



DEPARTMENT OF BIOLOGICAL AND ENVIRONMENTAL SCIENCES

BIO217 Evolutionary biology, 15 credits

Evolutionär biologi, 15 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Biological and Environmental Sciences on 2014-03-28 and was last revised on 2024-03-15 to be valid from 2024-03-15, spring semester of 2024.

Field of education: Science 100%

Department: Department of Biological and Environmental Sciences

Other participating department

Department of Marine Sciences

Position in the educational system

This is a course in biology at the basic level. The course can be part of the Bachelor programs in biology, marine sciences, environmental sciences and molecular biology. The course is also offered as a separate course.

The course can be part of the following programme: 1) Bachelor's Programme in Biology (N1BIO)

Main field of studies

Marine Sciences

Biology

Environmental Science

Molecular Biology

Specialization

G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements

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Entry requirements

Alternative 1: Completed basic courses in biology comprising 60 credits in the subject areas of cell biology, molecular genetics, evolution, botanical and zoological physiology, ecology and biodiversity and systematics, or equivalent, of which at least 45 credits must be approved.

Alternative 2: Completed courses in the first year of the Bachelors in science in Environmental science programme and additional 15 hp basic level course in biology, or equivalent.

Alternative 3: 90 credits approved of 120 credits on courses within the first two years of the Bachelor program in marine sciences, University of Gothenburg, or equivalent.

In addition, English B/6 is required.

Learning outcomes

After completing the course, students should be able to:

Knowledge and understanding

- account for evolutionary mechanisms operating at different organizational levels (i.e. individual, population, species)
- describe evolutionary processes and mechanisms from historical, geological and contemporary perspectives (both microevolutionary and macroevolutionary patterns)
- explain Hardy-Weinberg equilibrium and how deviations from HWE can predict processes affecting populations and population evolution
- describe natural selection and distinguish among kin selection, sexual selection and neutral evolution
- account for the components of phenotypic variance in relation to trait heritability and how trait heritability will impact the response to selection, as well as describe the differences between broad and narrow sense heritability
- account for theories concerning how and when life arose and the important events that have had an impact on the development of life
- account for genome evolution and describe the differences between species trees and gene trees
- describe the main features of the tree of life

Competence and skills

- apply software to analyze population evolution with respect to stochastic and deterministic processes (primarily genetic drift, migration and selection)

- apply methods for reconstructing phylogenetic trees
- use R for basic evolutionary analyses
- use DNA sequence data for the identification of taxa
- search, evaluate and summarize scientific literature in the areas relevant to the course content
- design, analyze and discuss a scientific experiment in an area relevant to the course content

Judgement and approach

- evaluate species concepts based on characteristics in different groups of organisms
- account for the challenges of modern society where evolutionary processes have a high relevance (development of bacterial resistance, GMOs, plant and animal breeding, environmental change)
- account for the scientific perspective on the origin of life

The course is sustainability-related, which means that at least one of the learning outcomes clearly shows that the course content meets at least one of the University of Gothenburg's confirmed sustainability criteria.

Course content

The course begins with a focus on microevolution. There will be a brief review of basic population genetics, and then the focus will be on evolutionary concepts that apply to individuals, within and among populations, and within species. There will be practical exercises using real data to expose students to these concepts as well as some popular software for population genetic analyses. There will also be a short review/introduction to data analysis in R. The general programming language, R, will be used for several exercises in the course and is useful for the analyses of all types of biological data.

Then there are two field weeks at the Tjärnö Marine Laboratory. During the field weeks students will apply the scientific method, learn about experimental design and analysis and conduct their own short experiment (in small groups). The students will present their experiments at the end of this section.

After the field weeks, the focus will be on macroevolution, including phylogenetics, genome evolution, the tree of life, the fossil record and the history of life. Again, there will be several practical exercises to illustrate the topics and a group presentation at the end of this section.

Finally, there will be a link between micro- and macro-evolution through discussions about speciation and species concepts. The course will end with some practical

applications of evolution such as human-induced evolution and genetic barcoding.

Form of teaching

The course is based on lectures, exercises, field weeks, and group projects.

Language of instruction: English

The course is given entirely in English, unless all students are proficient in Swedish, in which case parts of the course may be given in Swedish.

Assessment

The assessment consists of a written exam at the end of the course, as well as written reports, exercises, participation in group exercises and labs.

A student who has failed an exam twice has the right to change examiner, if it is possible. A written application should be sent to the department.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

For the grade Pass 60% of the written exam is usually required, as well as approved written reports and oral presentations. For the grade Pass with Distinction 85% of the written exam is usually required, as well as approved written reports and oral presentations.

Course evaluation

Opportunity to submit a written course evaluation is usually given at the end of the course. A summary of the results is presented on the Canvas page for the course, as well as to the participants of the next course.

Additional information

Travel to and from and stay at the field station entails a cost to the student.