Faculty of Science

BIOR90, Biology: Evolutionary Biology - Methods and Applications, 15 credits

Biologi: Evolutionsbiologi - metoder och tillämpningar, 15 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2021-09-09 to be valid from 2021-09-09, autumn semester 2022.

General Information

The course is an elective second cycle component of a Master of Science degree in Biology and a compulsory second cycle component of a Master of Science degree in Biology specialising in Evolutionary Biology.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Biology	A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The general aim of the course is to provide students with detailed knowledge and understanding of the methods of evolutionary biology, and apply these to a wide range of problems.

Knowledge and understanding

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

- Explain how genomics can be used to infer evolutionary history, to screen for signatures of selection, and to identify the genetic and developmental mechanisms of evolutionary change
- Explain comparative phylogenetic models and methods, and illustrate how these can be used to test predictions from evolutionary theory with examples

- Summarize the conceptual foundations and applications of models and methods used to quantify phenotypic variation, natural selection, and evolutionary change

Competence and skills

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

- Compare and critically evaluate different approaches for solving evolutionary problems
- Critically apply advanced concepts, models and methods to estimate phylogenetic relatedness and infer past evolutionary events in order to test theoretical predictions
- Design and conduct correlative and experimental studies, including planning of data collection and analyses to test self-generated predictions
- Present studies in evolutionary biology orally and in writing
- Identify and apply appropriate bioinformatics methods to analyse ‘omic’ data to address evolutionary questions
- Contribute to scholarly discussions on how evolutionary theory can be used to solve societal challenges

Judgement and approach

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

- Identify and evaluate strengths and weaknesses of different approaches and methods to study evolution
- Critically review and analyse the application of evolutionary models and methods to outstanding challenges in society
- Reflect on own and others' work and provide constructive feedback

Course content

The course will enable students to acquire extensive knowledge and understanding of the models and methods of evolutionary biology and their applications.

The course will provide the theoretical and practical know-how for using genomic data to reconstruct evolutionary history, investigate signatures of selection, and establish the genetic and developmental mechanisms of evolutionary change. It will also explain how comparative phylogenetic methods are used to infer the sequence of evolutionary events and test hypotheses from evolutionary theory. The course will provide the knowledge and tools to document and quantify ongoing selection and to test theoretical predictions in natural and experimental populations. The final part of the course provides an opportunity to investigate how evolutionary theory can be used to meet outstanding challenges in society, including in medicine, conservation, biotechnology, and sustainable development.

Course design

The teaching consists of lectures, group seminars and video tutorials in close combination with lab- and field-based practical exercises. Compulsory participation is required in seminars, practical exercises, and associated elements.

Assessment

The assessment is based on the participation and performance of students in the compulsory components, comparative analyses and applications as well as analyses of phenotypes and genomes during the course.

Students who do not pass an assessment will be offered another opportunity for assessment soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
For a grade of Pass on the whole course, the student must have passed the compulsory components.

The final grade is determined through a weighing of the results of the components that are included in the examination.

Entry requirements

To be admitted to the course, students must have 120 credits in Natural Science studies, including knowledge corresponding to BIOR89 Evolutionary Biology - Patterns and Processes, 15 credits, and additional 15 credits of second-cycle courses in biology, molecular biology or bioinformatics. A degree of Bachelor of Science. English 6/English B.

Subcourses in BIOR90, Biology: Evolutionary Biology - Methods and Applications

Applies from H22

2201 Analyses of phenotypes and genomes, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction
2202 Comparative analyses and applications, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction