UNIVERSITY OF SKÖVDE

TRANSLATION FROM SWEDISH

PROGRAMME SYLLABUS

Systems Biology with specialization in Bioinformatics - Master's Programme

120 credits

Programme code: BSYMA
Version number: 7
Valid from: 1 July 2026
Ratified by: Curriculum Committee for Bioscience
Date of ratification: 28 August 2025

1. General information about the study programme

The study programme is provided by the University of Skövde and is named Systems Biology with specialization in Bioinformatics - Master's Programme (Systembiologi med inriktning mot bioinformatik - masterprogram). It comprises 120 credits and is a second-cycle programme. The main field of study is Systems Biology.

2. Entry requirements

To be eligible for the program a Bachelor's Degree (equivalent to a Swedish Bachelor's Degree) with a major in the biological or medical area is required. The biological area can be defined as e.g. Molecular Biology, Biochemistry, Microbiology or Physiology. The medical area is here defined as Biomedicine.

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

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 initial study term of the programme is focused on developing skills in analysis of data using methods from bioinformatics and bioscience, and developing the ability to write computer code for such tasks in Python and R. An introduction of recent research topics in bioinformatics and systems biology is given, and the ability to critically assess scientific articles is practiced.

The second study term gives a broader insight into application areas of systems biology and methods for building models of biological systems. Special emphasis is placed on applications in analysis of networks and pathways. In parallel with this, the knowledge of statistical analysis is further developed, as well as the ability to use the R programming language for bioinformatical analyzes.

The third term focuses on NGS, i.e. methods for massively parallel sequencing, and methods for analysis of data from such experiments in applications of bioinformatics and systems biology. Students begin their dissertation projects during the second half of the third term, mainly by performing the planning phase of the project.

The programme is completed by performing a dissertation project comprising 45 credit units, where the gained knowledge should is applied by independently formulating and solving a research problem in systems biology.

The tuition consists mostly of lectures, seminars, computer laboratory exercises and project supervision.

The following courses are included in the programme:

Bioinformatics Analysis med R A1N, 7.5 credits

Bioinformatics - Concepts and Methods A1N, 7.5 credits

Data Analysis for Life Science A1N, 5 credits

Python programming for bioinformatics A1N, 10 credits

Analysis of sequencing data A1F, 7.5 credits

Current Research in Systems Biology and Bioinformatics A1F, 7.5 credits

Library preparation and sequencing technologies A1F, 7.5 credits

Multivariate Biological Analysis with R A1F, 7.5 credits

Network and Pathway Analysis A1F, 7.5 credits

Systems Biology A1F, 7.5 credits

Master Degree Project in Systems Biology A2E, 45 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 Master's Degree students shall be able to

- show knowledge and understanding within the main area of the education, inclusive of wide knowledge within the area, a considerable in depth knowledge within certain parts of the area as well as deeper insight into current research and development, and
- show in depth knowledge of methodology within the main area of the education.

Proficiency and Ability
For the Master's Degree students shall

- show the ability to critically and systematically integrate knowledge and analyse, assess and manage complex phenomena, questions and situations even with limited information,
- show the ability to critically independently and creatively identify and formulate questions, as well as to plan and, with adequate methods, carry out advanced assignments within specified time limits and thereby contribute to the development of knowledge as well as to evaluate these efforts,
- show the ability in both national and international contexts to, orally and in writing, clearly account for and discuss their conclusions and the knowledge and arguments these are based on in dialogue with different groups, and
- show the proficiency required to participate in research and development in other advanced activity.

Ability to Evaluate and Relate
For the Master's Degree students shall

- show the ability, within the main area of the education, to make assessments in accordance with relevant research, societal and ethical aspects as well as show awareness of ethical aspects in research and development,
- show insight into the possibilities and limitations of research, its role in society and human beings' responsibility for how it is used, and
- show the ability to identify the need for further knowledge and to take responsibility for the development of their knowledge.

Local objectives for the study programme at the University of Skövde

After completion of the programme the student shall demonstate

- deeper knowledge of how methods from systems biology and bioinformatics can be used in combination to process and analyze large-scale data generated by experiments in molecular biology,
- good knowledge and understanding of how digitalization can be used in the pursuit of improved public health and well-being, and
- knowledge and understanding of how digitalization can contribute to sustainable development by resource-efficient usage of data generated by experiments in molecular biology and biomedicine.

6. Language of instruction

The teaching is conducted in English.

7. Degree qualification

A student who passes the courses in the programme fulfills the requirements for obtaining a Degree of Master of Science (120 credits) with a major in Systems Biology.

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.