

Systems Biology for Precision Medicine, 4 credits

Systembiologi för precisionsmedicin, 4 högskolepoäng

Course Code/Codes	75MV009
Subject Area	Medical Science
School/equivalent	School of Medical Sciences
Valid from	2023-03-07
Approved	2023-03-07
Revised	
Approved by	Head of School
Translation to English, date and signature	2022-04-20 drr

1 Course content

The course includes:

- Theoretical background about different kinds of systems biological models and their application for precision medicine
- Computer laboratory on systems biology tools to analyse large-scale molecular data based on molecular network topology as well as small-scale timeseries data with mechanistic modelling and hybrid models for application of such models in precision medicine
- Writing scientific results reports about systems biology analysis of clinical and molecular data
- Learning and applying the concept of reproducible data analysis

2 Outcomes

2.1 The course in relation to the doctoral programme

The course shall primarily refer to the following intended learning outcomes for third-cycle courses and study programmes as described in the Higher Education Ordinance, i.e. the doctoral student shall demonstrate:

Knowledge and understanding

- advanced and up-to-date specialised knowledge in a limited area of this field (part of outcome 1)
- familiarity with the methods of the specific field of research in particular (part of outcome 2)

Competence and skills

- the capacity for scholarly analysis and synthesis (part of outcome 3)
- the capacity to review and assess new and complex phenomena, issues and situations autonomously and critically (part of outcome 3)
- the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively (part of outcome 4)
- the ability to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames (part of outcome 4)

The intended learning outcomes are listed in the same order as in the general syllabus for the programme.

2.2 Intended course learning outcomes

To obtain a passing grade, the doctoral student shall demonstrate:

Part of learning outcome 1

- understanding of the theoretical basis of different kinds of systems biological modeling approaches (large-scale molecular network analysis, qualitative modeling, mechanistic mathematical modeling, hybrid models)

Part learning outcome 2

- knowledge and understanding of methods to employ the different modeling approaches

Part of learning outcome 3

- knowledge and understanding about data eligibility and formulation of distinct hypotheses, as well as experimental design, necessary to obtain data appropriate for the different systems biological approaches discussed and applied in the course
- understanding of how systems biological models can aid precision medicine

Part of learning 4

- skills and abilities include application of tools like Cytoscape, Cell Designer, Copasi, and R
- ability to accurately report analysis results from systems biological analyses

3 Reading list and other teaching material

The following course readings and teaching material will be used on the course:

Lecture slides.

Tutorials which contain a detailed plan to run the hands-on labs but also necessary background knowledge and link to further reading.

In addition, literature and scientific articles will be supplied. Changes in literature might occur.

4 Teaching formats

Teaching on the course takes the following format:

Lectures
 Computer laboratory work
 Group discussions
 Independent study

5 Examination

The course is assessed through the following examinations which will be graded separately:

-A oral examination covering all intended course learning outcomes, 2 credits (Code 0100)

-A individual written assignment, 2 credits (Code 0200)

For examinations consisting of several examination components, the following applies: If during the course it is concluded that a doctoral student is unable to complete a certain examination component, the examiner may set a substitute assignment provided that circumstances do not reasonably allow for the course component to be completed at a later date during the run of the course.

6 Grades

Examinations on third-cycle courses and study programmes are to be assessed according to a two-grade scale with either of the grades 'fail' or 'pass' (local regulations).

The grade shall be determined by a teacher specifically nominated by the higher education institution (the examiner) (Higher Education Ordinance).

To obtain a passing grade on examinations included in the course, the doctoral student is required to demonstrate that he/she attains the intended course learning outcomes as described in section 2.2. Alternatively, if the course consists of multiple examinations generating credit, the doctoral student is required to demonstrate that he/she attains the outcomes that the examination in question refers to in accordance with section 5.

A student who has failed an examination is entitled to a retake.

If an examination consists of several examination components, and a student fails an examination component, the examiner may, as an alternative to a retake, set a make-up assignment with regard to the examination component in question.

A doctoral student who has failed an examination twice for a specific course or course element is entitled, upon his/her request, to have another examiner appointed to determine the grade.

7 Admission to the course

7.1 Admission requirements

To gain access to the course and complete the examinations included in the course, the applicant must be admitted to a doctoral programme at Örebro University.

7.2 Selection

Selection between applicants who have been admitted to doctoral programmes at Örebro University and who otherwise meet the admission requirements as listed above is made according to the following order of precedence:

1. Research students from Örebro University.
2. Research students from other higher education institutions.

If no other selection criteria are specified in this section, priority shall be given to applicants with a lower number of course credits left before the award of their degree over applicants with a higher number of remaining course credits. Should two or more students have equal number of credits, selection will be done through the drawing of lots. This also applies within any selection groups listed unless otherwise stated.

7.3 Other applicants than doctoral students admitted at Örebro University

Other applicants than doctoral students admitted at Örebro University may be given access to the course on the grounds of provisions for and/or agreements regarding contracted courses, joint degrees, national graduate schools or cooperation in other respects with other universities.

Any decisions on what such other applicants may be given access to the course are made separately and on the basis of the provisions and/or agreements that occasion the student to apply for the course.

For participation in the course in other respects, the same provisions shall apply as for doctoral students admitted to Örebro University.

8 Transfer of credits for courses, study programmes and other experience

Provisions on the transfer of credits can be found in the Higher Education Ordinance and on the university's webpage.

9 Other information

The language of instruction on the course is English with lecturer-led components concentrated to two full-time intensive weeks with compulsory attendance. Doctoral students are expected to undertake independent study reading during and after these course weeks.

Transitional provisions