

The study programme focuses on applications of methods based on Artificial Intelligence (AI) to solve analysis problems in bioinformatics. The courses included in the programme cover both the theory behind methods and algorithms from the AI area, and practical usage of AI-based methods for analysis of molecular biological data. Emphasis is placed on development of skills in the usage of AI-based bioinformatics tools and the ability to write code for such tools, adapted to specific analysis tasks.

The first semester covers algorithms for machine learning, based on both symbolic methods and artificial neural networks, and also introduces neural network-based methods for deep learning. In courses focusing on bioinformatic analysis pipelines for sequencing data and integration of multi-omics data, the student develops practical skills in applying AI-based methods for analysis of datasets originating from large scale experiments. The initial courses include supervised computer lab exercises and assignments that develop the student's ability to use AI-based analysis tools and write computer code for developing and adapting such tools. The first semester also includes a course that covers current research topics in AI for bioinformatics and an introduction to scientific writing, as preparation for the upcoming thesis project.

During the second semester the student performs a thesis project comprising 30 credits. In the project the student is expected to independently apply the knowledge and skills gained in the study programme to solve a current and relevant research question in bioinformatics by applying or developing one or more AI-based methods.

Teaching in the programme consists mainly of lectures, seminars, computer lab exercises, assignments and projects.

The following courses are included in the programme:

Advanced AI for Biological Data A1F, 7.5 credits

Introduction to AI in Bioinformatics A1N, 7.5 credits

Bioinformatic Pipelines for High-Throughput Sequencing Data A1N, 7.5 credits

Current Research Topics in AI for Bioinformatics A1F, 7.5 credits

Master Project in Bioinformatics A1E, 30 credits

4. General objectives

Objectives for education at the second-cycle level in The Higher Education Act

Second-cycle courses and study programmes shall involve the acquisition of specialist knowledge, competence and skills in relation to first-cycle courses and study programmes, and in addition to the requirements for first-cycle courses and study programmes shall:

- further develop the ability of students to integrate and make autonomous use of their knowledge,
- develop the students' ability to deal with complex phenomena, issues and situations, and
- develop the students' potential for professional activities that demand considerable autonomy, or for research and development work.

5. Study programme objectives

Objectives for Master's Degree according to the Higher Education Ordinance

Knowledge and understanding
For a Degree of Master (60 credits) the student shall

- demonstrate knowledge and understanding in the main field of study, including both an overview of the field and specialised knowledge in certain areas of the field as well as insight into current research and development work, and
- demonstrate specialised methodological knowledge in the main field of study.

Competence and skills
For a Degree of Master (60 credits) the student shall

- demonstrate the ability to integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
- demonstrate the ability to identify and formulate issues autonomously as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames
- demonstrate the ability in speech and writing to report clearly and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
- demonstrate the skills required for participation in research and development work or employment in some other qualified capacity.

Judgement and approach
For a Degree of Master (60 credits) the student shall

- demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work
- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

Local objectives for the study programme at the University of Skövde

- show in-depth knowledge of applications and underlying theories for how datasets from large-scale molecular biology experiments are processed and analysed with AI-based methods,
- show in-depth knowledge of, and practical skills in, development of AI-based methods and tools used in bioinformatics,
- demonstrate good knowledge and understanding of how digitalization can be used to improve health and well-being,
- demonstrate knowledge and understanding of how digitalization can contribute to sustainable development through efficient use of data from molecular biological and biomedical experiments.

6. Language of instruction

The teaching is conducted in English.

7. Degree qualification

A student who passes the courses in the study programme fulfills the requirements for obtaining a Degree of Master of Science (60 credits) with a major in Bioinformatics.

Degree certificates are issued after application. Information about how to submit an application can be found on the website of the University of Skövde.

8. Changes to the programme syllabus

The programme syllabus and its courses may be changed, within the framework of the objectives for the study programme.

9. Student influence

Student influence in the study programme is ensured by means of programme evaluations. The students are informed about the results of the evaluations and potential measures that have been taken or are planned, based on the course evaluations.

10. Additional information

Further information about the study programme, as well as national and local governing documents for higher education, is available on the website of the University of Skövde.