UPPSALA UNIVERSITET

Appendix 3

Biology Courses offered in 2024-2025 International Bachelor Dual Degree Project "3+1"

Uppsala University Sweden

A recommended selection of courses for the project 3+1 is described below. These courses are taught in English and are selected to fulfil other requirements for international students. A full list of courses given at the department as well as detailed information on the courses can be found on the website: www.ibg.uu.se/education/course-programmes/biology-courses/

Study plan

All students within the 3+1 programme will obtain an individual study plan for their studies at Uppsala University. The study counsellor, Sofia Thorselius at the Biology Education Center, will be support for development of individual study plans. In each period only one 15 credits course can be studied. At Uppsala University full time studies equals 60 credits, four 15 credit-courses, per study year. The full study plan can be developed before or after arrival in Uppsala. Note: The first course for the fall (period 1) has to be determined for all students before May 1st 2024.

Research Training/Internship

The aim of the course is to give an insight into research and development, its organisation and implementation. Optional places for Research training are research departments and institutions, companies or authorities within relevant subject area. The students individually perform training in a research setting under co-supervision of supervisors and coordinators of education. The students will get training in research methodology and in oral and written presentation.

Bachelor's thesis

All degree projects at the Biology Education Centre are carried out as courses. The degree project gives training in how to plan, realise and report a scientific project. The project work is carried out under the guidance of a supervisor, in close connection to current research. A supervisor as well as a coordinator will guide the students before, during and in the final stage of the degree project.

Application

Application to third year of a Bachelor's Programme: *See* the document Application routines for application instructions.
Apply to: Director of Studies for the Bachelor's programmes, Elisabeth Långström, and Programme Director for the Bachelor's programme in biology/molecular biology Sebastian Sobek. Both are reached through info@ibg.uu.se
Courses and Individual Study plan: Sofia Thorselius, Study Counsellor: exchange@ibg.uu.se
Information in Chinese: Yin Zheng-Yuan: yin.zheng-yuan@ibg.uu.se

Information on courses

First/second cycle

First cycle corresponds to undergraduate level (bachelor) and ***Second cycle*** to graduate level (master). The second level courses *may* be applicable for 3+1 students depending on their study background.

Study periods

Period 1: September 2–November 3, 2024 (weeks 36–44)
Period 2: November 4, 2024–January 19 2025, (weeks 45–03)
Period 3: January 20–March 23, 2025 (weeks 04–12)
Period 4: March 24–June 8, 2025 (weeks 13–23)

Christmas break: *usually* there is a break over Christmas and New Year's and no scheduled teaching between December 20, 2024 to January 7, 2025. Additional days with no academic schedule 2024–25 are April 18–21 st, May 1st and May 29th, June 6 th.

Courses in English Biology Education Center Uppsala University

1. **Course track in *Ecology/Limnology***

Course	Level	Time period	Specific prerequisites	Comment
1BG200 Ecology 15 credits	1 (BSc)	Period 1 Fall 2024	Evolution, Ecology, Genetics, Zoology/Botany	
1BG227 Limnology (Inland water ecology) 15 credits	1	Period 1 Fall 2024	Evolution, Ecology, Genetics, Zoology/Botany	
1BG305 Applied Ecosystem Ecology 15 credits	2 (MSc)	Period 2 Fall 2024	1BG200 Ecology or 1BG227 Limnology	
1BG203 Animal Structure and function 15 credits	1	Period 2 Fall 2024	Evolution, Physiology	
1BG319 Behavioural Ecology 15 credits	2	Period 3 Spring 2025	1BG200 Ecology or 1BG227 Limnology with at least 6 credits passed	
1BG206 Plant structure and function 15 credits	1	Period 3 Spring 2025	Evolution, Molecular Biology, Cell Biology, Physiology	
1BG225 Research Training 15 credits	1	Period 3 or 4 Spring 2025	80 credits in Biology within the BSc Programme in Biology	
1BG214 Bachelor's Degree Project 15 credits	1	Period 3 or 4 Spring 2025	80 credits in Biology within the BSc Programme in Biology	Mandatory part of the programme

See Part 1 for Course Syllabuses for the Ecology track, page 4.

2. Course track in *Toxicology/Physiology*

Course	Level	Time period	Specific prerequisites	Comment
1BG209 Toxicology 15 credits	1 (BSc)	Period 1 Fall 2024	Molecular Biology, Genetics, Cell Biology, Physiology	
1BG203 Animal Structure and function 15 credits	1 (BSc)	Period 2 Fall 2024	Evolution, Physiology	
1BG308 Ecotoxicology 15 credits	2 (MSc)	Period 2 Fall 2024	1BG209 Toxicology	
1BG344 Genes, Brain and Behaviour 15hp	2 (MSc)	Period 2 Fall 2024		
1BG207 Neurobiology 15 credits	1 (BSc)	Period 3 Spring 2025	Molecular Biology, Genetics, Cell Biology	
1BG225 Research Training 15 credits	1 (BSc)	Period 3 or 4 Spring 2025	80 credits in Biology within the BSc Programme in Biology	
1BG214 Bachelor's Degree Project 15 credits	1 (BSc)	Period 3 or 4 Spring 2025	80 credits in Biology within the BSc Programme in Biology	Mandatory part of the programme

See Part 2 for Course Syllabuses for the Toxicology/Physiology track, page 16.

3. Course track in *Evolution/Molecular biology*

Course	Level	Time period	Specific prerequisites	Comment
1BG201 Microbial Genetics 15 credits	1 (BSc)	Period 1 Fall 2024	Molecular Biology, Genetics, Microbiology, Cell Biology	
1BG235 Diversity and Evolution of Microbial Eukaryotes 15 credits	1 (BSc)	Period 2 Fall 2024	Evolution, Molecular Biology, Genetics, Microbiology, Cell Biology, Physiology, Ecology	
1BG205 Evolutionary Genetics 15 credits	1 (BSc)	Period 2 Fall 2024	Evolution, Molecular Biology, Genetics, Ecology	
1BG230 Molecular Biology and Genetics II 15 credits	1 (BSc)	Period 3 Spring 2025	Molecular Biology, Genetics, Molecular Biology Practicals	
1BG207 Neurobiology 15 credits	1 (BSc)	Period 3 Spring 2025	Molecular Biology, Genetics, Cell Biology	
1BG225 Research Training 15 credits	1 (BSc)	Period 3 or 4 Spring 2025	80 credits in Biology within the BSc Programme in Biology	
1BG214 Bachelor's Degree Project 15 credits	1 (BSc)	Period 3 or 4 Spring 2025	80 credits in Biology within the BSc Programme in Biology	Mandatory part of the programme

See Part 3 for Course Syllabuses for the Biotechnology/Molecular biology track, page 28.

UPPSALA
UNIVERSITET

Syllabus for Ecology

Ekologi

15 credits
Course code: 1BG200
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including The Evolution and Diversity of Organisms (15 credits), Ecology and Population Genetics (15 credits), and 7.5 credits in floristics and faunistics.
Responsible department: Biology Education Centre

LEARNING OUTCOMES

The course gives an overview of ongoing ecological research and constitutes a basis for second-cycle studies and work within fields requiring knowledge in ecology, ranging from research in evolutionary ecology to practical work in nature conservation.
On completion of the course, the student should be able to:

- account for behavioural-ecological theories of sexual selection, foraging, altruism, cooperation, signalling and communication
- demonstrate understanding of plant and anmal life histories
- quantify and interpret diversity patterns
- account for theories of population dynamics, interspecific competition and trophic interactions in food webs
- carry out simple computer simulations of population dynamics
- plan, carry out and statistically evaluate an ecological study and presentthe results orally and in writing
- critically review and discuss primary scientific texts in Ecology.

CONTENT

Behavioural ecology including the connection between ecology, evolutionary theory, sexual selection and foraging, mating systems, kinship, altruism, cooperation and group living, adaptations to biological enemies, the evolution of signals and communication, and basic life history. Ecology and evolution of plant life histories, covering seed germination and dispersal as well as pollination ecology and an introduction to plant demography. Quantification and interpretation of diversity patterns. Models for population growth and population regulation as well as for interspecific competition and trophic interactions (e g Lotka-Volterra models, harvesting models), and food web theory.

INSTRUCTION

The course comprises a field course and a theory part that consists of lectures, computer simulations, calculation exercisesand seminars . The course includes integrated communication training with feedback and self-assessment.

ASSESSMENT

Modules: Theory 12 credits; Field course 3 credits;
The theory part is examined through a written examination. Active participation in seminars and exercises is required. The field course is presented both in writing (project report) and orally.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

OTHER DIRECTIVES

1BG200 Ecology C and 1BG382 Ecology D can not be included in the same degree.

UPPSALA
UNIVERSITET

Syllabus for Limnology

Limnologi

15 credits
Course code: 1BG227
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2014-03-13
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
One of the following alternatives:

1) Completed courses worth 60 credits in biology including The Evolution and Diversity of Organisms (15 credits), Ecology and Population Genetics (15 credits), Life and Interactions of Microorganisms (5 credits), 15 credits in chemistry and 7.5 credits taken in floristics and faunistics.

2) Completed courses worth 40 credits in chemistry and completed courses worth 35 credits in biology including The Evolution and Diversity of Organisms (15 credits), Ecology and Population Genetics (15 credits), Life and Interactions of Microorganisms (5 credits), and 7.5 credits taken in floristics and faunistics.

3) Completed courses worth 25 credits in earth sciences, completed courses worth 15 credits in chemistry and completed courses worth 35 credits in biology including The Evolution and Diversity of Organisms (15 credits), Ecology and Population Genetics (15 credits), Life and Interactions of Microorganisms (5 credits), and 7.5 credits taken in floristics and faunistics.
Responsible department: Biology Education Centre

LEARNING OUTCOMES

The general aim of the course is for students to acquire knowledge in limnology of relevance for their future work and research.

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

- analyse and evaluate abiotic and biotic conditions in aquatic ecosystems
- account for structure and dynamics in biogeochemical cycles and organism communities
- carry out basic sampling and analyses in freshwater field/laboratory systems
- plan and carry out experiment/field studies
- present and evaluate experiment/field studies both orally and in writing.

CONTENT

The course conveys knowledge of inland waters as ecosystems, with a special focus on lakes, including physical, chemical and biological aspects. It is characterised by many practical components that provide skills and deepen the theoretical contents.

All major organism groups are covered, from microorganisms to fish. Common species and characteristic species for different lake types are studied, as well as variations in different parameters that control the dynamics of lake ecosystems. Carbon, nitrogen and phosphorus cycles are covered, including their connections with environmental issues such as climate change and eutrophication. The course also includes analysis of the chemical composition of water as well as assessment of water quality. Case studies using data from different types of ecosystems are used for training in how to interpret and evaluate data and time series.

The course includes several field exercises, including a longer field course with practical training in sampling and analysis methodology, statistical data analysis, independent project and group work, and oral and written presentations.

INSTRUCTION

The teaching is conducted as lectures, seminars, computer exercises, field courses and laboratory sessions. Participation in seminars, field courses and laboratory sessions are compulsory.

ASSESSMENT

The module Species and habitat knowledge is examined through written and oral tests (4 credits). The field course requires active participation and oral and written presentations (4 credits). The theory part requires active participation in seminars and laboratory sessions and passed written exam (7 credits).

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

OTHER DIRECTIVES

Cannot be included in the same degree as 1BG380 Limnology I D, 1BG505 Limnology D, 1BG202 Limnology I or 1BG041 Limnology L.

UPPSALA
UNIVERSITET

Syllabus for Applied Ecosystem Ecology

Tillämpad ekosystemekologi

15 credits
Course code: 1BG305
Education cycle: Second cycle
Main field(s) of study and in-depth level: Biology A1N
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses of 120 credits including (1) 60 credits in biology and 30 credits in chemistry or 30 credits in earth science, or (2) 90 credits in biology. In both cases, either of the advanced courses Ecology 15 credits or Limnology 15 credits. English 6. (A Swedish Degree of Bachelor satisfies this requirement.)
Responsible department: Biology Education Centre

LEARNING OUTCOMES

The course builds further on the students' knowledge and experiences from earlier courses in ecology or limnology and aims at communicating an independent and source-critical working method for a future career in research or as professionals within the society, with sustainable development as the general aim.
On completion of the course, the student should be able to:

- explain overall structure and function of aquatic and terrestrial ecosystems and interactions between them from a catchment perspective, and motivate the use of catchments as a the basis for nature conservation, environmental protection and other planning purposes in society
- describe and apply the EU Water Framework Directive and generally know how water issues are handled also outside Europe
- handle GPS equipment and geographic information systems (GIS)
- independently plan, motivate and carry out sampling and analysis for monitoring of water quality in a catchment, and evaluate the result
- explain and distinguish between different forms of anthropogenic influence on aquatic systems and use this in evaluations of nature values and damages on lakes and watercourses
- critically review and communicate theories, complex problems and research results
- identify and discuss aspects related to environmental ethics.

CONTENT

Applied ecosystem ecology, theory and practice
The course handles catchment areas from an integrated ecosystem perspective. The following parts are included:

- The hydrological cycling and water as carrier of different substances
- Definition and identification of catchment areas from map material and in field
- River ecology
- Flow analyses of different substances in catchment areas
- The structure and function of different catchment ecosystems, interactions between terrestrial and aquatic ecosystems
- Anthropogenically influenced versus natural systems. Effects of different land use on hydrological, chemical and biological processes in soil and water
- Anthropogenic threats to aquatic ecosystems, in the form of hydromorphological changes (construction of dams and dikes,drainage of land), pollution (eutrophication, acidification, dangerous substances), introduction of non-native species and exploitation of species populations.

- Case studies for assessing Natura 2000 object

GIS training
Practical training in handling GIS software, to a large extent integrated in other parts of the course. An individual GIS project is also included.

Literature seminar; Water management
from Swedish, European and international perspective.

INSTRUCTION

The teaching is given as lectures, seminars, computer exercises, laboratory sessions, field exercises and group assignments. Participation in seminars, computer exercises, laboratory sessions, field exercises and group assignments are compulsory. Integrated communication training with feedback and self evaluation is included in the course.

ASSESSMENT

Modules:
Module 1, Applied ecosystem ecology, theory and practice 8 credits; Module 2, GIS training 5 credits; Module 3, Literature seminar 2 credits
Examination of Module 1 is continuously performed during the course through written reports, oral presentations and/or seminars.
Examination of Module 2 is made by written assignments and by individual tasks where the students produce and present an assignment where a GIS map is included.
Module 3 requires active participation in the seminar, with associated individual preparations.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Animal Structure and Function

Djurens struktur och funktion

15 credits
Course code: 1BG203
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) The Evolution and Diversity of Organisms (15 credits) and Physiology (15 credits), or 2) Biology A: Patterns and Processes (22.5 credits), or Biology A: Patterns, Processes and Science Education (22.5 credits), and Physiology (15 credits).
Responsible department: Biology Education Centre

LEARNING OUTCOMES

The aim of the course is to provide advanced knowledge of animals as integrated biomechanical and physiological organisms.

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

- describe and be familiar with how some selected organisms have been morphologically and anatomically adapted to a certain mode of life
- describe the most important organ systems and explain their functions
- draw conclusions about interrelationships and evolution through comparative anatomy and morphology
- describe and be familiar with different life cycles of selected groups of organisms
- describe important tissue types, such as muscle, connective tissue, bone, cartilage, kidney tissue, etc., on the basis of histological sections
- practically carry out detailed dissections of selected groups of organisms
- identify and discuss ethical aspects related to animal testing and other uses of animals in teaching and research.

CONTENT

The course explores the connections between comparative morphology, histology, biomechanics and physiology. The information is presented within a phylogenetic framework. The focus lies on how structure and function are integrated, and how they differ between animals with different life styles. Invertebrates and vertebrates will be studied, with an emphasis on the latter.
In-depth knowledge of the animals' structure, for example through a systematic overview of different animal groups, their organ systems and tissue types. Overview of reproductive strategies, life cycles and evolution.

INSTRUCTION

The theoretical teaching is given as lectures and seminars. The practical teaching includes a field course and a series of laboratory practicals based on dissections and physiological experiments. Participation in laboratory practical, field course and seminars is compulsory.

ASSESSMENT

Invertebrates: laborations and field course 2 credits, and seminars 4 credits. Vertebrates: labs, excursions, seminars and presentations 3 credits, and written examination 6 credits. All course parts require active participation.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Behavioural Ecology

Beteendeekologi

15 credits
Course code: 1BG319
Education cycle: Second cycle
Main field(s) of study and in-depth level: Biology A1N
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses of 120 credits including (1) 60 credits in biology and 30 credits in chemistry or 30 credits in earth science, or (2) 90 credits in biology. In both cases at least 6 credits competed of one of the advanced courses Ecology 15 credits, Limnology 15 credits, or Evolutionary Processes 15 credits. Proficiency in English equivalent to the Swedish upper secondary course English 6.
Responsible department: Biology Education Centre

LEARNING OUTCOMES

All animals are selected to pay close attention to the behaviour of others, be it conspecifics, prey or predators. The course treats these behaviours as evolved characters with a survival and a reproductive value. On completion of the course, the student should be able to:

- account for and critically evaluate theories and models for sexual selection, foraging, mating and life history strategies, sociality, predation, speciation, personality and communication
- handle and present current problems in behavioural ecology, in writing as well as orally
- carry out and present practical studies in behavioural ecology
- independently and critically review scientific texts and theories
- identify and in a structured way discuss ethical issues related to animal testing.

CONTENT

Sexual reproduction, ways of reproducing, and sexual selection. Models for sexual selection, foraging, alternative mating and life history strategies, cooperation and personality. The relationship between sexual selection and speciation, life history, sexual conflict and partner manipulation. The relationship between life history theory, energy use, predation and survival. The evolution of communication and design of signals. Orientation in current behavioural ecology research, with an aim to prepare for research.

INSTRUCTION

Teaching consists of lectures, group exercises (labs and computer exercises), group seminars and group as well as independent literature assignments. Independent work as well as discussions and group exercises make up an important part of the course. The course includes handling and presenting behavioural ecology problems in writing as well as orally, and independently and critically reviewing scientific texts and theories . Participation in group exercises, seminars and literature assignments are compulsory. The course employs integrated communication training with feedback and self-assessment.

ASSESSMENT

Modules: Theory 10 credits; Exercise 5 credits.
The module exercises require an active participation in group as well as independent assignments. The course ends with a written examination.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability

coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Plant Structure and Function

Växternas struktur och funktion

15 credits
Course code: 1BG206
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) The Evolution and Diversity of Organisms (15 credits, course completed), Molecular Biology and Genetics (10 credits, course completed), and the courses Cell Biology (15 credits, course taken) and Physiology (15 credits, course taken), or 2) Biology A: Patterns and Processes (22.5 credits, course completed), or Biology A: Patterns, Processes and Science Education (22.5 credits, course completed), and the courses Cell Biology (15 credits, course taken) and Physiology (15 credits, course taken).
Responsible department: Biology Education Centre

LEARNING OUTCOMES

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

* Give examples of several evolutionary innovations essential for the terrestrial plants possibilities to establish and diversify in different environments
* Account for fundamental physiological/functional, genetic/developmental and phylogenetic/biodiversity aspects of these innovations
* Describe how we, from different perspectives, can illustrate and contribute to a more general understanding of the origin of evolutionary innovations and their underlying genotypic and phenotypic mechanisms
* Describe
- fundamental aspects regarding phylogenetic relationships, morphology, anatomy and physiology of plants
- the principles behind historical analysis of relationships and character evolution
- molecular mechanisms behind important morphological and physiological innovations
- the principles of inference for evolutionary mechanisms based on genomic variation
- the principles for analysis of DNA sequences and gene expression
* Independently make use of phylogenetic trees to describe evolutionary patterns and analyse evolutionary causalities
* Perform and show practical skills in microscopy and genetic analysis
* Discuss and communicate principles, problems and research results for questions within the framework of the contents of the course

CONTENT

During evolution, different morphological, structural and physiological innovations have had central importance for the possibility of plants to establish and diversify in different environments. The course focuses on some of these innovations, for example the origin of vascular tissue and flowers and how different plants adapt to their environment. The course provides a deep understanding of these evolutionary innovations from different perspectives. The subparts include:

- Physiological/functional aspects of the evolutionary innovations covered by the course
- Genetic-developmental biological aspects of evolutionary innovations covered by the course
- Phylogenetic-biodiversity aspects of evolutionary innovations covered by the course
- Project work: in connection to one of the involved research disciplines, and related to one or more of the learning outcomes, a practical or literature-based independent project is carried out.

INSTRUCTION

The teaching consists of lectures, seminars, project work, study visits, and laboratory sessions. Participation in seminars, laboratory sessions, and project work are compulsory.

ASSESSMENT

Parts of the course: Theory 8 credits, projects 3 credits, laboratory sessions 4 credits.

The theory part is examined by written exams, written and oral presentations of parts with PBL character. The project work is examined through a written and an oral presentation including peer-review on another project. Laboratory sessions and seminars require active participation.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Microbial Genetics

Mikrobiell genetik

15 credits
Course code: 1BG201
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) Molecular Biology and Genetics (10 credits), Life and Interactions of Microorganisms (5 credits) and Cell Biology (15 credits), or 2) Biology A: Patterns and Processes (22.5 credits), or Biology A: Patterns, Processes and Science Education (22.5 credits), and Cell Biology (15 credits).
Responsible department: Biology Education Centre

LEARNING OUTCOMES

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

- explain the processes behind mutations and other genetic changes
- identify and distinguish genetic regulatory mechanisms at different levels
- solve theoretical and practical problems in genetic analysis particularly concerning genetic mapping and strain construction
- identify genes and mutations in non-annotated sequence data from databases by means of relevant bioinformatics programs
- plan basic experiments in microbial genetics concerned with clarifying phenotypes and their relationship with the genotype
- use common methods in microbial genetics
- describe and summarise experimental work in a correct way in a laboratory notebook.

CONTENT

Mechanisms behind stability and change in microbial genomes. Mechanisms behind the information flow from DNA to proteins and the multiple levels at which gene expression can be regulated. Genetic aspects of extrachromosomal elements such as bacteriophages and plasmids. Genetic methods to construct, map and move mutations, and to measure gene expression, and through exercises in problem-solving at seminars where scientific data are analysed. Laboratory sessions where the students through strain construction, genetic selection and screening familiarise themselves with important and common methods in microbial genetics. Careful and proper use of a laboratory notebook to record laboratory work.

INSTRUCTION

The teaching is given in the form of lectures, seminars and laboratory sessions. Participation in seminars and laboratory sessions is compulsory.

ASSESSMENT

Modules: Theory 7 credits; Exercises 3 credits; Laboratory notebook 2 credits; Student symposium 3 credits.
The theory module requires a writen assignment and a written test. The module Exercises require active participation in laboratory sessions and seminars. The module Laboratory notebook requires proper laboratory reports. The module Student symposium requires active participation in a student symposium with preparatory literature seminars.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

OTHER DIRECTIVES

The course cannot be included in the same degree as 1BG389 Microbial Genetics D.

UPPSALA
UNIVERSITET

Syllabus for Diversity and Evolution of Microbial Eukaryotes

Mikrobiella eukaryoters diversitet och evolution

15 credits
Course code: 1BG235
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2021-03-04
Established by: The Faculty Board of Science and Technology
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) The Evolution and Diversity of Organisms (15 credits, course completed), Molecular Biology and Genetics (10 credits, course completed), Life and Interactions of Microorganisms (5 credits, course completed), Cell Biology (15 credits, course completed), and Ecology and Population Genetics (15 credits, course taken, 7 credits completed), or 2) Biology A: Patterns and Processes (22.5 credits), or Biology A: Patterns, Processes and Science Education (22.5 credits), and in both cases Cell Biology (15 credits).
Responsible department: Biology Education Centre

LEARNING OUTCOMES

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

- describe the major lineages of the eukaryotic tree of life and analyse how they relate to each other
- discuss the morphology, cell structure and genome characteristics of the main groups of protists and fungi
- use and evaluate morphological and DNA analysis tools to study environmental diversity of protists and fungi
- critically assess the current consensus on the origin and evolution of the eukaryotic cell and organelles
- analyse the consequences of main transitions in life styles, such as evolution of photosynthesis, parasitism and multicellularity, on the evolution of eukaryotes
- discuss the ecosystem and societal importance of protists and fungi, for example as producers of enzymes for industry, and as parasites of human, crop and livestock

CONTENT

The course purpose is to develop an understanding of the full width of diversity in eukaryotes with a focus on fungi and protists. We focus on the diversity of microbial eukaryotes including photosynthesising, free living and parasitic species. The presently established hypotheses about the origin of the eukaryotic cell are presented, together with the most important groups of fungi and protists and their relationships, including algae, flagellates, amoebas, ciliates, predators, yeast and mould. The course covers the diversity and origin of algae, chloroplast and mitochondria evolution, and the evolution of plants, animals and fungi from unicellular ancestors. Parasitism is studied by highlighting examples of parasite diversity. We also overview the importance of fungi and protists for ecosystems and society.

INSTRUCTION

Lectures, laboratory sessions, seminars and problem-solving exercises.

ASSESSMENT

Written theoretical examination (8 credits), practical exercises and lab reports (4 credits), and seminars and written litterature assignment (3 credits).

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

READING LIST

The reading list is missing. For further information, please contact the responsible department.

UPPSALA
UNIVERSITET

Syllabus for Evolutionary Genetics

Evolutionär genetik

15 credits
Course code: 1BG205
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) The Evolution and Diversity of Organisms (15 credits, course completed), Molecular Biology and Genetics (10 credits, course completed) and Ecology and Population Genetics (15 credits, course taken), or 2) Biology A: Patterns and Processes (22.5 credits) or Biology A: Patterns, Processes and Science Education (22.5 credits).
Responsible department: Biology Education Centre

LEARNING OUTCOMES

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

- describe the basic mechanisms behind evolution of DNA sequences and gene structure
- describe the principles for population genetics
- describe the latest progress within molecular genetics
- use molecular genetic laboratory methods
- describe the main fields of research and studies of modern evolutionary genetics.
- use available sources of information as well as basic laboratory methods to generate molecular genetic information

CONTENT

The course focuses on the following concept and processes: Historical introduction to evolutionary genetics. Mutations: the source of genetic variation. DNA sequence evolution and mechanisms for molecular evolution. Population genetics: factors determining the composition and change in allale and genotype frequencies. Genetic markers and sequencing technologies. Mapping of genes: establishing the link between phenotype and genotype. Conservation genetics. Evolution of genetic systems, sex chromosomes and sex determination mechanisms. Speciation processes. Selfish genes: conflicts between genetic elements within an individual. Phylogeny: methods to analyse evolutionary relatedness between populations. Domestication: changes in the genetic composition of wild animals through selective breeding.

INSTRUCTION

Lectures, laboratory sessions, seminars, discussion sessions, computer exercises, literature assignments and projects. Participation in lab practicals, computer assignments and project work is compulsory.

ASSESSMENT

To pass the course, the students should:
o complete practical exercises and lab reports, 4 credits
o participate in seminars, 3 credits
o pass an examination, 8 credits
The grading is based on the results of the examination. Satisfactorily performed laboratory sessions and discussions can give extra points.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability

coordinator of the university.

READING LIST

The reading list is missing. For further information, please contact the responsible department.

UPPSALA
UNIVERSITET

Syllabus for Molecular Biology and Genetics II

Molekylärbiologi och genetik II

15 credits
Course code: 1BG230
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2015-03-12
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) Molecular Biology and Genetics (10 credits), or 2) Biology A: Patterns and Processes (22.5 credits) or Biology A: Patterns, Processes and Science Education (22.5 credits). In both cases students must have taken the courses Cell Biology (15 credits) and Physiology (15 credits). They must also have taken the courses The Basic Principles of Chemistry (15 credits), Organic Chemistry I (10 credits) and Biochemistry I (5 credits), and have completed 20 of the credits for these courses. The course requires practical laboratory experience in molecular biology.
Responsible department: Biology Education Centre

LEARNING OUTCOMES

After passing the course the student should be able to

- describe thoroughly how gene expression is regulated in bacteria, archaea and eukaryotes
- independently use and optimise molecular tools such as PCR and cloning
- use some and describe several methods and strategies for deeper analysis of biological questions, e.g. gene inactivation, gene editing, fluorescent reporter genes and model organisms
- describe how advanced molecular tools such as large-scale sequencing and proteomics can be used to study gene expression
- describe current applications of molecular biology and genetics, within e.g. evolutionary biology and medicine
- read and evaluate scientific articles and suggest follow-up experiments
- describe ethical issues related to the subjects that are covered during the course

CONTENT

The course focuses on regulation of gene expression in bacteria, archaea and eukaryotes, and basic molecular biological and genetic methods as well as the latest large-scale methods that are used to study gene function and gene expression. The following subjects are covered during the course: epigenetics; transcriptional and post-transcriptional regulation of gene expression; regulatory RNA. The latest methods within analysis of gene expression, e.g. large-scale sequencing and proteomics. Applications of molecular biology and genetics in current research. Methods for further studies of gene function: inactivation of genes, reporter genes, model organisms. Experimental strategies: selection of methods to study a specific scientific problem. Theoretical and practical training in PCR, cloning, epigenetics in fission yeast and inactivation of reverse genetics in the roundworm C. elegans. Ethical questions within molecular biology and genetics.

INSTRUCTION

Lectures, laboratory sessions, seminars and problem-solving exercises.

ASSESSMENT

Written examination (9 credits), written and oral presentation of laboratory sessions (5 credits) as well as oral and written presentation at literature seminar (1 credit).

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to

be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Neurobiology

Neurobiologi

15 credits
Course code: 1BG207
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) Molecular Biology and Genetics (10 credits, course completed) and the course Cell Biology (15 credits, course taken), or 2) Biology A: Patterns and Processes (22.5 credits, course completed), or Biology A: Patterns, Processes and Science Education (22.5 credits, course completed), and the course Cell Biology (15 credits, course taken).
Responsible department: Biology Education Centre

LEARNING OUTCOMES

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

- describe the structure and function of neurons and glia cells
- describe how the nervous system is established and how neurons are connected in neuronal circuits that control bodily functions and behavioral output
- describe the central nervous system, the autonomous nervous system and the peripheral nervous system including the structure and function of the sensory organs and the motor systems. Describe and analyse how the interactions between these neuronal systems via various neurotransmitters influence the functions of the body
- describe some of the functions of the nervous system such as the regulation of, movement, motivation, pain, emotions and memory, and how these can be dysfunctional in neurological and neuropsychiatric disorders
- analyse a given theoretical problem/case, identify gaps in knowledge and retrieve knowledge from relevant scientific literature
- give an account for basic and advanced neurobiological techniques
- identify and apply a suitable method theoretically or practically to address the research question at hand
- compile and present a literature study and develop an ability to critically analyse and discuss science by reviewing texts in public and scientific papers
- identify and discuss ethical issues related to scientific activities.

CONTENT

The course structure is aimed at in-depth knowledge of the molecular and cellular neurobiology and basic knowledge of general neurobiology. The emphasis is on mammalian neurobiology, particularly humans. Course introduction focuses on neuroanatomy and basic neurocellular mechanisms such as chemical and electrical signaling and neurotransmission. It then describes more advanced functions of the nervous system from the molecular to the integrated level, such as the different senses (sight, smell, etc.), motor and movement control, reward system, emotions and pain. The course also describes current methods in neuroscience research.

INSTRUCTION

The teaching consists of lectures, laboratory sessions, problem-based learning sessions and literature seminars.

ASSESSMENT

To pass the course, passed participation in all compulsory parts (laboratory sessions, seminars, literature assignment and presentation, and passed continuous exams such as half-time control), and passed results of examination are required. Credit points of the modules are: written

exam 9 credits, laboratory sessions 2 credits, seminars, 2 credits, the literature assignment and presentation 1 credit, and continuous exams, so called "duggas", 1 credit.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Toxicology

Toxikologi

15 credits
Course code: 1BG209
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including Molecular Biology and Genetics (10 credits), Cell Biology (15 credits) and Physiology (15 credits). Students must also have taken the courses The Basic Principles of Chemistry (15 credits), Organic Chemistry I (10 credits) and Biochemistry I (5 credits), with 20 credits completed.
Responsible department: Biology Education Centre

LEARNING OUTCOMES

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

- describe basic toxicological principles and describe how different chemicals are taken up by, processed in and eliminated from the body
- describe different the importance of different organs for detoxification/ toxification of chemicals, and describe mechanisms for chemically induced neurotoxicity and endocrine toxicity
- describe different behaviour tests and their importance to discover of different neurological and endocrinological disturbances
- describe when different chemicals are most toxic, and mechanisms behind the effects. Be able to discuss when and how different chemicals can interact under the development to induce effects
- describe different genetic testing methods and injuries after various types of ionising radiation
- apply different toxicological frameworks within the professional disciplines and have awareness about different risk assessment criteria

CONTENT

General toxicological principles and overview of toxic substances: The part includes basic description how substances are absorbed by, distributed and eliminated from the body. The part contains awareness about toxicokinetic models and the processes of biotransformation.

Toxicity in specific target organs ? effects and mechanisms: The part includes basic toxicological knowledge of the effect of chemicals on central organs that are of significance for the uptakes/elimination and detoxification/toxification. Basic knowledge about how the communication systems of the body, the nervous system and the endocrine system is influenced of chemicals.

Behaviour toxicology: The part includes basic behaviour toxicological knowledge, how behavioural techniques can reveal chemicals that give functional disturbances

Development toxicology: The part includes basic knowledge of different developmental phases; embryonic and embryonic development, development during the neonatal period. Critical developmental phases then teratogenic injuries and functional disturbances are induced.

Genetic toxicology and ionising radiation: The part includes basic knowledge about genetic injuries and general genetic testing methods and mechanisms behind chemically induced injuries and injuries after ionising radiation.

Toxicology in the society: Environmental toxicology, food toxicology, clinical toxicology, epidemiology, risk assessment.

INSTRUCTION

Lectures, group tuition, seminars and laboratory sessions. Attendance at the laboratory work and connected lessons is compulsory. The course may be given in English.

ASSESSMENT

Modules: Theory 10 credits: Written examination
Laboratory sessions 4 credits: Written laboratory reports
Literature assignment 1 credit: Written and oral presentation of literature assignment
A passing grade for the entire course requires passing grades for the laboratory work and seminars.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

TRANSITIONAL PROVISIONS

This course and the course 1BG381 Toxicology D cannot both be included in the same degree.

UPPSALA
UNIVERSITET

Syllabus for Animal Structure and Function

Djurens struktur och funktion

15 credits
Course code: 1BG203
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) The Evolution and Diversity of Organisms (15 credits) and Physiology (15 credits), or 2) Biology A: Patterns and Processes (22.5 credits), or Biology A: Patterns, Processes and Science Education (22.5 credits), and Physiology (15 credits).
Responsible department: Biology Education Centre

LEARNING OUTCOMES

The aim of the course is to provide advanced knowledge of animals as integrated biomechanical and physiological organisms.

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

- describe and be familiar with how some selected organisms have been morphologically and anatomically adapted to a certain mode of life
- describe the most important organ systems and explain their functions
- draw conclusions about interrelationships and evolution through comparative anatomy and morphology
- describe and be familiar with different life cycles of selected groups of organisms
- describe important tissue types, such as muscle, connective tissue, bone, cartilage, kidney tissue, etc., on the basis of histological sections
- practically carry out detailed dissections of selected groups of organisms
- identify and discuss ethical aspects related to animal testing and other uses of animals in teaching and research.

CONTENT

The course explores the connections between comparative morphology, histology, biomechanics and physiology. The information is presented within a phylogenetic framework. The focus lies on how structure and function are integrated, and how they differ between animals with different life styles. Invertebrates and vertebrates will be studied, with an emphasis on the latter.
In-depth knowledge of the animals' structure, for example through a systematic overview of different animal groups, their organ systems and tissue types. Overview of reproductive strategies, life cycles and evolution.

INSTRUCTION

The theoretical teaching is given as lectures and seminars. The practical teaching includes a field course and a series of laboratory practicals based on dissections and physiological experiments. Participation in laboratory practical, field course and seminars is compulsory.

ASSESSMENT

Invertebrates: laborations and field course 2 credits, and seminars 4 credits. Vertebrates: labs, excursions, seminars and presentations 3 credits, and written examination 6 credits. All course parts require active participation.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Ecotoxicology

Ekotoxikologi

15 credits
Course code: 1BG308
Education cycle: Second cycle
Main field(s) of study and in-depth level: Biology A1N
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses of 120 credits including 60 credits in biology and 30 credits in chemistry. Participated in the advanced course Toxicology 15 credits. English 6. Proficiency in English equivalent to the Swedish upper secondary course English 6.
Responsible department: Biology Education Centre

LEARNING OUTCOMES

The main objective of the course is to give the students knowledge and skills that allow an overall assessment of the fate of foreign chemicals in the environment and of their effects on different biological organisation levels. To that end, the conceptual framework introduced during the course in toxicology will be further developed and used.
On completion of the course, the student should be able to:

- describe sources and fates of chemicals in the environment
- present and explain mechanisms for adverse effects of chemicals
- estimate the risk for adverse effects of a chemical on different biological organisation levels based on knowledge about the toxicity, degradability, and bioavailability of the chemical
- retrieve and critically evaluate toxicological information from different sources (internet-based databases, hand books, scientific articles)
- independently carry out, and present orally and in writing , classification and labelling of chemicals dangerous for the environment
- independently carry out, and present orally and in writing, environmental risk assessment of chemicals

CONTENT

Environmental chemistry: This part comprises an overview of different chemical groups of anthropogenic origin present in the environment. Focus is on their sources and fates in the environment.

Effects of anthropogenic chemicals: This part comprises negative effects of chemicals on different biological organisation levels (cell, organ, organism, population, ecosystem) with focus on mechanisms. An experimental study is carried out.

Hazard assessment: This part comprises retrieval and critical evaluation of toxicological information from different sources (internet-based databases, hand books, scientific articles etc.) for classification and labelling of chemicals. The students perform an individual project on classification and labelling of chemicals dangerous for the environment according to EU guidelines.

Environmental risk assessment: This part comprises environmental risk assessments of chemicals and is done as projects.

INSTRUCTION

The teaching is given as lectures, seminars, a laboratory practical, exercises and theoretical project work. Active participation in all parts of the laboratory practical and the theoretical project work is compulsory. The course includes integrated communication training.

ASSESSMENT

Modules: Theory 8 credits; Project work 7 credits
The theory is examined through written examination. The module project work is examined through written and oral presentations and critical evaluation of other course participants' project reports.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Genes, Brain and Behaviour

Gener, hjärna och beteende

15 credits
Course code: 1BG344
Education cycle: Second cycle
Main field(s) of study and in-depth level: Biology A1N
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2008-03-13
Established by:
Revised: 2022-10-14
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses of 120 credits including (1) 60 credits in biology and 30 credits in chemistry, or (2) 90 credits in biology. Proficiency in English equivalent to the Swedish upper secondary course English 6.
Responsible department: Biology Education Centre

LEARNING OUTCOMES

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

- explain and use key concepts in behavioural genetics and neuropharmacology
- account for different experimental strategies that can be used to find the genes that affect the behaviour of individuals
- present and discuss questions concerning the interplay between inheritance and environment, and how these influence the behaviours of people and animals.

CONTENT

The course demonstrates, how physiological, pharmacological and genetic changes can influence the complex functions of the brain, such as language, movement, stress management, couple formation, attention, anxiety, fear, depression, eating behaviour and drug addiction. Specific points that are brought up are:

- The function of the brain and brain cells.
- Cellular networks
- Genes and environmental factors behind behaviours.
- Relevance of animal models to understand the behaviour of people.
- Pharmacological drugs that influence brain function.

The laboratory sessions include
Behavioural and pharmacological studies of rodents. Dissection of brain from sheep and RNA extraction from brain tissue. Bioinformatic analysis of cDNA microarrays. Expression analysis with quantitative real-time PCR. Study of gene expression in mouse brain in situ by using the Allen Brain Atlas. Genotyping of genetic polymorphisms in taste receptors.

INSTRUCTION

The course consists of lectures, laboratory sessions, seminars, computer exercises, a written assignment and workshops (group assignment with presentations and discussions in large groups). Participation in laboratory sessions, seminars, computer exercises and workshops are compulsory.

ASSESSMENT

Modules: Theory 10 credits; Laboratory session 3 credits; Seminars and workshop 2 credits

The theory part is examined in a written home examination with access to reading list. The laboratory sessions require written laboratory reports. The seminars and workshop require that each student presents the contents in, and initiate the discussion of, a scientific article and a list of key concepts that have been discussed during the course.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Neurobiology

Neurobiologi

15 credits
Course code: 1BG207
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) Molecular Biology and Genetics (10 credits, course completed) and the course Cell Biology (15 credits, course taken), or 2) Biology A: Patterns and Processes (22.5 credits, course completed), or Biology A: Patterns, Processes and Science Education (22.5 credits, course completed), and the course Cell Biology (15 credits, course taken).
Responsible department: Biology Education Centre

LEARNING OUTCOMES

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

- describe the structure and function of neurons and glia cells
- describe how the nervous system is established and how neurons are connected in neuronal circuits that control bodily functions and behavioral output
- describe the central nervous system, the autonomous nervous system and the peripheral nervous system including the structure and function of the sensory organs and the motor systems. Describe and analyse how the interactions between these neuronal systems via various neurotransmitters influence the functions of the body
- describe some of the functions of the nervous system such as the regulation of, movement, motivation, pain, emotions and memory, and how these can be dysfunctional in neurological and neuropsychiatric disorders
- analyse a given theoretical problem/case, identify gaps in knowledge and retrieve knowledge from relevant scientific literature
- give an account for basic and advanced neurobiological techniques
- identify and apply a suitable method theoretically or practically to address the research question at hand
- compile and present a literature study and develop an ability to critically analyse and discuss science by reviewing texts in public and scientific papers
- identify and discuss ethical issues related to scientific activities.

CONTENT

The course structure is aimed at in-depth knowledge of the molecular and cellular neurobiology and basic knowledge of general neurobiology. The emphasis is on mammalian neurobiology, particularly humans. Course introduction focuses on neuroanatomy and basic neurocellular mechanisms such as chemical and electrical signaling and neurotransmission. It then describes more advanced functions of the nervous system from the molecular to the integrated level, such as the different senses (sight, smell, etc.), motor and movement control, reward system, emotions and pain. The course also describes current methods in neuroscience research.

INSTRUCTION

The teaching consists of lectures, laboratory sessions, problem-based learning sessions and literature seminars.

ASSESSMENT

To pass the course, passed participation in all compulsory parts (laboratory sessions, seminars, literature assignment and presentation, and passed continuous exams such as half-time control), and passed results of examination are required. Credit points of the modules are: written

exam 9 credits, laboratory sessions 2 credits, seminars, 2 credits, the literature assignment and presentation 1 credit, and continuous exams, so called "duggas", 1 credit.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

UPPSALA
UNIVERSITET

Syllabus for Plant Structure and Function

Växternas struktur och funktion

15 credits
Course code: 1BG206
Education cycle: First cycle
Main field(s) of study and in-depth level: Biology G2F
Grading system: Fail (U), Pass (3), Pass with credit (4), Pass with distinction (5)
Established: 2007-03-15
Established by:
Revised: 2022-10-17
Revised by: The Faculty Board of Science and Technology
Applies from: Autumn 2023
Entry requirements:
Completed courses worth 60 credits in biology including 1) The Evolution and Diversity of Organisms (15 credits, course completed), Molecular Biology and Genetics (10 credits, course completed), and the courses Cell Biology (15 credits, course taken) and Physiology (15 credits, course taken), or 2) Biology A: Patterns and Processes (22.5 credits, course completed), or Biology A: Patterns, Processes and Science Education (22.5 credits, course completed), and the courses Cell Biology (15 credits, course taken) and Physiology (15 credits, course taken).
Responsible department: Biology Education Centre

LEARNING OUTCOMES

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

* Give examples of several evolutionary innovations essential for the terrestrial plants possibilities to establish and diversify in different environments
* Account for fundamental physiological/functional, genetic/developmental and phylogenetic/biodiversity aspects of these innovations
* Describe how we, from different perspectives, can illustrate and contribute to a more general understanding of the origin of evolutionary innovations and their underlying genotypic and phenotypic mechanisms
* Describe
- fundamental aspects regarding phylogenetic relationships, morphology, anatomy and physiology of plants
- the principles behind historical analysis of relationships and character evolution
- molecular mechanisms behind important morphological and physiological innovations
- the principles of inference for evolutionary mechanisms based on genomic variation
- the principles for analysis of DNA sequences and gene expression
* Independently make use of phylogenetic trees to describe evolutionary patterns and analyse evolutionary causalities
* Perform and show practical skills in microscopy and genetic analysis
* Discuss and communicate principles, problems and research results for questions within the framework of the contents of the course

CONTENT

During evolution, different morphological, structural and physiological innovations have had central importance for the possibility of plants to establish and diversify in different environments. The course focuses on some of these innovations, for example the origin of vascular tissue and flowers and how different plants adapt to their environment. The course provides a deep understanding of these evolutionary innovations from different perspectives. The subparts include:

- Physiological/functional aspects of the evolutionary innovations covered by the course
- Genetic-developmental biological aspects of evolutionary innovations covered by the course
- Phylogenetic-biodiversity aspects of evolutionary innovations covered by the course
- Project work: in connection to one of the involved research disciplines, and related to one or more of the learning outcomes, a practical or literature-based independent project is carried out.

INSTRUCTION

The teaching consists of lectures, seminars, project work, study visits, and laboratory sessions. Participation in seminars, laboratory sessions, and project work are compulsory.

ASSESSMENT

Parts of the course: Theory 8 credits, projects 3 credits, laboratory sessions 4 credits.

The theory part is examined by written exams, written and oral presentations of parts with PBL character. The project work is examined through a written and an oral presentation including peer-review on another project. Laboratory sessions and seminars require active participation.

If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.