

P000043, Biology of Genomes, 7.5 Hp

Syllabus

Finalized by: Fun-VH, 2023-04-18

Valid from: 2023H

Level within study regulation:

Third cycle

Subject:

- Bioinformatics
- Biology

Grading scale:

Pass / Failed

Course language:

Swedish

Entry requirements:

Admitted to a postgraduate program in animal science, biology, veterinary medicine, food science, nutrition, nursing, or related subjects, or to a residency program in veterinary science.

Objectives:

The course intends to provide advanced knowledge of theory and methods for studies of eukaryotic genomes, including their organization and evolution. There is a focus on animal genomics, but theoretical and methodological aspects of the course are applicable on many different organisms.

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

- systematically describe and analyse structure, diversity and evolution of eukaryotic genomes and genes,
- describe and analyse various types of genetic variation,
- illustrate and distinguish between the types of genetic recombination and recite some of its applications in genome analysis,
- apply and critically process key features of molecular phylogenetic / -genomic and evolutionary analysis,
- comprehensively describe the different types of RNA in the transcriptome and understand principles for transcriptional regulation and gene function,
- describe and plan different approaches for functional analysis of genes and genomes,
- explain and evaluate the principles of whole genome mapping and comparative genomics to identify genes and loci underlying mendelian and quantitative inherited diseases as well as important phenotypic traits,
- explain epigenetic and epigenomic markers and methods for the analysis of these,
- describe and explain the concept of genome editing and transgenic animals,
- compile data, apply and explain basic statistics relevant to genome analysis,
- independently search for, summarize, interpret, and critically assess scientific articles in genetics, molecular genetics, and genomics,
- integrate knowledge in molecular genetics and biotechnology to solve complex problems of relevance for genome analysis,
- summarize the importance of and how bioinformatics can be used in genome analysis,
- discuss how the content of the course is relevant to the student's own research project.

Content:

The course is based on lectures, exercises, and group discussions. The contents build largely on animal genome research. Theoretical teaching is for the most part directly applicable also within for example human or plant genetics. Genome science is rapidly evolving, and the course is based on current state-of-the-art methodology and research.

Computer exercises and group discussions will cover:

- structural and comparative genomics,
- molecular evolution and phylogenetics/-genomics,
- genomic diversity and genetic variation,
- functional genomics,
- gene mapping, GWAS, and QTL analysis,

- epigenetics/-genomics,
- genome editing and transgenic animals.

The aim of the computer exercises is to give the students useful tools for basic genetic and genomic analyses. Therefore, the computer exercises use free and open-source software that the student can download and use on their own laptop. In addition to the written and the oral examination, compulsory components occur within computer exercises and group assignments.

Modes of assessment:

Passed participation including oral presentations and written reports in compulsory course modules. Written and oral examination. - If a student has failed an examination, the examiner has the right to issue supplementary assignments. This applies if it is possible and there are grounds to do so.

- The examiner can provide an adapted assessment to students entitled to study support for students with disabilities following a decision by the university. Examiners may also issue an adapted examination or provide an alternative way for the students to take the exam.
- If this syllabus is withdrawn, SLU may introduce transitional provisions for examining students admitted based on this syllabus and who have not yet passed the course.
- For the assessment of an independent project (degree project), the examiner may also allow a student to add supplemental information after the deadline for submission. Read more in the Education Planning and Administration Handbook.

Organisation:

Department of Animal Breeding and Genetics

Supplementary information

Other information:

- The right to participate in teaching and/or supervision only applies for the course instance the student was admitted to and registered on.

- If there are special reasons, students are entitled to participate in components with compulsory attendance when the course is given again. Read more in the Education Planning and Administration Handbook.