Opasraportti

LuTK - Biology (2009 - 2010)

1. DEPARTMENT OF BIOLOGY

1.1. Departmental ECTS-coordinator

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1.2. General description of the department of biology

The Department of Biology was founded in 1995, when the former Departments of Zoology and Botany (founded in 1959) and Genetics (founded in 1970) were united as part of the reorganisation process of the Faculty of Science at the University of Oulu. The Department of Biology is located at Linnanmaa Campus together with the supporting units, the Museum of Zoology, Zoological Gardens, the Botanical Gardens and the Botanical Museum, and the Biology library. The Thule Institute administered Oulanka Research Station in Kuusamo, also forms an essential part of the research and teaching in the field of biology at the University of Oulu.

1.2.1 Staff

(The staffs' e-mail addresses are in the form 'Forename.Surname@oulu.fi')

Prof. Seppo Saarela, Head of the Department **:**

Ph.D., tel. +358-8-553 1238.

Prof. Jari Oksanen, Deputy Director:

Ph.D., tel. +358-8-553 1526.

Amanuensis:

Dr. Annamari Markkola, Ph.D., on leave of absence.

Acting amanuensis **Ms. Minna Vanhatalo**, Ph.Lic., consultation hours Mon.-Fri. 09-11 am, tel. +358-8-553 1491.

E-mail: Minna.Vanhatalo@oulu.fi

Study advisors:

Dr. Annamari Markkola, Ph.D. tel. +358-8-553 1531 (Plant Ecology).

E-mail: mailto:Marko.Hyvarinen@oulu.fi

Ms. Katja Karppinen, M.Sc., tel. +358-8-553 1544 (Plant Physiology).

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Ms. Suvi Sutela, M.Sc., tel. +358-8-553 1547 (Plant Physiology).

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Dr. Helmi Kuittinen, Ph.D., tel. +358-8-553 1788 (Genetics).

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Dr. Minna Ruokonen, Ph.D., tel. +358-8-553 1807 (Genetics, foreign students).

E-mail: Minna.Ruokonen@oulu.fi

Dr. Laura Kv ist, Ph.D., tel. +358-8-553 1218 (Animal Ecology).

E-mail: Laura.Kvist@oulu.fi

Dr. Seppo Rytkönen, Ph.D., tel. +358-8-553 1257 (Animal Ecology).

E-mail: Seppo.Rytkonen@oulu.fi

Dr. Satu Mänttäri, Ph.D., tel. +358-8-553 1243 (Animal Physiology).

E-mail: mailto:Seppo.Saarela@oulu.fi

Zoology

Professors:

Prof. Esa Hohtola, Ph.D., Professor in Animal Physiology, tel. +358-8-553 1239 (Research Topics: Thermoregulation, Energetics, Bird Physiology).

Prof. Seppo Saarela Ph.D., Professor in Animal Physiology. tel. +358-8-553 1238 (Research Topics: Thermoregulation and Chronobiology).

Prof. Arja Kaitala, Ph.D., Professor in Zoology, consultation hours Tues. 10-12 am, tel. +358-8-553 1211 (Research Topic: Evolutionary Ecology). On leave of absence.

Prof. Markku Orell, Ph.D., Professor in Zoology, tel. +358-8-553 1216 (Research Topic: Behavioural Ecology).

Prof. Timo Muotka, Ph.D., Professor in Hydrobiology.

Lecturers:

Dr. Kari Koivula, Ph.D., tel. +358-8-553 1225 (Research topics: Behavioural and Population Ecology).

Lecturer Animal Physiology, post open.

Senior Assistants:

Dr. Seppo Rytkönen, Ph.D., tel. +358-8-553 1257 (Research Topic: Behavioural Ecology).

Dr. Seppo Saarela, Ph.D., tel. +358-8-553 1238 (Research Topics: Thermoregulation and Chronobiology). On leave of absence.

Dr. Satu Mänttäri, Ph.D., tel. +358-8-553 1243 (Research Topic: Muscle Physiology).

Dr. Laura Kvist, Ph.D., tel. +358-8-553 1218 (Research Topics: Molecule Ecology and Evolution).

Doctoral Students:

Mr. Petri Lampila, M.Sc., tel. +358-8-553 1226 (Research Topic: Animal Ecology).

Ms. Pauliina Louhi, (Research Topic: Animal Ecology).

Zoological Museum:

Dr. Jouni Aspi, Ph.D., Senior Curator tel. +358-8-553 1214 (Research Topic: Ecological Genetics)

Senior Curator, post open.

Curator, post open.

Dr. Risto Tornberg, Ph.D., Curator, tel. +358-8-553 1264 (Vertebrates).

Mr. Atte Lahtela, Conservator, tel. +358-8-553 1262 (Vertebrates).

Zoological Gardens

Mr. Jari Ylönen, Research Technician, tel. +358-8-553 1270.

Botany

Professors:

Prof. Anja Hohtola, Ph.D., tel. +358-8-553 1540 (Research Topics: Physiology of Pine and Tissue Culture, Plant Biotechnology).

Prof. Satu Huttunen, Ph.D., Professor in Botany, consultation hour Wed. 10-11 am, tel. +358-8-553 1527 (Research Topics: Environmental Ecology and Ecophysiology of Plants).

Prof. Hely Häggman, Ph.D., Professor in Plant Physiology, tel. +358-8-553 1546 (Research Topic: Physiology of Forest Trees utilising the methods of Molecular Biology and Biotechnique).

Prof. Jari Oksanen, Ph.D., Professor in Plant Ecology, tel. +358-8-553 1526 (Research Topics: Plant Community Ecology, Gradient Analysis and Bioindication).

Prof. Juha Tuomi, Ph.D., Professor in Botany, consultation hour Thu. 2-3 pm, tel. +358-8-553 1528 (Research Topics: Theoretical and Evolutionary Ecology).

Research prof. Anne Tolvanen, Ph.D. (Finnish Forest Research Institute). tel. + +358-50 391 3782 or +358-8-553 1514 Professor in Forest Recreation Ecology.

Lecturers:

Lecturer Plant Physiology, post open.

Senior Assistants:

Dr. Anna-Maria Mattila, Ph.D., Senior assistant in Plant Physiology. On leave of absence.

Dr. Annamari Markkola, Ph.D., tel. +358-8-553 1531 (Research Topic: Ecology of Mycorrhizal Symbiosis).

Dr. Kari Taulavuori, Ph.D. tel. +358-8-553 1512 (Research Topics: Plant Seasonality and Frost Hardiness, Northern Issues, Climate Change).

Doctoral Students:

Plant Ecology, post open.

Plant Ecology, post open.

Botanical Gardens and Botanical Museum:

Director, **Dr. Marko Hyvärinen,** Ph.D., tel. +358-8-553 1571 (Research Topics: Population and Conservation Biology, Lichen Symbiosis).

Dr. Risto Virtanen, Ph.D., Senior Curator, tel. +358-8-553 1555. (Research Topics: Ecology of Arctic-Alpine Plant Communities).

Dr. Pekka Halonen, Ph.D., Curator, tel. +358-8-553 1554. (Research Topics: Fungal Taxonomy and Systematics).

Ms. Ritva Hiltunen, M.Sc., Curator, tel. +358-8-553 1573. (Research Topic: Ex Situ Conservation of Plants).

Ms. Mirja Siuruainen, M.Sc., Curator, tel. +358-8-553 1572. (Research Topics: Landscaping and Ornamental Use of Native Plants).

Mr. Tuomas Kauppila, Head Gardener, tel. +358-8-553 1574.

Genetics

Professors:

Prof. Outi Savolainen, Ph.D., Professor in Genetics, tel. +358-8-553 1782 (Research Topic: Population Genetics and Evolution).

Prof. Jaakko Lumme Ph.D., tel. +358-8-553 1783 (Research Topic: Population Genetics).

Lecturers:

Dr. Jaakko Lumme, Ph.D., tel. +358-8-553 1783 (Research Topic: Population Genetics). On leave of absence.

Senior Assistants:

Dr. Helmi Kuittinen, Ph.D., tel. +358-8-553 1803 (Research Topic: Evolutive Plant Molecular Genetics).

Dr. Minna Ruokonen, Ph.D., tel. +358-8-553 1807 (Research Topic: Conservation and Population Genetics).

1.2.2 Research profile

1) Zoology

Zoology studies consist of areas such as animal species and their taxonomic relations (systematics), animal distribution and abundance within their range (zoogeography), interaction between species, individuals and their environment (ecology) and whole animals as functional units (physiology). An ecologist most often operates with data gathered in the field; the data being either descriptive, inventory, comparative or experimental. Physiologists conduct experimental studies on the structure and function of animal tissues and organs, usually working in the laboratory. The different branches of zoology often overlap each other, and researchers must deal with a wide range of questions, for example, in the fields of ecophysiology, or ecological biogeography.

The knowledge from zoological studies is used in biotechnics, medicine, game, domestic and fur animal husbandry, fishery, limnology and nature conservation.

Research topics:

Life cycle ecology and evolution of host-parasite relations. Research on adaptations of life cycle features of aquatic invertebrates to local environmental conditions, and on coevolution between parasites and hosts. Special research topics are the role of parasites on evolution of reproductive systems, and evolutionary ecology of parasite resistance.

Prey-predator interaction. The importance of predators in the dynamics of northern bird and mammal populations is researched from the viewpoint of both, preys and predators. Phenomena under research include e.g. numeric and functional responses of predators as well as factors affecting predation risk.

Population, behavioral and nature conservation biology. Research is done on the issue how birds, mammals and plants adapt to the Northern, unpredictable conditions. Ecological, physiological and molecular genetic methods are used in research. Particularly the viability and the amount of the gene flow between metapopulations of decreased or endangered species are viewed. The differences and phylogeny of populations and subspecies are studied by using morphological and molecular genetic methods.

Evolutionary and behavioral ecology. Research on social behavioral of animals, particularly helping, social cheating, sexual selection and conflict between the different sexes. The research is mainly done on insects. Moreover there is research on the differentiation of isolated populations and on the mechanisms that maintain or prevent the differentiation.

Evolution, behaviour and systematics of invertebrate. Research group consists of independent researches focusing on evolution of invertebrate from different perspectives. Research on social behavior of animals, particularly sexual selection and life cycles between different populations. Life histories and mating strategies, sexual conflicts and co-operation, herbivory and insect-host plant interactions, parasites and hosts interactions and insect systematics. Experimental studies, molecular methods and theoretical modelling are used.

Ecological parasitology and ecological immunology. Life history trade offs, sexual selection, predator-prey interactions, parasitism and immunocompetence. Vertebrate and invertebrate are used as model species (mostly insects and crayfishes).

Ecology and co-evolution of hosts and parasites. Deer ectoparasites and diseases and their significance for deer ecology. Research subjects are nematode endoparasites and ectoparasites as deer ked.

Functional cell and developmental physiology. Research targets include development of different characteristics of bone and heart muscles during different developmental stages and under influence of different environmental factors. Research subject include e.g. effects of physical stress and hormones on the expression of typical ion channels and proteins in muscle cells. Model animals include species from phylogenetically different animal groups such as mammals, fish and insects. Particular interest is on ecophysiological characteristics of different animals.

Aquatic ecology and water protection. The group does research on the structure and function of aquatic communities and factors affecting the above. Interest is also on ecological basis for restoration of water systems and catchment areas, ecological risks facing water systems and methods in water protection and biomonitoring that are suitable for northern river systems.

Thermoregulation and cold acclimation in homeothermic animals. The physiology of cold acclimation in birds and mammals; its biochemical basis, physiology, energetic and hormonal regulation is studied. Diurnal and seasonal rhythms of animals are also researched.

2) Botany

Botany in Oulu includes mainly ecology and physiology. They can include other branches of sciences too, like modern systematics and taxonomy uses chemical compounds and molecular biology with morphological distinctive marks in order to study the relationships between plant species. Ecological research focuses on interactions between animals and plants and between microbes and fungi. In Oulu, botanical basic research has particularly focused on ecophysiology of plants and northern plant ecology. The research of fungi and lichen is also under focus. Plant physiological research has emphasis on the physiology of trees, the metabolism, genetic regulation, cold-resistance, dormancy and tolerance towards stress factors of environment.

Applied botanical research includes the inventory of natural resources (including forests, mires and lakes), the effects of environmental changes on plants, nature conservation, environmental impact assessment and ecological background of land use planning. New applying branches are for example, restoration ecology and utilisation of secondary metabolic products.

Advanced studies in botany concentrate on theoretical plant ecology, ecophysiology, special questions in northern areas and molecular biology of plants. Most botany graduates find posts as teachers or researchers. Many of them also find jobs in public administration and environmental protection, as well as in recreation and cultural services **.**

Research topics:

Northern plant ecophysiology and environmental ecology. Research on the susceptibility of the northern nature to disturbances, climate change and air pollutants. Emphasis on the research of the boreal and subarctic plants' stress tolerance and ecophysiology.

Evolutionary plant ecology. Theoretical and empirical research about how plants adapt to variable environments. Particularly emphasis on the interactions between plants and herbivores or plants and fungi.

Population ecology of plants. Research on viability of plant populations, especially risk factors to endangered plant species. Patch dynamics is studied by considering plant populations as metapopulations.

Plant ecology of terrestrial ecosystems. The emphasis is on the ecology of boreal coniferous forests, soil ecology and on plant life cycle and growth strategies.

Economic plants and the production of plant biomass in the northern areas. A field where the co-operation of basic research, the applied branches of science and the restoration ecology are all very significant challenges considering the future.

Plant physiology. Physiology of northern plants is studied using the methods of molecular biology and biotechnology. Research consists of plant developmental biology and topics are biosynthesis of lignin, the importance of polyamines on the development of a pine embryo, regulation mechanism of berry ripening and plant defence and microbe interactions. Applied multidisciplinary research topics include environmental effects of transgenic plants and bioactive secondary metabolite products.

3) Genetics

Genetics studies how the hereditary information encoded in DNA is transmitted to new generations and how it controls the growth, differentiation and metabolic functions of cells. Genetics includes also studies on individual variation within populations and evolutionary changes.

During recent decades, genetic methods have revolutionised many areas of biological research. Basic knowledge of genetics is thus essential for getting a comprehensive view of modern biology. This is also seen in the labour market where expertise in genetics and genetic methods is commonly demanded.

Education in genetics gives a good background for understanding the function and development of organisms at the levels of molecules, cells, organisms and populations. Education also provides competence to apply methods used in molecular biological laboratories and in data analyses.

The research in genetics in Oulu focuses on factors that maintain genetic variation and cause evolutionary changes on populations and in genomes. The projects belong to the fields of biodiversity studies, bioinformatics and biotechnology, and they include studies on genetic adaptation to northern conditions, genetic changes in fragmented landscapes, genomic evolution and speciation process. Study organisms include animals, plants and bacteria.

Research topics:

Genetic basis of plant adaptation. Group works out the genetic architecture of adaptation differences. It studies the molecular population genetics of adaptation affective genes aiming in genomic approach. Species used in this research are Scots pine and *Arabidopsis* species. Molecular population genetics of specification is studied between different *Arabidopsis lyrata* subspecies. Cross-breeding between different diverged populations is shown by genetic incompatibility. In the early stages of specification the marks created by the genetic factors and evolution forces can be detected with the help of gene mapping and sequence analysis.

Evolutionary genetics of insect populations. Research on the structure and evolution of northern *Drosophila* populations using molecular and population biological methods. Declining populations of the *Drosophila virilis* species are the main study objects.

Evolution of parasites and hosts. Parasitic flatworms and their host fish species relations in post ice age Northern Europe are studied using techniques of molecular genetics. Example study organisms include salmon and *Gyrodactylus salaris*.

Conservation genetics. Endangered species population genetics and gene flow are studied both in micro and macro spatial scale in fragmented landscapes. Research gives information for practical conservation of endangered species. Research is done with close cooperation with ecologists and environmental authorities.

Phylogeography. In different groups the genetic structure, phylogeography and evolution history of populations is studied using DNA markers as well as the interconnection of various factors affecting the genetic variation and fitness in nature populations.

Genetics and evolution of social insects. Research on genetic background of sociability in insects, especially in ants. Additionally, the effects of social behaviour to the genetic structure of populations are studied. Research combines theoretical and molecular biological methods.

Presentations of research groups working at the department of biology can be found at the Biology library and at the homepage of the department (http://cc.oulu.fi/~biolwww/english/index.html)!

2. INFORMATION ON DEGREE PROGRAMME

2.1. General description

Bachelor of Science degree

Student can choose Bioscience, Ecology or Biology Teacher line majoring in bioscience or ecology.

Master of Science degree

The Degree Programme in Biology offers the possibility of majoring in Animal Ecology, Animal Physiology, Plant Ecology, Plant Physiology and Genetics. Three lines of specialisation are available:

1) **Ecology** (majors either in Animal or Plant Ecology),

2) **Bioscience** (majors in Animal Physiology, Plant Physiology or Genetics)

3) **Biology Teacher** (majors in any of the five major subjects)

Students can freely choose from the lines, excluding students who are chosen to the Biology Teacher line based on the results of an aptitude test arranged during the first spring term and the second autumn term, and their grades in the taken courses in biology.

General structure of the degree

B.Sc. degree	Subject	TEAbs	TEAeco	BS1	BS2	ECO1	ECO2
Major	Bioscience	78		102	99		
	Ecology		72			92	92
Minor	Bioscience		33-35			61-63	36-38
	Ecology	33,5		60	25		
	Geog/Chem/Psyc/HE	25-35	25-35				
	Educational studies	25	25				
Optional minor					25		25
Other studies		8	8	8	8	8	8

Optional studies		7,5	16-17	10	23	19	19-21
Degree (cr.)		180	180	180	180	180	180

M.Sc. degree	Subject	TEA	BSz	BSg	BSb	ECOz	ECOb
Major		60	75	81	73	83	70
Minor	Geog/Chem/Psyc/HE	25-35					
	Educational studies	35					
Optional studies			53	39	47	37	50
Degree (cr.)		120	120	120	120	120	120

Abbreviations:

TEA Biology teacher option

TEAbs Biology teacher option with emphasis in bioscience

TEAeco Biology teacher option with emphasis in ecology

BS Bioscience option

BS1 Bioscience option: major in bioscience minimum 90 cr. and minor in ecology minimum 60 cr.

BS2 Bioscience option: major in bioscience minimum 90 cr. and minor in ecology minimum 25 cr. and optional minor minimum 25 cr.

ECO Ecology option

ECO1 Ecology option: major in ecology minimum 90 cr. and minor in bioscience minimum 60 cr.

ECO2 Ecology option: major in ecology minimum 90 cr. and minor in bioscience minimum 25 cr. and optional minor minimum 25 cr.

z with emphasis in zoology

g with emphasis in genetics

b with emphasis in botany

Compulsory courses to all students in the degree programme in biology

Bachelor of Science degree: Foreign language 1* Y90xxxx 2 cr.; Foreign language 2* Y90xxxx 2 cr.; Swedish Y901004 2 cr.; Orientation course for new students 750031Y 2 cr.; Cell biology 5 cr.; Concepts of genetics 753124P 7 cr.; Bachelor of Science seminar 4 cr.; Bachelor of Science thesis 10 cr.; Maturity exam 0 cr.

*Language must be the same for both Compulsory Courses.

Master of Science degree: Master of Science seminar 750696S 4 cr.; Final examination 75x699 10 cr.; Master of Science thesis 20/40 cr. and Maturity exam 0 cr.

Bachelor of Science degree aims to provide students with extensive background knowledge in biology. Master of Science degree gives students a more profound understanding in the scientific field chosen by the students. It also aims to equip and prepare students for working after the degree. Already in the first stages of it is worth thinking of where one wants to work. It can have an influence on the choice of minor subjects and studies supporting biology.

Personal study plan (PSP) is made for the entire study period but it is also good to be prepared to change it when needed. Students of biology sketch a preliminary PSP in the first autumn during orientation. Students will make a more precise PSP later on in their studies. Own interests and fields that are strong should be valued. Studying also provides good opportunities for strengthening language skills and verbal presentations. While choosing optional studies it's worth while to consider their applicability in relation to getting a job. You can get help for your planning from e.g. amanuensis, student tutors of different subjects (see e.g. personnel pages in this volume or see the department web-pages at http://www.cc.oulu.fi/~biolwww/english/tutors.html) and University of Oulu Career Services. The timing of your studies should be done according to the presented time table. However, students can plan their own course schedule in their own way. Admittance for many of the courses requires the completion of another course. Courses that are recommended for completing in the latter years will not always admit students that are in the beginning of their studies. However, if there is vacant places even first year students can complete these courses.

Information and notifications on course schedules and courses programmes can be found on the big information board next to office at the biology corridor and in the internet at **http://cc.oulu.fi/~biolwww/.** Usually you have to sign in for courses already in the end of the earlier semester. The books needed in the courses are usually available for lending at the main library or the biology library. However, it is worth to consider buying some of the essential books.

In the beginning of B. Sc.- studies consist mainly of compulsory studies after which the proportion of optional courses increases. Basic studies give knowledge and know-how for studying and working in this line of work. They are done during the first years. Subject studies form the essential part of the studies and it there where one learns e.g. concepts, theories and research methods of biology. In the M. Sc. degree face the advanced courses concentrate mainly on the latter face of the studies and they include a 40 credit Master of Science - thesis.

Teacher specialisation (TEA)

10 students are chosen yearly to teacher specialisation from degree programme in biology based on their grades in and an aptitude test. It is possible to first time apply for the aptitude test first year spring or second year autumn. The admission for the teacher admission is made in second year. The aptitude test can be taken two times in the first two years, The annual intake quota is 10, and maximum two places are for M. Sc. degree students who apply for the teacher specialisation. The Faculty of Science resolves the detailed admission criteria.

Admission criteria:

1. Half of the admission points is set by the success in the studies and half by success in aptitude test.

2. Points for the success in studies is calculated by the compulsory courses for the teacher students in the first academic year multiplied by the passed course credit point weighted by the average grade. In order to take both ecology students and bioscience students equally into account taken field courses are excluded from the admission criteria.

3. The studies success points and the aptitude test point are calculated by the range of both items. Maximum point in both items is fifty (50) points.

4. Aggregate is comprised by calculating the study success points and aptitude test points together. Maximum point is hundred (100) points.

5. First the applicants are set up in order of superiority by the aggregate. The class of the student is not taken into account in this point. If there are more that two applicants from other classes that 2. year who are in this annual intake quota only two best are chosen rest of the intake quota is for the second year students.

A student can choose his/her specialisation and major in the B. Sc. degree either ecology or bioscience. Specialisation lines for the teacher student in the M- Sc. degree can be either bioscience or ecology and major can be chosen from animal ecology, physiological zoology, genetics, plant ecology and plant physiology. The other subject for teaching (at least 60 cr.) can be geography, chemistry, psychology and health sciences. Of the acquired 60 cr for the other teaching subject minimum 25 credits are completed in the B. Sc. degree and 25-35 credits in the M. Sc. degree. This ECTS package presents teacher specialisation major biology - minor geography. Minor subject for teaching see Chemistry ECTS package. Course descriptions concerning the combination of biology and psychology can be found in the ECTS package Faculty of Education. All courses in biology are considered as belonging to biology teaching module. For geography and chemistry see the geography and chemistry ECTS packages, for psychology see the Faculty of Education ECTS package. Health sciences teaching is given as chargeable studying in the open university instruction which has been approved by the Faculty of Medicine.

Teachers educational studies (60 cr):

Information on the timing and contents of studies are available in the study guide of the Faculty of Education and the amanuensis of biology. It is presumed that the students master basic skills in media and information techniques when they start their teachers pedagogical studies. These skills (Basics of Windows, text handling, email and use of the internet) can be taught in courses or learnt independently.

Compulsory studies in biology for the teacher specialisation

B. Sc. - degree			**BS**	**ECO**
Basic methods of statistics I	806109P	9 cr	C	C
Cell biology	750121P	5 cr	C	C
Basics of ecology	750124P	5 cr	C	C
Field course in terrestrial animals	751306A	6,5 cr	x	C
Field course in aquatic animals	751307A	4 cr	x	C
Developmental biology-histology	751367A	9 cr	C	Y

Identification of animals	751373A	7 cr	C	C
Animal physiology	751388A	4-8 cr	C	C 4
Animal evolution systematics and morphology	755306A	7 cr	xx	C
Identification of plant species	752303A	3,5 cr	C	C
Field course in ecological botany	752304A	8 cr	x	C
Plant evolution and systematics	752309A	3 cr	xx	Y
Macro fungi *	752616S	3 cr		C
Basic course in plant morphology	752337A	4 cr	xx	Y
Plant developmental biology	756332A	4 cr	xx	Y
Basics in functional plant biology	752345A	4-9 cr	C	C 4
Concepts of genetics	753124P	7 cr	C	C
Experiment. course in general genetics	753104P	8 cr	C	
Bachelor of Science final examinations	750366A	5 cr	C	C
Bachelor of Science seminar	750396A	4 cr	C	C
Bachelor of Science - thesis	750367A	10 cr	C	C
Maturity exam	750332A	0 cr	C	C

M. Sc. - degree

Master of Science final examinations	75X699S	10 cr	C	C
Master of Science seminar	750696S	4 cr	C	C
Master of Science - thesis	75X602S	20-40 cr	C	C
Maturity exam	750632S	0 cr	C	C

C = Compulsory course

x = BS - student has to choose at least 6 cr filed courses in biology for the teaching subject (2 different courses).

xx = BS -student has to choose on of the above courses in ecology in the teaching subject.

Y = ECO - student has to choose on of the above courses in biosciences in the teaching subject.

Compulsory studies in geography for the teacher specialisation

Courses chosen from the following course list. Minimum 60 cr: 790152P, 790141P, 790101P, 790102P, 790104P, 790106A, 790160A, 79303 or 790305A, 790307A, 790340A, 790349A, 790322A, 790326A, 791635, 790310A, 790347, 790346A or 790348A.

See Geography ECTS package for details.

Progression of Biology Studies:

M.Sc.

2 nd year	Master of Science thesis, advanced studies in biology	
1 stspring and summer	Basic and subject studies in geography Educational studies	Master of Science thesis
1 stautumn	Basic and subject studies in geography	Advanced studies in biology
3 rd summer	M.Sc. thesis, research training	Practical training, M.Sc. thesis

B.Sc.

Subject studies in biology, B.Sc. thesis

3 rd spring Basic and subject studies in geography

3 rd autumn Basic and subject studies in geography
Educational studies
Subject studies in biology

Field courses, excursions, summer examinations, research training

2 nd summer

Field course of geography

2 nd spring Basic and subject studies in geography Subject studies in biology

Subject studies in biology

2 nd autumn

Aptitude test for teachers

1 st summer Field courses in biology

1 st year Basic studies in biology and minor subjects

Teacher **Ecology** **Bioscience**

Progression of Biology Studies: LINKKI ENGL.KIELISEEN OPPAASEEN

Minor subject studies

The minimum of studies accepted as a minor subject is 15 credits. Often the amount of 25 cr. is recommended. Minor subject studies include often one other biology subjects (bioscience, ecology) depending on the major subject of the student. Minor subject studies can also be taken from other departments or universities. The most common minor studies for biologists are statistics, biochemistry, chemistry and physics and for teachers geography and educational

studies. Also e.g. environmental studies, environmental techniques, mathematics, teleinformatics, economics and language studies can be useful.

2.2. Qualification awarded

The Department of Biology offers Bachelor of Science and Master of Science Degrees and Licentiate in Philosophy and Doctor in Philosophy Degrees. Students have to take the Bachelor's Degree before completing his/her Master's.

Postgraduate studies can be pursued at all departments of the Faculty. A student with the Master of Science degree may proceed to pursue the degree of Licentiate of Science or Doctor of Science, provided that the grade for the major subject is high enough and that he or she presents an acceptable research plan. The Dean grants permission to pursue postgraduate studies. The Dean's decision will be based on a statement by the Department Council of the major subject on the student's previous studies and the research

Bachelor of Science (B.Sc.) ***Luonnontieteiden kandidaatti*** **(LuK)** (180 credits)

Master of Science (M.Sc.) ***Filosofian maisteri*** **(FM)** (120 credits)

Post-graduate degrees:

Licentiate in Philosophy (Ph.Lic.) ***Filosofian lisensiaatti***. In addition to the M.Sc. degree, 150 credits in major and minor subjects plus the Ph.Lic. thesis.

Doctor of Philosophy (Ph.D.) ***Filosofian tohtori*** . In addition to M.Sc., 240 credits in major and minor subjects (not required if Ph.Lic. has been completed) plus the Ph.D. thesis.

2.3. Admission requirements

The selection of new students is based on the applicant's records of previous education and / or entrance examination arranged by and held at the University of Oulu. General admission requirement for the first academic degree is completed matriculation examination (*ylioppilastutkinto)* or equivalent proof of completing upper secondary school.

2.4. Educational and professional goals

The Degree Programme in Biology admits 50 new students annually, and ca. 40-50 biology students obtain the Master of Science degree every year. The degree programme had 297 undergraduate students and 86 postgraduate

students studying biology as a major subject in 2008. About 75 students study biology as a minor subject and, in addition, about 100 students from other departments take classes in biology. Nine Doctors of Philosophy completed their studies in academic year 2008. Almost one fourth of the biology students at the University of Oulu also pursue some studies abroad in the ERASMUS (SOCRATES) or NORDPLUS exchange programmes or via the bilateral student exchange programme and ISEP. For foreign students, the Degree Programme offers a study programme called Northern Nature and Environment Studies, which is integrated to the department's regular courses and taught entirely in English for the exchange students.

Students learn basic phenomena and mechanisms of life from the molecules to the ecosystems. The studies also give the basic information of evolution and diversity of living organisms; the characteristics, structure, functions and regulation of genes, cells and organisms and the behaviour of organisms and their interactions between biotic and abiotic environment. Students get the basic scientific skills to produce new biological data and to study critically and analytically already existing knowledge. Graduated biologists have excellent skills and knowledge to apply what they have learned in their special field in ecology, cell and molecular biology, genetics, physiology, environment research or as teachers. Graduated students work, depending on the orientation of their studies, as specialists, researchers or teachers.

2.5. Access to further studies

To obtain the right for postgraduate studies the Master of Science degree from the Department of Biology has to include 40 cr. M.Sc. thesis and the grade for the major subject has to be good. The discussion about the postgraduate studies has to start with the professor. After the subject has been agreed the applicant will devise the personal study plan for the Doctor of Philosophy degree. The Ph.D. study plan is accepted by the departmental council.

Postgraduate applicants who have obtained their Master of Science or comparable degree from other university in Finland or abroad have to apply the right to study from the dean of the Faculty of Science and to devise the personal study plan for the Doctor of Philosophy degree.

2.6. Course structure diagram with credits

The studies in biology consist of basic studies (code P), subject studies (code A) and advanced studies (code S). In addition, language studies and orientation studies (code Y) are a part of the curriculum. The instruction in biology is given in the form of lecture courses, practical and theoretical exercises, seminars, workshops and field courses. Computer-aided teaching, herbarium collections and the collections of the Museum of Zoology are also utilised.

See also General Structure of the Degree (subtitle 2.2. General Description).

Abbreviations

TEA Biology teacher option

TEAbs Biology teacher option with emphasis in bioscience

TEAeco Biology teacher option with emphasis in ecology

BS Bioscience option

BS1 Bioscience option: major in bioscience minimum 90 cr. and minor in ecology minimum 60 cr.

BS2 Bioscience option: major in bioscience minimum 90 cr. and minor in ecology minimum 25 cr. and optional minor minimum 25 cr.

ECO Ecology option

ECO1 Ecology option: major in ecology minimum 90 cr. and minor in bioscience minimum 60 cr.

ECO2 Ecology option: major in ecology minimum 90 cr. and minor in bioscience minimum 25 cr. and optional minor minimum 25 cr.

z with emphasis in zoology

g with emphasis in genetics

b with emphasis in botany

C compulsory

o optional

Courses included in the major subject (bioscience, ecology) are in **bold**.

Courses included in the minor subject (bioscience, ecology) are underlined.

BACHELOR OF SCIENCE DEGREE

1st autumn semester			**TEA**		**BS**		**ECO**		
code		**cr**	**bs**	**eco**	**1**	**2**	**1**	**2**	**Subject**
Orientation course for new students	750031Y	2	C	C	C	C	C	C	Biology
Cell biology	750121P	5	**C**	C	**C**	**C**	C	C	Biology
Identification of animals (beginning)	751373A	7	C	**C**	x*	x**	**C**	**C**	Zoology
Identification of plant species	752303A	2-3,5	C	**C**	x*	x**	**C**	**C**	Botany
Basic course in plant morphology	752337A	2-4	C^	C^^	**C**	**C**	C*	C*	Botany
Basic chemistry	780109P	4	**C**	C	**C**	**C**	C	C	Chemistry
Introduction to organic chemistry (beginning)	780112P	4			**C**	**C**			Chemistry

x* BS: optional ECO- minor courses of which one has to complete a minor subject (minimum of 60 credits)

x** BS: optional ECO- minor courses of which one has to choose at least 6,5 cr. In addition one has to do 18,5 cr of optional ECO courses in order to complete a 25 cr minor subject + 25 cr optional minor subject from other degree programme.

C^ TEAbs: choose on of the following ECO-courses (752337A+756332A, 755306A or 752309A) into the teaching subject

C^^ TEAeco: choose on of the following BS-courses (752337A+756332A, 751367A or 752309A) into the teaching subject

C* ECO: Compulsory to complete either Plant morp. lect + prac (752337A) = 4 cr or Plant morph. lect (752337A) + Plant developmental biology (756332A) = 6 cr

1st spring semester				**TEA**		**BS**		**ECO**	
code		**cr**	**bs**	**eco**	**1**	**2**	**1**	**2**	**Subject**
Introductory laboratory course in chemistry	780122P	3	**C**	C	**C**	**C**	C		Chemistry
Foreign language 1	Y90xxx	2	C	C	C	C	C	C	Language Center
History of biology	750103P	2							Biology
Basics of ecology	750124P	5	C	**C**	x*	C	**C**	**C**	Biology
Identification of animals (ending)	751373A	7	C	**C**	x*	x**	**C**	**C**	Zoology
Concepts of genetics	753124P	4-7	**C**	C	**C**	**C**	C	C	Genetics
Experimental course in general genetics	753104P	8	**C**		**C**	**C**	C		Genetics
Introduction to organic chemistry (ending)	780112P	4			**C**	**C**			Chemistry

x* BS: optional ECO- courses of which one has to complete a minor subject (minimum of 60 credits)

x** BS: optional ECO- minor courses of which one has to choose at least 6,5 cr. In addition one has to do 18,5 cr of optional ECO courses in order to complete a 25 cr minor subject + 25 cr optional minor subject from other degree programme.

1st summer				**TEA**		**BS**		**ECO**	
	code	**cr**	**bs**	**eco**	**1**	**2**	**1**	**2**	**Subject**
Field course in terrestrial animals	751306A	2-6,5	C**	**C**	x*		**C**	**C**	Zoology
Field course in aquatic animals	751307A	4	C**	**C**	x*		**C**	**C**	Zoology
Field course in ecological botany	752304A	4-8	C**	**C**	x*		**C**	**C**	Botany

P** TEAbs have to choose 6 cr of ECO -field courses into the teaching subject (at least 2 courses)

x* BS: optional ECO - courses, of which one has to complete a minor subject (minimum of 60 credits)

2nd autumn semester				**TEA**		**BS**		**ECO**	
	code	**cr**	**bs**	**eco**	**1**	**2**	**1**	**2**	**Subject**
Foreign language 2	Y90xxxx	2	C	C	C	C	C	C	Language center
Biomolec. for bioscientists (begins)	740147P	8			**C**	C			Biochemistry
Biomolecules (begins)	740148P	5	**C**				C		Biochemistry
Biogeography (beginning)	750363A	6			x*		**C**	**C**	Biology
Animal evolution, systematics and morphology	755306A	7	C^	**C**	x*	x**	**C**	**C**	Zoology
Plant ecology	752300A	7			x*		**C**	**C**	Botany
Plant tissue culture	752388A	5			**oC**	**oC**			Botany
Economic plants	752394A	3					**o***	**o***	Botany
	753314A	8			**oC**	**oC**			Genetics

Basics in population genetics									
Molecular evolution	753327A	4			**oC**	**oC**			Genetics
Introduction to geography	790152P	5	C***	C***					Geography
Introduction to planning geography	790141P	5	C***	C***					Geography

x* BS: optional ECO- courses of which one has to complete a minor subject (minimum of 60 credits)

x** BS: optional ECO- minor courses of which one has to choose at least 6,5 cr. In addition one has to do 18,5 cr of optional ECO courses in order to complete a 25 cr minor subject + 25 cr optional minor subject from other degree programme.

C^ TEAbs: choose on of the following ECO-courses (752337A+756332A, 755306A or 752309A) into teaching subject

C^^^ TEAeco: choose from the following BS-courses (753104P, 751388A or 752345A) into teaching subject

C*** TEA: choose 35 cr of courses in geography (subject for teaching) into your B.Sc. degree.

oC optional course for the B.Sc. degree, compulsory for the M.Sc. degree.

o* optional course for the B.Sc. degree or the M.Sc. degree.

			TEA		**BS**		**ECO**		
2nd spring semester									
	code	**cr**	**bs**	**eco**	**1**	**2**	**1**	**2**	**Subject**
Biomolec. for bioscientists (ends)	740147P	8			**C**	C			Biochemistry
Biomolecules (ends)	740148P	5	**C**				C		Biochemistry
Biochemical methods I	740144P	8				C			Biochemistry
Evolutionary ecology	750336A	5			x*		**C**	**C**	Zoology
Biogeography (ending)	750363A	6			x*		**C**	**C**	Biology

Basics of bioinformatics	750340A	3			**C**	**C**			Genetics
Molecular methods I	750364A	4			**C**	**C**			Biology
Developmental biology-histology	751367A	5-9	**C**	C^^	**C**	**C**			Zoology
Functional animal ecology	751378A	6					**o***	**o***	Zoology
Animal physiology (lectures)	751388A	4-8	**C**	C^^^	**C**	**C**	C	x**	Zoology
Basics in functional plant biology	752345A	4-9	**C**	C^^^	**C**	**C**	C	x**	Botany
Plant developmental biology	756332A	4	C^	C^^	**C**	**C**	C*	C*	Botany
Examinations on optional topics	751354A	2-6							Zoology
Examinations on optional topics	752352A	2-6							Botany
Examinations on optional topics	753351A	2-6							Genetics
Cartography and introductory course of spatial data processing	790101P	5	C***	C***					Geography
Introduction to the systematic physical geography	790102P	5	C***	C***					Geography
Introduction to the systematic human geography	790104P	5	C***	C***					Geography
Special themes in physical geography	790303A	5	C***	C***					Geography
Special themes in human geography	790305A	5	C***	C***					Geography
Substitutive book exam (phys geog.) or	790347A	5 or	C***	C***					Geography

Substitutive book exam (human geo.)	790348A	5	C***	C***					Geography

x* BS: optional ECO- courses of which one has to complete a minor subject (minimum of 60 credits)

x** ECO: choose one of the BS-courses (751388A 8 cr or 752345A 9 cr) or 751388A lec. and 752345A lec. = total 8 cr into your BS-minor subject (25 cr minimum)

C* ECO: Compulsory to complete either Plant morphology lec. + prac. (752337A) = 4 cr or Plant morph. lec. (752337A) + Plant developmental biology (756332A) = 6 cr

C^ TEAbs: choose on of the following ECO-courses (752337A+756332A, 755306A or 752309A) into teaching subject

C^^ TEAeco: choose on of the following BS-courses (752337A+756332A, 751367A or 752309A) into the teaching subject

C^^^ TEAeco: Compulsory to complete 751388A lec. and 752345A lec. = total 8 cr into teaching subject

v* optional course for the B.Sc. degree or the M.Sc.-degree.

C*** TEA: choose minimum 25 cr of courses in geography (subject for teaching) into your B.Sc. degree.

2nd summer			**TEA**		**BS**		**ECO**		
	code	**cr**	**bs**	**eco**	**1**	**2**	**1**	**2**	**Subject**
Arctic ecology excursion	750339S	4					**o***	**o***	Biology
Botanical collection	752662S	2-6					**o***	**o***	Botany
Identification of garden Plant Species	756311A	5					**o***	**o***	Botany
Field course in physical geography	790310A	7	C***	C***					Geography
Field course in human geography	790311A	5	C***	C***					Geography

C*** TEA: choose 35 cr worth of courses in geography (subject for teaching) into your B.Sc. degree. Course 790310 7 cr is optional with 790311 5 cr. 790326A 3 cr (arranged in spring) is optional with 790311 5 cr. Choose one of these three courses.

v* optional course for the B.Sc. degree or the M.Sc.-degree.

3rd autumn semester			**TEA**		**BS**		**ECO**		
	code	**cr**	**bs**	**eco**	**1**	**2**	**1**	**2**	**Subject**
Molecular biology I (lectures)	740373A	4				C			Biochemistry
Laboratory, instrumentation and measurement techniques.	750322A	5			**oC**	**oC**			Zoology
Ecological methods I	750347A	6					**C**	**C**	Biology
Bachelor of science seminar (begins)	750396A	4	**C**	**C**	**C**	**C**	**C**	**C**	Biology
Legislation in environmental protection (e.s.y.)	750316A	5					**o***	**o***	Biology
Optional examination in environmental protection	750399A	2-6							Zoology /Genetics
Wildlife management and game animal ecology	751368A	3,5-6					**o***	**o***	Zoology
Animal physiology (exercises)	751388A	4-8	**C**		**C**	**C**	C	x**	Zoology
Animal behavior	751366A	5					**oC**	**oC**	Zoology
Macro fungi	752316A	3		**C**			**o***	**o***	Botany
Conservation of biodiversity	752321A	3					**o***	**o***	Botany
Effects of environmental pollutants on plants (odd numbered years)	752322A	4					**o***	**o***	Botany
Plant population biology	756323A	5					**C**	**C**	Botany

Human genetics (e.s.y.)	753307A	4			**o***	**o***			Genetics
Quantitative genetics and plant and animal breeding (e.s.y.)	753394A	4			**o***	**o***			Genetics
Introductory course to regional geography	790106P	3	C***	C***					Geography
Changing Europe	790307A	3	C***	C***					Geography
Developing of remote rural areas	790340A	3	C***	C***					Geography
Geographical knowledge and research	790322A	2	C***	C***					Geography
World regional geography	790349A	4	C***	C***					Geography
Introduction to tourism geography	790160P	5	C***	C***					Geography
Educational studies		25	C	C					Education

x* BS: optional ECO- courses of which one has to complete a minor subject (minimum of 60 credits)

x** ECO: choose one of the BS-courses (751388A 8 cr or 752345A 9 cr) or 751388A lec. and 752345A lec. = total 8 cr into your BS-minor subject (25 cr minimum)

oC Optional course in the B. Sc. degree, compulsory in the M.Sc. degree.

o* Optional course for the B. Sc. degree or the M. Sc. degree.

C*** TEA: choose minimum 25 cr worth of courses in geography (subject for teaching) into your B.Sc.

3rd spring semester				**TEA**		**BS**		**ECO**	
	code	**cr**	**bs**	**eco**	**1**	**2**	**1**	**2**	**Subject**
Swedish	Y901004	2	C	C	C	C	C	C	Language center
Metabolism I (lec)	740149A	4				C			Biochemistry
Microbiology I (lec)	740374A	3				C			Biochemistry

Winter ecology and physiology	750325A	6-8			**o***	**o***	**o***	**o***	Biology
Nature conservation and land use	750303A	3					**o***	**o***	Thule
Ecological methods I (ends)	750347A	6					**C**	**C**	Biology
Molecular methods II	750365A	4			**C**	**C**			Biology
Bachelor of Science final examination	750366A	5	**C**	**C**	**C**	**C**	**C**	**C**	Zoo/Bot /Gen
Bachelor of Science seminar (ends)	750396A	4	**C**	**C**	**C**	**C**	**C**	**C**	Biology
B.Sc. - thesis	750367A	10	**C**	**C**	**C**	**C**	**C**	**C**	Bot /Zoo/Gen
Bachelor of Science maturity exam	750332A	0	**C**	**C**	**C**	**C**	**C**	**C**	Biology
Research training	750313A	2-14			**o***	**o***	**o***	**o***	Bot /Zoo/Gen
Comparative endocrinology	751357A	3			**o***	**o***			Zoology
Laboratory animal course for researchers	040910A	6							Lab. Animal Centre
Comparative animal physiology	751384A	8			**oC**	**oC**			Zoology
Community ecology	755310A	4					**oC**	**oC**	Zoology
Thermal biology and energetics	755311A	3			**o***	**o***			Zoology
Basic course in hydrobiology	754308A	3					**o***	**o***	Biology
Stream ecology	754320A	4					**o***	**o***	Zoology
Plant evolution and systematics	752309A	3-7	C^	C^^	x*	x**	**C**	**C**	Botany

Plant ecology of forestry	752359A	3,5				**o***	**o***	Botany
Plant ecophysiology in changing environments	756304A	5-10		**o***	**o***	**o***	**o***	Botany
Plant symbiosis	756338A	5		**o***	**o***	**o***	**o***	Botany
Secondary metabolism of plants	756618S	4		**o***	**o***			Botany
Experimental course of genomics and gene expression	753317A	8		**o***	**o***			Genetics
Basic methods in statistics II	806110P	10						Mathematics
Laboratory animal course for scientist	040910S	6		**o**	**o**			Laboratory animal centre

x* BS: optional ECO- courses of which one has to complete a minor subject (minimum of 60 credits)

x** ECO: choose on of the BS-courses (751388A or 752345A) into your BS-minor subject (25 cr minimum)

C^ TEAbs: choose on of the following ECO-courses (752337A+756332A, 755306A or 752309A) into the teaching subject

C^^ TEAeco: choose on of the following BS-courses (752337A+756332A, 751367A or 752309A) into the teaching subject

oC Optional course in the B. Sc. degree, compulsory in the M.Sc. degree.

o* Optional course for the B. Sc. degree or the M. Sc. degree.

o optional major course to the M.Sc. degree.

3rd summer				**TEA**		**BS**		**ECO**	
	code	**cr**	**bs**	**eco**	**1**	**2**	**1**	**2**	**Subject**
Practical training	750615S	5-9			**C**	**C**	**C**	**C**	Biology
Floristic inventory	752672S	2-5					**o**	**o**	Botany, museum

Mire ecology (odd numbered years)	752692S	4				**o**	**o**	Botany
Excursion to Southern Finland or abroad	752305A	4-7				**o***	**o***	Botany

v Optional course for the M. Sc. degree.

o* Optional course for the B. Sc. degree or the M. Sc. degree.

C Practical training (750615S) compulsory course for the M. Sc. degree.

MASTER OF SCIENCE DEGREE

1st autumn semester			**TEA**		**BS**		**ECO**		
	code	**cr**	**TEA**	**BS a**	**BS g**	**BS b**	**ECO a**	**ECO b**	**Subject**
Master of Science seminar (starts)	750696S	4	**C**	**C**	**C**	**C**	**C**	**C**	Biology
Radiochemistry and radiation safety	740368A	5		o					Biochemistry
Optional examinations in environmental protection	750399A	2-6							Zoology/ Genetics
Course in microscopic techniques	750619S	4		**o**		**o**			Biology
Laboratory, instrumentation and measurement techniques.	750622S	5		**oC**					Zoology
Molecular methods I	750364A	4					**o**	**o**	Biology
Research training	750613S	2-14		**o**	**o**	**o**	**o**	**o**	Bot /Zoo/Gen
Legislation in environmental protection (e.s.y.)	750616S	5					**o**	**o**	Biology

Thursday seminar in biology	750618S	2	**o**	**o**	**o**	**o**	**o**	Biology
Effects of air pollutants on plants (e.o.y.)	752622S	4				**o**	**o**	Botany
Environmental impact assessment (EIA) and ecological inventory of natural resources	750626S	7				**o**	**o**	Botany
Kaamos -symposium	750629S	2	**o**	**o**	**o**	**o**	**o**	Biology
Biodiversity in human changed environments	750635S	6		**o**		**o**	**o**	Biology
Research group Seminar	750661S	2-4	**o**	**o**	**o**	**o**	**o**	Bot /Zoo/Gen
Optimization and game theories	750642S	3				**o**	**o**	Botany
Wildlife management and game animal ecology	751668S	3,5-6				**o**		Zoology
Reindeer biology	751674S	3				**o**		Zoology
Advanced course in animal physiology	751635S	8	**C**					Zoology
Neurobiology	751636S	3	**o**					Zoology
Animal behavior	751666S	5				**oC**		Zoology
Lectures on special topics in zoology	751690S	2-3,5	**o**			**o**		Zoology
Population ecology	755607S	7				**C**	o	Zoology
Avian reproductive biology	755608S	2				**o**		Zoology
Evolution of life histories	755609S	4	**o**			**o**		Zoology
Field methods in freshwater biomonitoring	754616S	4				**o**	**o**	Zoology
Maintenance and restoration of inland waters	754613S	4				**o**	**o**	Zoology

Research seminar in fish ecology	754618S	2-4			**o**		Zoology
Special course in fish ecology	754619S	8			**o**		Zoology
Plant evolution and systematics (prac)	752609S	3-7				**C**	Botany
Macro fungi	752616S	3				**o**	Botany
Plant tissue culture	752688S	5		**oC**			Botany
Plant pathology	752653S	4				**o**	Botany
(even years)							
Taxonomy and ecology of plants	752656S	2-6				**o**	Botany museum
Special topics in plant ecology	752667S	2-5				**o**	Botany
Advanced molecular plant physiology (e.s.y.)	752682S	9		**C**			Botany
Restoration ecology	756607S	2-6				**o**	Botany
Metapopulation dynamics	750604S	4			**o**	**o**	Bot/Zoo
Structure and dynamics of plant Communities	756622S	5				**o**	Botany
Genetic transformation of plants (e.s.y.)	756625S	4		**o**			Botany
Human genetics (Every sec. year)	753607S	4	**o**	**o**			Genetics
Basics in population genetics (begins)	753614S	8	**oC**		o	o	Genetics
Molecular evolution	753627S	3,5	**oC**				Genetics
Special seminar in genetics	753613S	4	**o**				Genetics
	753630S	2	**o**				Genetics

Genetic research seminar (begins)								
Quantitative genetics and plant and animal breeding (e.s.y.)	753694S	4			**o***	**o***		Genetics
Examinations on optional topics	751654S	2-6		**o**			**o**	Zoology
Examinations on optional topics	752652S					**o**	**o**	Botany
Examinations on optional topics	753651S				**o**			Genetics
Pharmacology and toxicology	040106A	10,5		o				Medicine
Physiology	040102A	15		o				Medicine
Studies in geography		25	C***					Geography

oC Optional course in the B. Sc. degree, compulsory in the M.Sc. degree.

o optional major course to the M.Sc. degree.

C*** TEA: choose studies in Geography (subject for teaching) to your M. Sc. degree. Total credit amount in subject of teaching has to be minimum 60 after finishing both B.Sc and MSc. studies.

1st spring semester			**TEA**	**BS**			**ECO**		
	code	**cr**	**TEA**	**BS a**	**BS g**	**BS b**	**ECO a**	**ECO b**	**Subject**
Advanced information skills	300002M			**o**	**o**	**o**	**o**	**o**	Tellus
Immunobiology	740369A	3		o					Biochemistry
Master of Science seminar (cont.)	750696S	4	**C**	**C**	**C**	**C**	**C**	**C**	Biology
Nature conservation and land use	750603S	3					**o**	**o**	Thule

Winter ecology and physiology	750625S	6-8	**o**			**o**	**o**	Biology
Thursday seminar in biology	750618S	2	**o**	**o**	**o**	**o**	**o**	Biology
Biodiversity in boreal forests	750627S	3,5				**o**	**o**	Zoology
Ecological methods II	750647S	7				**C**	**C**	Biology
Ecosystem ecology	750699S	3					**o**	Botany
Laboratory animal course for researchers	040910A	6						Lab. Animal Centre
Functional animal ecology	751678S	6	**o**			**o**		Zoology
Identification of vertebrates in the field	751642S	2				**C**		Zoology
Special course in aquatic invertebrates	751648S	4-5				**o**		Zoology
Advanced identification of animals	751651S	4-8				**o**		Zoology
Comparative endocrinology	751657S	3	**o**					Zoology
Preparation of an insect collection	751660S	2-6				**o**		Zoology, museum
Comparative animal physiology	751684S	8	**oC**					Zoology
Thermal biology and energetics	755611S	3	**o**					Zoology
Community ecology	755610S	3-4				**oC**		Zoology
Molecule ecology	755615S	2-5				**o**		Biology
Basic course in hydrobiology	754308A	3				**o**	**o**	Biology
Final examination in hydrobiology	754612S	7				**o**	**o**	Zoology/

							Botany
Stream ecology	754620S	5					
Specific topics on hydrobiology	754621S	2-4			**o**	**o**	Zoology
Advanced identification of plant species I	752608S	6				**o**	Botany, museum
Advanced plant tissue culture	756629S	4		**o**			Botany
Special course / Signal transduction in plants	752691S	4		**o**			Botany
Seminar on special topics in botany	752695S	2-4		**o**		**o**	Botany
Plant ecophysiology in changing environments	756604S	5-10	**o***	**o***	**o***	**o***	Botany
Soil ecology	756612S	3-5				**o**	Botany
Physiology of forest trees	756615S	4		**o**			Botany
Secondary metabolism of plants	756618S	4		**o**		**o**	Botany
Evolutionary ecology of plant reproduction	756619S	2-4				**o**	Botany
Plant adaptations to herbivory	756621S	2				**o**	Botany
Stress physiology of plants	756626S	4		**o**			Botany
Plant hormones	756627S	4		**o**		**o**	Botany
Soil biology	756633S	2		**o**			Botany
Plant symbiosis	756638S	4	**o**	**o**	**o**	**o**	Botany
Special seminar in genetics	753613S	4	**o**				Genetics

Basics in population genetics (ends)	753614S	8			**oC**		o	o	Genetics
Population genetic analysis of DNA (lec.)	753616S	4			**C**				Genetics
Population genetic analysis of DNA (prac.)	753631S	6			**C**				Genetics
Genomics and gene expression practicals	753617S	8		o	**o**				Genetics
Experimental course in molecular evolution	753622S	4			**o**				Genetics
Bioinformatics	753629S	4			**o**				Genetics
Genetic research seminar (ends)	753630S	2			**o**				Genetics
Methods in genomics and genomics evolution	753612S	6							Genetics
Seminar in ecological and conservation genetics	753692S	4			**o**		o	o	Genetics
Studies in geography		25	C***						Geography
Educational studies		35	C						Education

oC Optional course in the B. Sc. degree, compulsory in the M.Sc. degree.

o optional major course to the M.Sc. degree.

C*** TEA: choose studies in Geography (subject for teaching) to your M. Sc. degree. Total credit amount in subject of teaching has to be minimum 60 after finishing both B.Sc and MSc. studies.

1st summer			**TEA**		**BS**		**ECO**		
	code	**cr**	**TEA**	**BS a**	**BS g**	**BS b**	**ECO a**	**ECO b**	**Subject**
Arctic ecology excursion	750639S	4					**o**		Biology
Excursion to Southern Finland or abroad	752605S	4-7					o	**o**	Botany

Arctic and alpine ecology	752642S	4						**o**	Botany
Aquatic and littoral vegetation	752677S	3,5					o	**o**	Botany
M. Sc. - thesis	75x602S	20-40	**C**	**C**	**C**	**C**	**C**	**C**	Zoo/Bot/Gen

o optional major course to the M.Sc. degree.

2nd autumn semester **TEA** **BS** **ECO**

code	**cr**	**TEA**	**BS a**	**BS g**	**BS b**	**ECO a**	**ECO b**	**Subject**
Advanced information skills	300002M		**o**	**o**	**o**	**o**	**o**	Tellus
Master of Science seminar (cont.)	750696S	4	**C**	**C**	**C**	**C**	**C**	**C**	Biology
Advanced identification of plant species II	752625S	5-8						**o**	Botany
M. Sc. -thesis	75x602S	20-40	**C**	**C**	**C**	**C**	**C**	**C**	Zoo/Bot/Gen
Master of Science final examinations	75x699S	10	**C**	**C**	**C**	**C**	**C**	**C**	Zoo/Bot/Gen

o optional major course to the M.Sc. degree.

2. spring semester **TEA** **BS** **ECO**

code	**cr**	**TEA**	**BS a**	**BS g**	**BS b**	**ECO a**	**ECO b**	**Subject**
Master of Science seminar (ends)	750696S	4	**C**	**C**	**C**	**C**	**C**	**C**	Biology
M. Sc. -thesis	75x602S	20-40	**C**	**C**	**C**	**C**	**C**	**C**	Zoo/Bot/Gen
	75x699S	10	**C**	**C**	**C**	**C**	**C**	**C**	Zoo/Bot/Gen

Master of Science final examinations									
Maturity exam	750632S	0	**C**	**C**	**C**	**C**	**C**	**C**	Biology

Master of Science studies

Master of Science studies in ANIMAL ECOLOGY

Total contents 120 cr, advanced courses in animal ecology at least 80 cr

Compulsory studies:

Practical training	750615S	5-9 cr
Master of Science seminar	750696S	4 cr
Master of Science final examinations	751699S	10 cr
Master of Science - thesis	755602S	40 cr
Maturity exam	750632S	0 cr
Ecological methods II	750647S	7 cr
Population ecology	755607S	7 cr
Identification of vertebrates in the field	751642S	2 cr
Community ecology	755610S	3-4 cr
Animal behaviour (if it is not in the B. Sc. degree)	751666S	5 cr

Optional studies:

Lectures on special topics in zoology	751690S	2-3,5 cr

Structure of animal populations, conservation and biodiversity

Biodiversity in boreal forests	750627S	3,5 cr
Biodiversity in human changed environments	750635S	6 cr
Field methods in freshwater biomonitoring	754616S	4 cr
Advanced identification of animals	751651S	4-8 cr
Preparation of an insect collection	751660S	2-6 cr
Plant ecology:		
Metapopulation dynamics	750604S	4 cr
Biosciences:		
Molecular methods I	750364A	4 cr
Basics of population genetics	753614S	8 cr
Evolutionary- and behavioral ecology:		
Functional animal ecology (if not included in the B. Sc. - degree)	751678S	6 cr
Avian reproductive biology	755608S	2 cr
Evolution of life histories	755609S	4 cr
Optimization and game theories	750642S	3 cr

Natural resources and management

Basic course in hydrobiology (if not included in the B. Sc. - degree)	754308A	4 cr
Basic methods in hydrobiology	754609S	3,5 cr
Stream ecology	754620S	5 cr
Specific topics on hydrobiology	754621S	4 cr
Special course in aquatic invertebrates	751648S	4-5 cr

Assessment and monitoring of the ecological status of water bodies	754613S	4 cr
Special seminar in fish ecology	754618S	2-4- cr
Special course in fish ecology	754619S	8 cr
Wildlife management and game animal ecology (if not included in the B. Sc. - degree)	751668S	3,5-6 cr
Reindeer biology	751674S	3 cr
Nature conservation and land use	750603S	3 cr
Arctic ecology excursion	750639S	4 cr
Environmental impact assessment (EIA) and ecological inventory of natural resources	750626S	7 cr
Legislation in environmental protection	750616S	5 cr

Master of Science studies ANIMAL PHYSIOLOGY

Total contents 120 cr, advanced courses in animal physiology at least 80 cr

Compulsory studies:

Practical training	750615S	5-9 cr
Master of Science seminar	750696S	4 cr
Master of Science final examinations	753699S	10 cr
Master of Science - thesis	757602S	40 cr
Maturity exam	750632S	0 cr
Comparative animal physiology (if not included in the B. Sc. - degree)	751684S	8 cr
Laboratory, instrumentation and measurement techniques (if not included in the B. Sc. - degree)	750622S	5 cr
Advanced course in animal physiology	751635S	8 cr

Optional studies (***** marked compulsory) **:**

Physiological adaptation and ecophysiology

Comparative animal physiology ***** (if not included in the B. Sc. - degree)	751684S	8 cr
Thermal biology and energetics	755611S	3 cr
Winter ecology and physiology (if not included in the B. Sc. - degree)	750625S	6-8 cr

Studies in ecology that are considered in the major subject e.g.

Evolution of life histories	755609S	4 cr
Functional animal ecology	751678S	6 cr

Cell physiology and cell biology

Comparative animal physiology ***** (if not included in the B. Sc. - degree)	751684S	8 cr
Comparative endocrinology	751657S	3 cr
Thermal biology and energetics	755611S	3 cr
Course in microscopic techniques	750619S	4 cr
Laboratory, instrumentation and measurement techniques* (if not included in the B. Sc. - degree)	750622S	5 cr
Neurobiology	751636S	3 cr
Laboratory animal course for scientists	040910S	6 cr

Studies in genetics e.g.

Experimental course of genomics and gene expression	753617S	8 cr

Studies in biochemistry e.g.

Radiochemistry and radiation safety, Immunobiology

Studies in medicine

Pharmacology and toxicology, Physiology

Optional studies can also include subject studies, if they have not been completed in the B.Sc. degree.

It is also possible to choose optional courses that support your studies from other specialisations.

Courses shown can also be replaced with book exams. Additionally, there are lectures in varying subjects.

Master of Science studies in GENETICS

Total contents 120 cr, advanced courses in genetics at least 80 cr

Evolutionary genomics:

Bioinformatics, Genomics, Population genetics

Genetic diversity and genetic resources:

Genomics, Population genetics, Environmental genetics

Compulsory studies:

Practical Training	750615S	5-9 cr
Master of Science seminar	750696S	4 cr
Master of Science final examinations	753699S	10 cr
Master of Science - thesis	757602S	40 cr
Maturity exam	750632S	0 cr

Studies in population genetics

Molecular evolution (if not included in the B. Sc. - degree)	753627S	4 cr
Basics in population genetics (if not included in the B. Sc. - degree)	753614S	8 cr

DNA analysis in population genetics, lectures	753616S	4 cr
DNA analysis in population genetics, exercises	753631S	6 cr

Optional studies:

Studies in bioinformatics

Bioinformatics	753629S	4 cr
Experimental course in molecular evolution	753622S	4 cr

Studies in genomics

Methods in genomics and genomics evolution	753612S	6 cr
Experimental course of genomics and gene expression	753617S	8 cr

Studies in environmental genetics- genetic resources

Seminar in ecological and conservation genetics	753692S	4 cr
Quantitative genetics and plant and animal breeding	753694S	6 cr
Special seminar in genetics	753613S	4 cr
Genetic research seminar	753630S	2 cr
Human genetics	753607S	4 cr

Studies from other subjects from e.g. ecology

If one plans to complete a Master of Science - degree in genetics, it is recommended that both Molecular evolution and Basics of population genetics are included already in the B.Sc. degree.

Master of Science studies in PLANT ECOLOGY

Total contents 120 cr, advanced courses in plant ecology at least 80 cr

Compulsory studies:

Practical training	750615S	5-9 cr
Master of Science seminar	750696S	4 cr
Master of Science final examinations	753699S	10 cr
Master of Science - thesis	757602S	40 cr
Maturity exam	750632S	0 cr
Ecological methods II	750647S	7 cr
Plant evolution and systematics (practicals)	752609S	4 cr

Optional studies:

Special topics in plant ecology	752667S	2-5 cr

Population and evolutionary ecology

Metapopulation dynamics	750604S	4 cr
Plant adaptations to herbivory	756621S	2 cr
Evolutionary ecology of plant reproduction	756619S	2-4 cr
Optimization and game theories	750642S	3 cr

Ecophysiology and environmental ecology

Plant pathology	752653S	4 cr
Soil ecology	756612S	3-5 cr
Soil biology	756633S	2
Nature conservation and land use	750603S	3 cr
Plant ecophysiology in changing environments (if not included in the B. Sc. - degree)	756604S	5-10 cr
Ecosystem ecology	750631S	3 cr

Legislation in environmental protection	750616S	5 cr
Environmental impact assessment (EIA) and ecological inventoring of natural resources	750626S	7 cr
Restoration ecology	756607S	7 cr
Field methods in freshwater biomonitoring	754616S	4 cr
Basics in hydrobiology (if not included in the B. Sc. - degree)	754308A	4 cr
Stream ecology	754620S	5 cr
Assessment and monitoring of the ecological status of water bodies	754613S	4 cr

Community ecology and biodiversity

Structure and dynamics of plant communities	756622S	5 cr
Arctic and alpine ecology	752642S	4 cr
Mire ecology	752692S	4 cr
Macro fungi	752616S	3 cr
Taxonomy and ecology of plants	752656S	2-6 cr
Advanced identification of plant species I	752608S	6 cr
Advanced identification of plant species II	752625S	5-8 cr
Floristic inventory	752672S	2-5 cr
Excursion to Southern Finland or abroad	752605S	4-7 cr
Aquatic and littoral vegetation	752677S	3,5 cr
Biodiversity in boreal forests	750627S	3,5 cr
Biodiversity in human changed environments	750635S	6 cr

Plant physiology:

Secondary metabolism of plants	756618S	4 cr
Animal ecology:		
Population ecology	755607S	7 cr
Bioscience:		
Molecular methods I	750364A	4 cr
Basics of population genetics	753614S	8 cr

Master of Science studies in PLANT PHYSIOLOGY

Total contents 120 cr, advanced courses in plant physiology at least 80 cr

Functional plant biology and biotechniques

Compulsory studies:

Practical training	750615S	5-9 cr
Master of Science seminar	750696S	4 cr
Master of Science final examinations	752699S	10 cr
Master of Science - thesis	756602S	40 cr
Maturity exam	750632S	0 cr
Plant tissue culture (if not included in the B. Sc. - degree)	752688S	5 cr
Advanced molecular plant physiology	752682S	9 cr

Optional studies (***** marked compulsory):

Seminar on special topics in botany	752695S	2-4 cr

Molecular plant physiology

Advanced molecular plant physiology*	752682S	9 cr
Special course/Signal transduction in plants	752691S	4 cr
Plant hormones	756627S	4 cr

Plant biotechnique

Genetic transformation of plants	756625S	4 cr
Plant tissue culture* (if not included in the B. Sc. - degree)	752688S	5 cr
Advanced plant tissue culture	756629S	4 cr
Plant hormones	756627S	4 cr
Course in microscopic techniques	750619S	4 cr

Applied plant biology

Physiology of forest trees	756615S	4 cr
Secondary metabolism of plants (if not included in the B. Sc. - degree)	756618S	4 cr
Plant ecophysiology in changing environments (if not included in the B. Sc. - degree)	756604S	5-10 cr
Stress physiology of plants	756626S	4 cr

It is possible to choose optional courses from other specialisations. Offered course can also replaced for book exams. Plant physiology also offers varying special courses.

Teacher specialisation studies at the Master of Science degree

Total contents 120 cr, advanced courses in major (animal ecology, animal physiology, genetics, plant ecology or plant physiology) 60 cr. including Master of Science thesis (20-40 cr), maturity exam, Master of Science seminar and Master of Science final examinations. Minor teaching subject (geography, chemistry, psychology, health sciences) 35 cr and educational studies 35 cr.

Substituting compulsory studies

If student wants to substitute compulsory courses, one have to make official suit to department council. Equivalence decision will be case-specific.

Hydrobiology

Hydrobiology studies the community structure and ecological interactions of lakes, streams and marine environments as well as the systematics, morphology and physiology of aquatic organisms. Hydrobiology studies include biology of aquatic organisms, assessment and conservation of aquatic ecosystems and physics and chemistry of aquatic systems.

The aim of the studies is to train up to expertise in aquatic ecosystems and research. Give readiness to apply the knowledge in tasks related to water system utilisation, conservation and management. The aim is also to introduce students to the techniques and economics directed at aquatic environments. Basics in hydrobiology are also needed in environmental impact assessment and elaborate planning of aquatic environment utilisation.

Studying hydrobiology

Students can do minimum 25 credits studies in hydrobiology. Department of biology gives separate certificate signed by professor Timo Muotka. Study module consists of courses given by Department of biology (paragraph A and C), optional studies (paragraph D) and separate final book exam (paragraph E). Paragraph C compulsory studies include 750616S Legislation in environmental protection or optionally 488101A Environmental legislation. Paragraph B book exam is compulsory for the students who do not do subject studies in biology.

Hydrobiology study package:

A. 780109P Basic chemistry 4 cr.

(Also other combinations of chemistry studies can be accepted)

B. 750160P Minor subject examination in biology 4 cr.

Examination to students who do not take subject studies of the degree programme in biology. Has to be passed before taking studies C, D and E

C. Compulsory studies in the hydrobiology study package:

754308A Basic course in hydrobiology 3 cr.

750616S Legislation in environmental protection 5 cr.

or alternatively:

488101A Environmental legislation 5 cr.

D. A minimum 15 credits from the following course units or other course units in the field of hydrology:

751307A Field course in aquatic animals 4 cr.

754320A Stream ecology 4 cr.

754621A Specific topics on hydrobiology 4 cr.

752377A Aquatic and shore vegetation 3,5 cr.

751648S Special course in aquatic invertebrates 2-4 cr.

754609S Basic methods in hydrobiology 4 cr.

781625S Aquatic chemistry 4 cr.

754613A Assessment and monitoring of the ecological status

of water bodies 4 cr.

754616S Field methods in freshwater biomonitoring 4 cr.

E. 754312A Final examination in hydrology 7 cr.

Hydrobiology studies start with the section A. and B. basic studies (or other study combinations in chemistry, biophysics or biology). Obligatory courses are lectured every second year. Section D optional studies can include courses from other faculties and other universities which is suited to the hydrobiology study module. These studies have to be agreed separately with the professor. Section E. books are agreed with the professor.

Responsible person for the hydrobiology studies: Prof. Timo Muotka.

Environmental studies

In the Faculty of Science it is possible to do study module in environmental protection 25 credits or environmental research 60 credits. Alternative modules and course descriptions can be found from the Faculty of science curriculum and Faculty of technology / Department of process and environmental engineering) curriculums.

Studies abroad

Department of biology has good connections to many European biology departments via ERASMUS exchange programme cooperation. NORDPLUS programme includes all Nordic universities and University of Oulu's ISEP programme 50 North American universities.

Besides passing courses students can also do their research training, project work or M.Sc. thesis in foreign research group. Students are economically supported with student financial aid and University exchange stipend during their exchange period. Foreign biology studies are accepted as part of the degree - however compulsory studies is recommended to settle with the responsible teacher before the students go to exchange. Amanuensis of the biology degree programme or International relations will give more information about the exchange opportunities. Amanuensis will help with the study plan and application procedures. Yearly about 15 biology students study abroad 3-12 months time. Most popular targets have been Glasgow, Aberdeen, Lund and Leiden.

2.7 Final examination

Master of Science thesis (20 / 40 cr.)

Independent research work on a scientific subject in agreement with the responsible professor and under the supervision of the department. The supervisors may be professors of the department, docents and other teachers

and researchers who have the docent's status. The student may have several supervisors, the other supervisor may be from other department, university (also abroad) or from research institute. The student can also do the thesis from own topic. The subject must be agreed on with the professor in advance. The research work can contain fieldwork, laboratory work, theoretical work or work on collections in museum. The work always includes a literature survey. After having completed the thesis, the student writes the Maturity Exam. The dean will order the final examiners by the proposal of the professor. Department council accepts and grades the thesis on the basis of the final examiners' opinions.

2.8 Examination and assessment regulations

Lecture courses in the Degree Programme in Biology are mainly given in Finnish. However, lectures and practical exercises included in the Northern Nature and Environment Studies (marked as NNE in the description of the courses), a special study programme offered to foreign students, are held in English. All seminar sessions and individual tuition are offered in English to exchange students.

Lecture courses and also most of the practical exercises are held throughout the academic year on a weekly basis. Field courses and short advanced courses are taught in intensive periods. Attendance at lectures is not compulsory, but students must participate in 80 % of the exercises.

The lecture courses include a mid-term and/or a final exam. Final exams can be retaken twice.

The comprehensive final exams and retakes of some of the course exams can be taken twice a month on Fridays starting at 8:15 am in auditorium YB211. The dates in academic year 2009-2010 are 4.9., 18.9., 2.10., 16.10., 30.10., 13.11., 27.11., 11.12.2009 and 8.1., 22.1., 5.2., 19.2., 5.3., 19.3., 9.4., 23.4., 7.5., 21.5.2010.

The students must register for the exams in the Department Office on the Monday before each exam at the latest.

The examinations are graded from 1 (minimum for passing) to 5. Some courses are graded as pass/fail.

1/5 = Sufficient (1,00 - 1,49)

2/5 = Satisfactory (1,50 - 2,49)

3/5 = Good (2,50 - 3,49)

4/5 = Very Good (3,50 - 4,49)

5/5 = Excellent (4,50 - 5,00)

The grades for the major and minor subjects are determined by calculating the average of the grades of individual courses, which are weighed by the number of credits:

Satisfactory 2

Good 3

Excellent 5

The major subject includes not only the studies in the major subject but also the joint studies in biology (code 750***) and hydrobiology studies (code 754***). With bioscience students hydrobiology studies can be part of the ecology minor however the compulsory studies in ecology has to be done (see details from the course structure diagram). Studies of 15 cr. or more entitles for the mark and grade of a minor subject in B.Sc. studies (minor in bioscience or ecology). Students are recommended to do minor subject as 25 cr. In B.Sc. studies the major has to be minimum 90 credits. For teacher students the minimum for the major is 70 cr. The remaining studies (below 15 cr.) are counted into "other studies". The credits of the M.Sc. thesis are counted into the major subject studies but the grade of the M.Sc. thesis doesn't affect the grade of the major subject studies. In ecological or physiological zoology the major subject studies are coded with 751*** and 755*** in ecological or physiological botany the major subject studies are coded with 752*** and 756*** and in genetics major subject studies are coded with 753*** and 757***. The grade is weighed by the number of credits in all majors. In M.Sc. studies the major has to be minimum 60 credits for teacher students and 80 credits for researcher students.

M.Sc studies for biology students in their major has to be advanced studies (code 75****S). If biology student has done subject or advanced studies (codes 75****A or 75****S)

The minor subject for the biology students in M.Sc. degree are as follows (minimum 15 credits):

Zoology course codes 751*** and 755***

Botany course codes 752*** and 756***

Genetics course codes 753*** and 757***

The minor subject in biology is granted for other that biology students.

Studies of 15 cr. or more entitles for the mark and grade of a minor subject in biology. Studies are coded with 750***, 751*** and 752***, 753***, 754***, 755***, 756***and 757***. The grade is weighed by the number of credits.

3. DESCRIPTION OF INDIVIDUAL COURSE UNITS

Course units by themes

General biology and methodology:

750103P	History of biology
750618S	Thursday seminar in biology
750x22A/S	Laboratory, instrumentation and measurement techniques
750619S	Course in microscopic techniques
750340A	Basics of bioinformatics
750363A	Biogeography
750396A	B.Sc.- seminar
750696S	M.Sc. - seminar

751373A Identification of animals

751642S Identification of vertebrates in the field

751651S Advanced identification of animals

751660S Preparation of an insect collection

752303A Identification of plant species

752x09A/S Plant evolution and systematics

752337A Basic course in plant morphology

752x88A/S Plant tissue culture

756629S Advanced plant tissue culture

753104P Experimental course in general genetics

753x07A/S Human genetics

753612S Methods in genomics and genomics evolution

750629S Kaamos -symposium

Cell and molecular biology:

750121P Cell biology

750364A Molecular methods I

750365A Molecular methods II

751388A Animal physiology

751636S Neurobiology

751367A Developmental biology-histology

756625S Genetic transformation of plants

753124P Concepts of genetics

753104P Experimental course in general genetics

753x17A/S Experimental course of genomics and gene expression

753x27A/S Molecular evolution

753622S Experimental course in molecular evolution

753629S Bioinformatics

753630S Genetic research seminar

753612S Methods in genomics and genomics evolution

Physiology:

751388A	Animal physiology
751635S	Advanced course in animal physiology
751636S	Neurobiology
751x57A/S	Comparative endocrinology
751x84A/S	Comparative animal physiology
755x11A/S	Thermal biology and energetics
752345A	Basics of functional plant biology
752682S	Advanced molecular plant physiology
752691S	Special course/Signal transduction in plants
756615S	Physiology of forest trees
756x04A/S	Plant ecophysiology in changing environments
756x38A/S	Plant symbiosis
756618S	Secondary metabolism of plants
756626S	Stress physiology of plants
756627S	Plant hormones

Ecology:

750124P	Basics of ecology
750347A	Ecological methods I
750647S	Ecological methods II
750631S	Ecosystem ecology
751306A	Field course in terrestrial animals
751307A	Field course in aquatic animals
750336A	Evolutionary ecology
751x66A/S	Animal behaviour
755607S	Population ecology
755x10A/S	Community ecology
755608S	Avian reproductive biology
755615S	Molecular ecology
752300A	Plant ecology
752304A	Field course in ecological botany

754618S	Research seminar in fish ecology
754619S	Special course in fish ecology
756612S	Soil ecology
756633S	Soil biology
752667S	Special topics in plant ecology

Population biology:

750124P	Basics of ecology
750347A	Ecological methods I
750604S	Metapopulation dynamics
750647S	Ecological methods II
752300A	Plant ecology
752321A	Conservation of biodiversity
756323A	Plant population biology
753x14A/S	Basics in population genetics
753616S	DNA analysis in population genetics, lectures
753631S	DNA analysis in population genetics, practicals
753692S	Seminar in ecological and conservation genetics

Evolutionary biology and systematics:

750642S	Optimization and game theories
755306A	Animal evolution, systematics and morphology
750336A	Evolutionary ecology
751x66A/S	Animal behaviour
751x78A/S	Functional animal ecology
755609S	Evolution of life histories
752x09A/S	Plant evolution and systematics
752656S	Taxonomy and ecology of plants
756619S	Evolutionary ecology of plant reproduction
753x27A/S	Molecular evolution
753622S	Experimental course in molecular evolution

756615S	Molecular ecology

Environmental studies:

750x03A/S	Nature conservation and land use
750x99P/A	Optional examinations in environmental protection
750627S	Biodiversity in boreal forests
750635S	Biodiversity in human changed environments
750x16A/S	Legislation in environmental protection
750604S	Metapopulation dynamics
750631S	Ecosystem ecology
754308A	Basic course in hydrobiology
754x20A/S	Stream ecology
754621S	Specific topics on hydrobiology
754616S	Field methods in freshwater biomonitoring
754613S	Assessment and monitoring of the ecological status of water bodies
751388A	Animal physiology
751x68A/S	Wildlife management and game animal ecology
750626S	Environmental impact assessment (EIA) and ecological inventory of natural resources
754612S	Final examination in hydrobiology
752321A	Conservation of biodiversity
752x22A/S	Effects of air pollutants on plants
752175P	Environmental ecology
753692S	Seminar in ecological and conservation genetics
756607S	Restoration ecology

Variable themes, possibly in the field of environment:

750x39A/S	Arctic ecology excursion
751690S	Lectures on special topics in zoology
753613S	Special seminar in genetics
	Optional examinations
752695S	Seminar on special topics in botany

750x99P/A/S	Optional examinations in environmental protection
752667S	Special topics in plant ecology

Agriculture and forestry:

751x68A/S	Wildlife management and game animal ecology
751674S	Reindeer biology
752304A	Field course in ecological botany
752x16A/S	Macro fungi
752653S	Plant pathology
752359A	Plant ecology of forestry
756615S	Physiology of forest trees
752394A	Economic plants
753x94A/S	Quantitative genetics and plant and animal breeding

Northern studies:

751306A	Field course in terrestrial animals
751307A	Field course in aquatic animals
752304A	Field course in ecological botany
750x25A/S	Winter ecology and physiology
750627S	Biodiversity in boreal forests
752x42A/S	Arctic and alpine ecology
752672S	Floristic Inventory
752692S	Mire ecology
750x39A/S	Arctic ecology excursion

Hydrobiology:

754x20A/S	Stream ecology
754308A	Basic course in hydrobiology
754621S	Specific topics on hydrobiology

754609S	Basic methods in hydrobiology
754612S	Final examination in hydrology
754616S	Field methods in freshwater biomonitoring
754613S	Assessment and monitoring of the ecological status of water bodies
754618S	Research seminar in fish ecology
754619S	Special course in fish ecology
751307A	Field course in aquatic animals
751648S	Special course in aquatic invertebrates

Course language codes:

E = Means that a course can be taken in English, e.g. by reading a textbook or selected literature and taking an exam, although lectures are given in most cases in Finnish. In practical groups, tutoring will be given in English.

NNE = **Northern Nature and Environment Studies** programme is taught entirely in English or in English and Finnish. Most of the NNE courses are integrated in the department's regular courses.

Codes of the courses:

Y = General studies (4 th number in the code is 0), general studies

P = Basic studies (4 th number in the code is 1), introductory / bachelor level studies

A = Subject studies (4 th number in the code is 3), intermediate / bachelor level studies

S = Advanced studies (4 th number in the code is 6), advanced / master level studies

J = Postgraduate studies

The course units are arranged by the code numbers.

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

300002M: Advanced Information Skills, 1 op
751635S: Advanced course in animal physiology, 8 op
752682S: Advanced course in plant biology, 9 op
751651S: Advanced identification in animals, 4 - 8 op
752608S: Advanced identification of plant species I, 6 op
752625S: Advanced identification of plant species II, 5 - 8 op
756629S: Advanced plant tissue culture, 4 op
751666S: Animal behaviour, 5 op
751366A: Animal behaviour, 5 op
755306A: Animal evolution, systematics and morphology, 7 op
751388A: Animal physiology, 4 op

752677S: Aquatic and littoral vegetation, 3,5 op
750339A: Arctic ecology excursion, 4 op
755608S: Avian reproductive biology, 2 op
750366A: Bachelor of Science final examination, 5 op
750332A: Bachelor of Science maturity exam, 0 op
750396A: Bachelor of Science seminar, 3 op
750367A: Bachelor of Science thesis, 10 op
754308A: Basic course in hydrobiology, 3 op
752337A: Basic course in plant morphology, 2 op
751373A: Basic identification of animals, 5 op
752688S: Basic of plant tissue culture, 5 op
753614S: Basics in population genetics, 8 op
753314A: Basics in population genetics, 8 op
750340A: Basics of bioinformatics, 3 op
750124P: Basics of ecology, 5 op
752345A: Basics of functional plant biology, 4 op
752388A: Basics of plant tissue culture, 5 op
750627S: Biodiversity in boreal forests, 3,5 op
750635S: Biodiversity in human changed environments, 3 - 6 op
750363A: Biogeography, 4 op
753629S: Bioinformatics, 4 op
752662S: Botanical collection, 2 - 6 op
752362A: Botanical collection, 2 - 6 op
750121P: Cell biology, 5 op
755310A: Community ecology, 3 - 4 op
755610S: Community ecology, 3 - 4 op
751384A: Comparative animal physiology, 8 op
751684S: Comparative animal physiology, 8 op
751657S: Comparative endocrinology, 3 op
751357A: Comparative endokrinology, 3 op
753124P: Concepts of genetics, 4 - 7 op
752321A: Conservation of Biodiversity, 3 op
750619S: Course in microscopic techniques, 4 op
753631S: DNA analysis in population genetics, exercises, 6 op
753616S: DNA analysis in population genetics, lectures, 4 op
751367A: Developmental biology-histology, 4 op
752672S: Distribution mapping of plants, 2 - 5 op
750347A: Ecological methods I, 6 op
752394A: Economic Plants, 3 op
750631S: Ecosystem ecology, 3 op
752322A: Effects of Air Pollutants on Plants, 5 op
752622S: Effects of air pollutants on plants, 5 op
752175P: Environmental ecology, 5 op
750626S: Environmental impact assessment (EIA) and ecological inventory of natural resources, 5 op
755609S: Evolution of life histories, 4 op
750336A: Evolutionary ecology, 5 op
752352A: Examination in optional topics, 2 - 6 op
751654S: Examination on optional topics, 2 - 6 op
752652S: Examinations on optional topics, 2 - 6 op
751354A: Examinations on optional topics, 2 - 6 op
753651S: Examinations on optional topics, 2 - 6 op
753351A: Examinations on optional topics, 2 - 6 op
752605S: Excursion to Southern Finland or Abroad, 4 - 7 op
752305A: Excursion to Southern Finland or Abroad, 4 - 7 op
750639S: Excursion to the Subarctic area, 4 op
753104P: Experimental course in general genetics, 6 op
753622S: Experimental course in molecular evolution, 4 op
751307A: Field course in aquatic animals, 4 op
752642S: Field course in arctic-alpine ecology and vegetation, 5 op
752304A: Field course in ecological botany, 5 - 6 op
751306A: Field course in terrestrial animals, 4 op
754616S: Field methods in freshwater biomonitoring, 4 op
752699S: Final examination in botany, 10 op
753699S: Final examination in genetics, 10 op

754612S: Final examination in hydrobiology, 7 op
751699S: Final examination in zoology, 10 op
752186P: Foreign studies, 0 op
751193P: Foreign studies, 0 op
753193P: Foreign studies, 0 op
751393A: Foreign studies, 0 op
753393A: Foreign studies, 0 op
752386A: Foreign studies, 0 op
752686S: Foreign studies, 0 op
753693S: Foreign studies, 0 op
751693S: Foreign studies, 0 op
751678S: Functional animal ecology, 6 op
751378A: Functional animal ecology, 6 op
756625S: Genetic transformation of plants, 4 - 8 op
753630S: Genetics research seminar, 2 op
753617S: Genomics and gene expression practicals, 8 op
753317A: Genomics and gene expression practicals, 8 op
750103P: History of biology, 2 op
753607S: Human genetics, 4 op
753307A: Human genetics, 4 op
756311A: Identification of garden plant species, 5 op
752303A: Identification of plant species, 2 - 3 op
751642S: Identification of vertebrates in the field, 2 op
750600J: Integration of research and teaching, 1 - 4 op
755614J: Introductory essay of Ph. D. research, 4 op
757606J: Introductory essay of Ph.D. research, 4 op
756632J: Introductory essay of Ph.D. research, 4 op
750629S: Kaamos symposium, 2 - 4 op
040910S: Laboratory Animal Course For Scientists, 6 op
750322A: Laboratory techniques and instrumentation, 5 op
750622S: Laboratory, instrumentation and measurement techniques, 5 op
751690S: Lectures on special topics in zoology, 2 - 4 op
750616S: Legislation in environmental protection, 5 op
750316A: Legislation in environmental protection, 5 op
752316A: Macro fungi, 3 op
752616S: Macro fungi, 3 op
750696S: Master of science seminar, 4 op
757602S: Master of science thesis in genetics, 40 op
755602S: Master of science thesis in zoology, 40 op
750632S: Maturity exam, 0 op
750604S: Metapopulation dynamics, 4 op
750647S: Methods in ecology II, 7 op
753612S: Methods in genomics and genomics evolution, 6 op
750160P: Minor subject examination in biology, 4 op
752692S: Mire ecology, 5 op
755615S: Molecular ecology, 2 - 5 op
753627S: Molecular evolution, 4 op
753327A: Molecular evolution, 4 op
750364A: Molecular methods I, 4 op
750365A: Molecular methods II, 4 op
750303A: Nature conservation and land use, 3 op
750603S: Nature conservation and land use, 3 op
751636S: Neurobiology, 3 op
750642S: Optimatisation and game theories, 3 op
750199P: Optional examinations in environmental protection, 2 - 6 op
750399A: Optional examinations in environmental protection, 2 - 6 op
750699S: Optional examinations in environmental protection, 2 - 6 op
750031Y: Orientation course for new students, 1 op
756615S: Physiology of forest trees, 5 op
756621S: Plant adaptations to herbivory, 2 op
756332A: Plant developmental biology, 4 op
752300A: Plant ecology, 7 op
752359A: Plant ecology and forestry, 3,5 op
756304A: Plant ecophysiology in changing environments, 5 op

756604S: Plant ecophysiology in changing environments, 5 op
752609S: Plant evolution and systematics, exercises, 2 op
752309A: Plant evolution and systematics, lectures, 3 op
756627S: Plant hormones, 5 op
752653S: Plant pathology, 4 op
756619S: Plant reproductive biology, 2 - 4 op
756638S: Plant symbiosis, 4 op
756338A: Plant symbiosis, 4 op
756323A: Population biology of plants, 5 op
755607S: Population ecology, 7 op
750615S: Practical training, 10 - 15 op
751660S: Preparation of an insect collection, 2 - 6 op
756602S: Pro gradu thesis, 40 op
753394A: Quantitative genetics and plant and animal breeding, 6 op
753694S: Quantitative genetics and plant and animal breeding, 6 op
751674S: Reindeer biology, 3 op
750661S: Research group seminar, 2 - 4 op
750662J: Research plan seminar, 1 - 2 op
754618S: Research seminar in fish ecology, 2 - 4 op
750613S: Research training, 2 - 15 op
750313A: Research training, 2 - 15 op
756607S: Restoration ecology, 2 - 6 op
756618S: Secondary metabolism of plants, 4 op
753692S: Seminar in ecological and conservation genetics, 4 op
752695S: Seminar on special topics in botany, 2 op
756633S: Soil biology, 3 op
756612S: Soil ecology, 3 - 5 op
751648S: Special course in aquatic invertebrates, 2 - 4 op
754619S: Special course in fish ecology, 8 op
752691S: Special course/Signal transduction in plants, 2 - 4 op
753613S: Special seminar in genetics, 4 op
752667S: Special topics in plant ecology, 2 - 5 op
754621S: Specific topics on hydrobiology, 4 op
754620S: Stream biology, 4 op
754320A: Stream ecology, 4 op
756626S: Stress physiology of plants, 4 op
756622S: Structure and dynamics of plant communities, 5 op
756605S: Studies in Botany in other Finnish Universities, 0 op
757605S: Studies in Genetics in other Finnish Universities, 0 op
755605S: Studies in Zoology in other Finnish Universities, 0 op
756105P: Studies in botany in other Finnish universities, 0 op
756305A: Studies in botany in other Finnish universities, 0 op
757105P: Studies in genetics in other Finnish universities, 0 op
757305A: Studies in genetics in other Finnish universities, 0 op
755105P: Studies in zoology in other Finnish universities, 0 op
755305A: Studies in zoology in other Finnish universities, 0 op
752656S: Taxonomy and ecology of plants, 2 - 4 op
755311A: Thermal biology and energetics, 3 op
755611S: Thermal biology and energetics, 3 op
750618S: Thursday seminar in biology, 2 op
750033Y: Tutorial for new students, 1 op
751668S: Wildlife management and game animal ecology, 6 op
751368A: Wildlife management and game animal ecology, 6 op
750625S: Winter ecology and physiology, 3 - 8 op
750325A: Winter ecology and physiology, 3 - 8 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

300002M: Advanced Information Skills, 1 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Other Studies
Laji: Course
Vastuuyksikkö: Faculty of Science
Arvostelu: 1 - 5, pass, fail
Opettajat: Sassali, Jani Henrik
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

751635S: Advanced course in animal physiology, 8 op

Voimassaolo: - 31.07.2019
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Hohtola, Esa Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
8 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st autumn.
Learning outcomes:
After completing the course the student is able to plan and execute small physiological research projects as well as analyze, interpret and report the results in scientific format. The course thus trains the student for preparing his /her master's thesis.
Contents:
The course comprises of 2-3 extensive laboratory exercises that are carried out as small research projects. The exercises can be from any area of physiology. The students will themselves plan the schedule for the experiment, and write the results in the form of a scientific publication. The report will be presented in a concluding seminar either as an oral presentation or poster.
Learning activities and teaching methods:
Laboratory work, group meetings, seminar.
Target group:
Compulsory to BSz.
Recommended optional programme components:
751x84A/S, 750x22A/S or equivalent knowledge.
Recommended or required reading:
The required scientific articles and other material will be distributed during the course.
Assessment methods and criteria:
Exercises, reports and final seminar.
Grading:
Pass / Fail.
Person responsible:
Prof. Esa Hohtola.

752682S: Advanced course in plant biology, 9 op

Voimassaolo: - 31.07.2018

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Häggman, Hely Margaretha

Opintokohteen oppimateriaali:
Buchanan, Bob B. , , 2000
Opintokohteen kielet: Finnish

ECTS Credits:
9 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd autumn, every second year.
Learning outcomes:
The student will be familiarized and understands how gene expression affects plant development and metabolism, learns both holistic and specific methods to study gene expression and is able to evaluate and analyze the reliability of the data achieved. The student will also be familiar with the most recent literature of the field.
Contents:
Due to the new sequencing technologies the amount of sequence data will increase rapidly. The course will focus on gene expression and especially on regulation of gene expression (transcription factors, RNAi, microRNAs, genome level regulation, histone acetylation, and methylation). Research methods at transcriptome. Proteome and metabolome level will be included as well as qualitative and quantitative methods both at single gene level but also at global level. The laboratory course will include some of these studies. The seminars will familiarize the students on the most recent literature.
Learning activities and teaching methods:
30 h lectures and seminar, 68 h exercises (demonstrations included), reports, final exam.
Target group:
BSb: compulsory.
Recommended optional programme components:
752345A or equivalent knowledge.
Recommended or required reading:
Buchanan, Gruissern, Jones 2000: Biochemistry & Molecular Biology of Plants. Courier Companies Inc. 1367 p. (parts of the book), lecture handouts and literature given during the course.
Person responsible:
Prof. Hely Häggman and Prof. Anja Hohtola.

751651S: Advanced identification in animals, 4 - 8 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Orell, Markku Ilmari

Opintokohteen oppimateriaali:
Suomen luonto, , 1998
Suomen luonto, , 1997
Suomen luonto, , 1998
Koli, Lauri , , 1990
Siivonen, Lauri , , 1994
Koivisto, Ilkka, , 1984
Hildén, Olavi, , 1984
Koli, Lauri, , 1984
Opintokohteen kielet: Finnish

ECTS Credits:
4-8 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st autumn.
Learning outcomes:
Student is able to identify special animal groups or species from museum samples and know the ecology and distribution in Finland.
Contents:
Identification of special animal groups (fishes; amphibian and reptiles; birds; mammals; some group of invertebrates), their ecology and distribution.
Learning activities and teaching methods:
Independent study, oral final exam.
Target group:
ECOe.
Recommended or required reading:
Suomen eläimet 1-3; Suomen luonto: Linnut; Nisäkkäät; Kalat, Sammakkoeläimet ja matelijat, Koli, L.: Suomen kalat, Siivonen, L. & Sulkava, S.: Pohjolan nisäkkäät or relevant literature in English.
Assessment methods and criteria:
Oral exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Markku Orell.

752608S: Advanced identification of plant species I, 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Halonen, Pekka Ensio

Opintokohteen oppimateriaali:
Hämet-Ahti, L., Suominen, J., Ulvinen, T. & Uotila, P., , 1998
Opintokohteen kielet: Finnish

ECTS Credits:
6 cr.
Timing:
B.Sc. 3 rd year, M.Sc. 1 st year.
Learning outcomes:
Advanced identification of the vascular plants of Finland.
Contents:
Independent studying of herbarium samples. Distribution types of plants in Fennoscandia excluding the Russian parts.
Learning activities and teaching methods:
Independent studying of herbarium samples. The course could be examined in two parts: 1) monocots, 2) ferns, dicots and distributions.
Recommended optional programme components:
752303A or equivalent knowledge.
Recommended or required reading:
Hämet-Ahti et al. 1998: Retkeilykasvio (Field Flora of Finland), Ed. 4. Finnish Museum of Natural History, Helsinki. 656 p.
Grading:
1-5 / Fail.
Person responsible:
Dr. Pekka Halonen.

752625S: Advanced identification of plant species II, 5 - 8 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Halonen, Pekka Ensio
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5-8 cr.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
Identification of systematically or ecologically limited groups. For example macrofungi, mosses, lichens, phytoplankton, aquatic, shore, forest, meadow, peatland or fell plants, species of primeval forest and macroscopic plant remains.
Contents:
Identification of systematically or ecologically limited groups from herbarium samples and preparates. Lichens 8 cr., others 5 cr.
Learning activities and teaching methods:
Independent studying of herbarium samples or preparations, species exam.
Recommended optional programme components:
752303A or equivalent knowledge.
Assessment methods and criteria:
Species exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Pekka Halonen.

756629S: Advanced plant tissue culture, 4 op

Voimassaolo: - 31.07.2014
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Hohtola, Anja Terttu Marjatta
Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st spring.
Learning outcomes:
Lectures deepens the knowledge and understanding of various tissue culture techniques.
Contents:
Lectures provide insight to tissue culture techniques and research work by expanding knowledge and understanding especially in applications which are potential in plant biotechnology. The course includes laboratory part, which familiarize students with basic techniques such as protoplast isolation, fusion and culture, bioreactors and, different culture methods.
Learning activities and teaching methods:
Lectures, exercises.
Recommended optional programme components:

752388A.
Recommended or required reading:
Handouts.
Person responsible:
Prof. Anja Hohtola.
Other information:
The course will take place if sufficient resources are available.

751666S: Animal behaviour, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kaitala Arja

Opintokohteen oppimateriaali:
Viitala, Jussi , , 2005
Krebs, John R. , , 1993
Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd spring, M.Sc. 1 st spring.
Learning outcomes:
To understand basic principles of animal behaviour in an evolutionary ecology contest.
Contents:
The basics of behavioural ecology of animals. Lecture topics: Animal foraging, predator-pray interactions, mating systems, and social behaviour. Seminars are based on the latest research results.
Learning activities and teaching methods:
30 h lectures, seminars, final exam.
Target group:
B.Sc. degree optional to ECO, M.Sc. degree compulsory to ECOz.
Recommended or required reading:
Krebs, J. R. & Davies, N.B. (1993) An Introduction to Behavioural Ecology, 4 th edition, Oxford: Blackwell.
Viitala, J, (2005): Vapaasta tahdosta? Käyttäytymisen evolutiivinen perusta. 2005. Atena.
Grading:
1-5 / Fail.
Person responsible:
Prof. Arja Kaitala.

751366A: Animal behaviour, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kaitala Arja

Opintokohteen oppimateriaali:
Krebs, John R. , , 1993
Viitala, Jussi , , 2005
Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.

Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd spring, M.Sc. 1 st spring.
Learning outcomes:
To understand basic principles of animal behaviour in an evolutionary ecology contest.
Contents:
The basics of behavioural ecology of animals. Lecture topics: Animal foraging, predator-pray interactions, mating systems, and social behaviour. Seminars are based on the latest research results.
Learning activities and teaching methods:
30 h lectures, seminars, final exam.
Target group:
B.Sc. degree optional to ECO, M.Sc. degree compulsory to ECOz.
Recommended or required reading:
Krebs, J. R. & *Davies*, N.B. (1993) An *Introduction to Behavioural* Ecology, 4 th edition, Oxford: Blackwell.
Viitala, J, (2005): Vapaasta tahdosta? Käyttäytymisen evolutiivinen perusta. 2005. Atena.
Grading:
1-5 / Fail.
Person responsible:
Prof. Arja Kaitala.

755306A: Animal evolution, systematics and morphology, 7 op

Voimassaolo: - 31.07.2010

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kaitala Arja

Opintokohteen kielet: Finnish

ECTS Credits:
7 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2 nd autumn.
Learning outcomes:
To understand basics of the evolution of animal kingdom, evolution of structural innovations and principles of systematics.
Contents:
Evolution history of animals, basics of systematics, relationships, the structure of animals and their organs in different invertebrate and vertebrate classes. Practical work deals with reviews to structural characters and animal dissecting.
Learning activities and teaching methods:
20 h lectures, 36 h compulsory exercises (preparations and demonstrations), lecture and exercises final exams.
Target group:
Compulsory for TEAeco and ECO, optional for TEAbs and BS.
Recommended or required reading:
A course booklet (in Finnish) can be bought from biology office. Hickman, C, P. et al. (2009). Animal Diversity, 5. edition, McGraw Hill New York.
Assessment methods and criteria:
Lecture and exercises exams.
Grading:
1-5 / Fail.
Person responsible:
Prof. Arja Kaitala.

751388A: Animal physiology, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Saarela, Seppo Yrjö Olavi

Opintokohteen oppimateriaali:

Campbell, Neil A. , , 2005

Opintokohteen kielet: Finnish

Leikkaavuudet:

755323A Animal physiology 5.0 op

ECTS Credits:
4-8 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 2 nd spring (lect), 3 rd autumn (prac).
Learning outcomes:
After completing the course the student is able to form a general view of animal body functions, the regulation of organ systems, and the background of human health and diseases. In addition, the students learn basic methods in animal physiology research.
Contents:
The practical laboratory experiments focus on the basic problematic of physiological themes including nervous system, muscles, circulation, nutrition, metabolism, immune system, hormones and reproduction using the principal physiological methods and computer aided measurements.
Learning activities and teaching methods:
50 h lectures and independent studying, mid-semester exams, home essays (spring) 32 h laboratory, final exam (autumn).
Target group:
Compulsory to BS, TEAbs and ECO1, lectures 4 cr. compulsory to TEAeco and optional to ECO2.
Recommended optional programme components:
750121P or equivalent knowledge. This course is a prerequisite for courses 751x84A/S, 751636S and 751635S.
Recommended or required reading:
Chapter Animal Form and Function in Campbell, N. A. & Reece J. B. 2008: Biology, 8 th ed., Benjamin Cummings, New York Inc., 1312 p., handouts and practical work handout of animal physiology.
Assessment methods and criteria:
Home essays and final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Seppo Saarela.

752677S: Aquatic and littoral vegetation, 3,5 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari-Heikki Oksanen

Opintokohteen kielet: Finnish

ECTS Credits:
3,5 cr.
Language of instruction:
Finnish.
Timing:

M.Sc. 1 st or 2 nd autumn.
Learning outcomes:
The student will learn to identify a selection of aquatic and littoral plant species, and some features of their ecological requirements.
Contents:
Littoral and aquatic vascular plants, bryophytes and macro algae.
Learning activities and teaching methods:
10 h lectures, 26 h exercises, field excursions around Oulu, literature, final exam.
Person responsible:
Prof. Jari Oksanen.
Other information:
The course will take place if sufficient resources are available.

750339A: Arctic ecology excursion, 4 op

Voimassaolo: - 31.07.2011

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Taulavuori

Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. or M.Sc. degree.
Learning outcomes:
Student learns special features of the northern areas and natural resources. Ecological and environmental problems and pollution in the northernmost parts of Fennoscandia. Students get acquainted to activities in different countries' research stations.
Contents:
Arctic ecology excursion and seminar.
Learning activities and teaching methods:
Excursion and seminar.
Target group:
Ecology students.
Grading:
Pass / Fail.
Person responsible:
Dr. Kari Taulavuori.
Other information:
The course will take place if sufficient resources are available.

755608S: Avian reproductive biology, 2 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Orell, Markku Ilmari

Opintokohteen kielet: Finnish

ECTS Credits:
2 cr.
Language of instruction:

Finnish.
Timing:
M.Sc. degree. Every second year.
Learning outcomes:
Student gets current scientific research knowledge in animal reproductive ecology and behaviour.
Contents:
Introduction to sexual reproduction and parental care in animals. Birds are used as a taxonomic reference group, but the concepts and theories are discussed in the general evolutionary ecological framework. Topics: e.g. habitat selection, territoriality, mating systems and brood parasitism.
Learning activities and teaching methods:
24 h lectures, exam.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Markku Orell and Dr. Seppo Rytkönen.
Other information:
The course will take place if sufficient resources are available.

750366A: Bachelor of Science final examination, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd year.
Learning outcomes:
Student will understand basic methods, results and theories in ecology, physiology or genetics.
Contents:
Examinations on books related to B.Sc.-thesis subject. List of books are presented on noticed boards and in the internet. All the books are done on the same exam.
Learning activities and teaching methods:
Book exam.
Target group:
Compulsory to the biology students.
Recommended or required reading:
See book list: http://cc.oulu.fi/~ehohtola/luk-kirjat.htm
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Esa Hohtola, Prof. Hely Häggman, Prof. Satu Huttunen, Prof. Jaakko Lumme and Prof. Markku Orell.

750332A: Bachelor of Science maturity exam, 0 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
0 cr.
Language of instruction:
Finnish / Swedish / English.
Timing:
B.Sc. degree.
Contents:
After completing the Bachelor of Science and Master of Science. Thesis, the student writes an essay in his/her native language on the thesis, to show a good command of the language and the topic of the thesis. Detailed instructions on the biology notice board.

Learning activities and teaching methods:
Four pages long essay exam. Two teachers examine the maturity exam (at least one teacher has to present the students major subject). Department council accepts the maturity exam. 4 h exam.
Target group:
Compulsory to the biology students. Exam is taken after completion of the thesis.
Assessment methods and criteria:
Four pages long essay.
Grading:
Pass / Fail.
Person responsible:
Professor of the student's major subject.

750396A: Bachelor of Science seminar, 3 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Esa Juhani, Jari-Heikki Oksanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

750376A	Bachelor of Science seminar and thesis	10.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd year.
Learning outcomes:
Student will familiarize himself with the help of lectures, workshop and seminar in making scientific review, presentation and scientific communication.
Contents:
Seminar concerns widely scientific channels of communication. It promotes working out of the B. Sc. thesis. Course includes short seminar presentation of the thesis subject. Seminar also includes working the thesis and scientific articles, ways and channels of scientific communication, writing techniques, publishing forums and references. Seminar includes course 030005P Introduction to information retrieval (1 cr), see Scientific library Tellus for more information.
Learning activities and teaching methods:
Lectures, exercises, exam, workgroups, and seminar or poster presentation.
Target group:
Compulsory to the biology students.
Assessment methods and criteria:
Exam, workgroup and presentation.
Grading:
Pass / Fail.
Person responsible:

Prof. Esa Hohtola (autumn) and Prof. Jari Oksanen (spring).

750367A: Bachelor of Science thesis, 10 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
10 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd year.
Learning outcomes:
Student will plan and write up thesis by getting acquainted to an interesting biology subject and reviewing it critically with the help of relevant scientific source material.
Contents:
Independent research work on a scientific subject in agreement with the responsible professor and under the supervision of the Department. The supervisors may be professors of the department, docents and other teachers and researchers who have the docent's status. The student may have several supervisors, the other supervisor may be from other department, university (also abroad) or from research institute. The subject must be agreed on with the professor in advance. The research work can contain fieldwork, laboratory work, theoretical work or work on collections in museum. The work always includes a literature survey. After having completed the thesis, the student writes the Maturity Exam. The dean will order the final examiners by the proposal of the professor. Department council accepts and grades the thesis on the basis of the final examiners' opinions.
Learning activities and teaching methods:
About 20 pages long thesis.
Target group:
Compulsory to the biology students.
Recommended optional programme components:
Done at the same time as B.Sc. seminar workshop in spring.
Assessment methods and criteria:
Thesis.
Grading:
Pass / Fail.
Person responsible:
Professors.

754308A: Basic course in hydrobiology, 3 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Muotka, Timo Tapani
Opintokohteen oppimateriaali:
Brönmark, Christer , , 2005
Opintokohteen kielet: Finnish
Leikkaavuudet:

754322A	Introduction to hydrobiology	5.0 op

ECTS Credits:

3 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3rd spring, M.Sc. 1st spring. Even numbered years.
Learning outcomes:
Basic knowledge of inland water ecosystems structure, function and organisms. Basic concepts of hydrobiology which are necessary for further hydrobiology studies.
Contents:
Hydrography and physical and chemical properties of lakes and streams. Structure and ecological interactions of aquatic ecosystems (bacters plant and animal plankton, water insects other invertebrates, fishes). Most important biological interactions (competition, predation, parasitism, mutualism), inland water food web structure and regulation. Biodiversity of inland waters. Human influence on inland water biodiversity and ecosystem functions.
Learning activities and teaching methods:
26 h lectures, final exam.
Target group:
Lectures are compulsory to the students taking the hydrobiology study package.
Recommended or required reading:
Course material and book Brönmark, C. & Hansson, L. 2005: The Biology of Lakes and Ponds. Oxford University Press, 285 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Timo Muotka.

752337A: Basic course in plant morphology, 2 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:

Terävä, Eija , , 2008

Opintokohteen kielet: Finnish

ECTS Credits:
2-4 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 1 st spring.
Learning outcomes:
To learn the basic structure of root, root, leaf and reproductive organs and to understand the development towards more complex structures in the plant kingdom. Basic terms used in plant morphology are introduced.
Contents:
Organology and morphology of shoot plants including transformation of organs and adaptation to different tasks. General survey of plant tissues and anatomical structure of organs. Exercises gives a picture of plants' diversity and what kind of different structure modification plants have in order to adapt to the different habitats.
Learning activities and teaching methods:
16 h independent studying and exam (2 cr), which is prerequisite for the 30 h exercises (2 cr).
Target group:
Compulsory to BS (4-6 cr) and ECO 4-6 credits which can be comprised of lectures and exercises of this course or lectures from this course (2 cr) and course 756332A (4 cr). Optional for TEAbt and TEAeco in addition to this course (both lectures and exercises) is plant developmental biology (756332A) total 8 cr.
Recommended or required reading:
Lecture material, course handout and supplementary reading Mauseth, J.D.: Botany. An Introduction to Plant Biology (parts).
Assessment methods and criteria:

Two exams.
Grading:
1-5 / Fail.
Person responsible:
Prof. Anja Hohtola.

751373A: Basic identification of animals, 5 op

Voimassaolo: - 31.07.2016
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Koivula
Opintokohteen kielet: Finnish

ECTS Credits:
7 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 1 st autumn and spring. NNE.
Learning outcomes:
Main point of the course is to learn to indentify Finnish animal species (vertebrate) and families (invertebrate) from museum samples. Basics of species' ecology and classification of organisms.
Contents:
During the autumn semester (18 h lectures, 16 h exercises, exam), the Finnish vertebrate fauna is studied using stuffed museum samples. In the spring semester (2 h lectures, 33 h exercises, exam) the invertebrate taxons (mostly family- or genus-level) common in Finland are studied using museum samples.
Learning activities and teaching methods:
20 h lectures, 48 h exercises, 2 final exams.
Target group:
Compulsory to TEA, ECO, optional to BS.
Recommended optional programme components:
This course is needed for attending courses 751306A and 751307A.
Recommended or required reading:
Course handouts, Itämies J. ja Viro P. 1995: Eläinten lajintuntemus, selkärangattomat, 73 p.; Putaala, A., Marjakangas, A. & Rytkönen, S. 2001: Eläinten lajintuntemus, selkärankaiset, 42 p.
Assessment methods and criteria:
Two species exams.
Grading:
1-5 / Fail.
Person responsible:
Dr. Kari Koivula.

752688S: Basic of plant tissue culture, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Hohtola, Anja Terttu Marjatta
Opintokohteen oppimateriaali:
Collin, Hamish A. , , 1998
Opintokohteen kielet: Finnish

ECTS Credits:

5 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2 nd or M.Sc. 1 st autumn.
Learning outcomes:
The course aims to help students learn to basic plant tissue culture concepts, to establish tissue culture systems and to understand totipotency.
Contents:
Preparation of culture media and establishment of sterile cultures starting from different plant organs and tissues. Cytodifferentiation and viability tests are also included in the course. Students are able to follow how plant hormones determine the differentiation of tissues.
Learning activities and teaching methods:
8 h lectures, 45 h demonstrations and exercises, literature work, seminar.
Target group:
Optional to BS in the B.Sc. degree, compulsory to BSb in the M.Sc. degree.
Recommended or required reading:
Course handout and chapters 7-12 from the book: Collin, H. A. & Edwards, S. 1998: Plant Cell Culture. Bios Scientific Publ.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Anja Hohtola.

753614S: Basics in population genetics, 8 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen oppimateriaali:
Hartl, Daniel L. , , 2000
Hedrick, Philip W. , , 2005

Opintokohteen kielet: Finnish

Leikkaavuudet:

757613S Basics in population genetics 5.0 op

ECTS Credits:
8 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2nd or M.Sc. 1st autumn and spring.
Learning outcomes:
The students should know the basic theory and results of population genetics, and be able to apply these in analysis of data. They should also be able to use some basis experimental research methods.
Contents:
Basic theory population genetics. Measuring variation, mutation, genetic drift, inbreeding, selection, genetics of speciation, basic molecular population genetics.
Learning activities and teaching methods:
24 h lectures, 30 h mathematical exercises, 90 h exercises and seminar + 40 h of independent work; final exam.
Target group:
Optional to BS in B.Sc. degree, compulsory to BSg in M.Sc. degree.
Suitable for ecology students and molecular biology students.
Recommended optional programme components:

753104P and 753327A or equivalent knowledge. Recommended for 753692S and 753x94A/S. This course is a prerequisite to courses 753622S, 753629S and 753616S.
Recommended or required reading:
Hedrick 2005: Genetics of populations 3. ed (or older) Hartl 2000: A Primer of Population Genetics, Sinauer, Massachusetts.
Assessment methods and criteria:
Seminar and final exams.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen and Dr. Minna Ruokonen.

753314A: Basics in population genetics, 8 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen oppimateriaali:
Hedrick, Philip W. , , 2005
Hartl, Daniel L. , , 2000

Opintokohteen kielet: English

Leikkaavuudet:

757313A Basics in population genetics 5.0 op

ECTS Credits:
8 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2nd or M.Sc. 1st autumn and spring.
Learning outcomes:
The students should know the basic theory and results of population genetics, and be able to apply these in analysis of data. They should also be able to use some basis experimental research methods.
Contents:
Basic theory population genetics. Measuring variation, mutation, genetic drift, inbreeding, selection, genetics of speciation, basic molecular population genetics.
Learning activities and teaching methods:
24 h lectures, 30 h mathematical exercises, 90 h exercises and seminar + 40 h of independent work; final exam.
Target group:
Optional to BS in B.Sc. degree, compulsory to BSg in M.Sc. degree.
Suitable also for ecology students and molecular biology students.
Recommended optional programme components:
753104P and 753327A or equivalent knowledge. Recommended for courses 753692S and 753x94A/S. This course is a prerequisite to courses 753622S, 753629S and 753616S.
Recommended or required reading:
Hedrick 2005: Genetics of populations 3. ed (or older) Hartl 2000: A Primer of Population Genetics, Sinauer, Massachusetts.
Assessment methods and criteria:
Seminar and final exams.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen and Dr. Minna Ruokonen.

750340A: Basics of bioinformatics, 3 op

Voimassaolo: - 31.07.2016
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Ruokonen, Minna Johanna
Opintokohteen oppimateriaali:
Mount, David W. , , 2001
Opintokohteen kielet: English
Leikkaavuudet:

757314A Basics of bioinformatics 5.0 op

ECTS Credits:
3 cr.
Language of instruction:
Finnish / (English).
Timing:
B.Sc. studies, 2 nd spring.
Learning outcomes:
After the course the student knows and is able to use the basic methods for handling the nucleotide and protein sequences. The aim is that the student learns how to use the databases, understands the background and principles of the analytic methods, is able to take up a critical attitude towards the used methods and gets a good background for applying new methods that are developed continuously.
Contents:
Searching of material from the databases, inferring the function of a gene and structure of a protein based on sequence data, comparing the sequences and evaluating the differences between them as well as examining the evolution history of the genes.
Learning activities and teaching methods:
12 h lectures, 2 h seminar, 20 h exercises, independent work.
Target group:
BT: compulsory, recommended for all biologists. Suitable also for biochemists.
Recommended optional programme components:
Course Concepts of genetics (753124P) compulsory, also Molecular evolution (753327A) is recommended.
Recommended or required reading:
Mount, D.W. 2000: Bioinformatics, sequence and genome analysis. Cold Spring Harbor Laboratory Press, 564 p.
Assessment methods and criteria:
Reports, seminar presentation.
Grading:
1-5 / Fail
Person responsible:
Dr. Minna Ruokonen.

750124P: Basics of ecology, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari-Heikki Oksanen, Orell, Markku Ilmari
Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 1 st spring.
Learning outcomes:

After completion of the course both biology and minor studies students understand better function of nature and the ecological phenomena in individual, population, community and ecosystem level.

Contents:

The course gives a student a basic idea about ecological interactions in individual-, population-, community- and ecosystem levels. In individual level the focus is on environmental demands of plants and animals. In population level the birth- and death rate of age groups and their effect on population growth is focused. In interactions between different species the emphasis is on how the competition between species leads to differentiation of niches. Predation is viewed as the regulatory effect on the population dynamics of prey populations. In community level the biodiversity and the patterns of succession are the main questions. In ecosystem level the emphasis is on energy flows and nutrient cycling. Evolution and adaptation are important in different fields of ecology.

Learning activities and teaching methods:

The course is divided into three parts which follow the course book Krebs, C. J. 2009: Ecology (6 th edition). 1 st part: 24 hours of lectures based mainly on parts 1-2 of the course book. 2 nd part: 24 hours of lectures are based on part 3 of the course book. 3 rd part: students read the part 4 from the course book. In the final exam of the course, there will be three questions, one from each part and all the questions have to be passed.

Target group:

Compulsory to TEA, ECO and BT2, optional to BT1.

Recommended or required reading:

Krebs, C. J. 2009: Ecology (6 th edition).

Assessment methods and criteria:

Final exam.

Grading:

1-5 / Fail.

Person responsible:

Prof. Markku Orell and Prof. Jari Oksanen.

752345A: Basics of functional plant biology, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Anja Terttu Marjatta

Opintokohteen oppimateriaali:

Taiz, Lincoln , , 2006

Opintokohteen kielet: Finnish

Leikkaavuudet:

756346A	Plant biology lectures	5.0 op

ECTS Credits:

4-9 cr.

Language of instruction:

Lectures in Finnish, exercises in English if needed.

Timing:

B.Sc. 2 nd spring.

Learning outcomes:

Understand the function and regulation of plant cells and individuals.

Contents:

The most important phenomena of plant life, like photosynthesis, enzyme kinetics, nitrogen metabolism, function of cell membranes and so on are learned. In the laboratory, students have exercises in basic methods of plant physiology and in reporting their results in written form.

Learning activities and teaching methods:

28 h lectures and final exam (4 cr), 45 h laboratory exercises with preliminary exam and reports (3 cr.)

Target group:

B.Sc. TEAbs, BS and ECO1: compulsory 9 cr. TEAeco: compulsory lwctures (4 cr). Students from other degree can take the lectures 4 cr.

Recommended optional programme components:

750121P or equivalent knowledge and course 752337A help to follow this course. This course is a prerequisite for course 752682S.

Recommended or required reading:
Course handout, Taiz, L. & Zeigler, E. 2006: Plant Physiology (3rd ed. or newer) Sinauer Ass., Sunderland Mass.
Assessment methods and criteria:
Lectures and exam, exercises, reports.
Grading:
1-5 / Fail.
Person responsible:
Prof. Anja Hohtola and Dr. Anna Maria Mattila.

752388A: Basics of plant tissue culture, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Anja Terttu Marjatta

Opintokohteen oppimateriaali:

Collin, Hamish A. , , 1998

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2 nd or M.Sc. 1 st autumn.
Learning outcomes:
The course aims to help students learn to basic plant tissue culture concepts, to establish tissue culture systems and to understand totipotency.
Contents:
Preparation of culture media and establishment of sterile cultures starting from different plant organs and tissues. Cytodifferentiation and viability tests are also included in the course. Students are able to follow how plant hormones determine the differentiation of tissues.
Learning activities and teaching methods:
8 h lectures, 45 h demonstrations and exercises, literature work, seminar.
Target group:
B.Sc. degree BS: optional, M.Sc. degree BSb: compulsory.
Recommended or required reading:
Course handout and chapters 7-12 from the book: Collin, H. A. & Edwards, S. 1998: Plant Cell Culture. Bios Scientific Publ.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Anja Hohtola.

750627S: Biodiversity in boreal forests, 3,5 op

Voimassaolo: - 31.07.2011

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen oppimateriaali:

Gaston, Kevin J. , , 1998

Opintokohteen kielet: English

ECTS Credits:
3,5 cr.
Language of instruction:
English.
Timing:
M.Sc. 1 st or 2 nd spring.
Learning outcomes:
The student gets the latest knowledge in conservation biology with special regards to boreal forest ecosystem.
Contents:
Latest knowledge in conservation biology with special regards to boreal forest ecosystem. The course contains 8 hours introductory lectures defining basic concepts in conservation biology, as well as focusing on characteristics and ecosystem functioning in the boreal zone. The discussions focus on current topics in recently published papers concerning e.g. natural disturbances, habitat fragmentation, species extinctions etc. The scope of the course is not restricted to any particular taxa, but the emphasis will be on conceptual issues and on applications of ecological research.
Learning activities and teaching methods:
8 h lectures, 14 h discussion groups.
Recommended or required reading:
Gaston, K. J. & Spicer, J. I. 2004: Biodiversity. An Introduction. Blackwell. 191 p.
Person responsible:
Prof. Timo Muotka.
Other information:
The course will take place if sufficient resources are available.

750635S: Biodiversity in human changed environments, 3 - 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Orell, Markku Ilmari

Opintokohteen oppimateriaali:

Gaston, Kevin J. , , 2004

Opintokohteen kielet: Finnish

Leikkaavuudet:

755631S Biodiversity in human changed environments 5.0 op

ECTS Credits:
6 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st and 2 nd year, autumn.
Learning outcomes:
Student gets a wide view on basic concepts in conservation biology, why and how biodiversity can be maintained, present situation of biodiversity worldwide, threats and conservation needs of biodiversity.
Contents:
The course consists of three parts:
1. Introduction, which initiates students into main concepts and the present situation of biodiversity worldwide.
2. Populations, communities, and ecosystems in human changed environments. Themes e.g. extinctions, conservation areas and their management, biodiversity and functioning of ecosystems, invasive species issues, extinction and fragmentation of natural habitats.
3. Genetics. Modern theory and practice of genetic conservation especially the usage of molecular genetic methods in determining the population structure.
Learning activities and teaching methods:
34 h lectures nad practicals, internet work and exam.

Target group:
Advanced course for ecology and genetics students.
Recommended or required reading:
Part 1.: Gaston, K. J. & Spicer, J. I. 2004: Biodiversity. An Introduction. 2 nd ed, Blackwell. 191 p. Other literature agreed on with the responsible persons.
Assessment methods and criteria:
Practical work and exam.
Grading:
Work report: Accepted / Fail, exam: 1-5 / Fail.
Person responsible:
Dr. Laura Kvist, Prof. Timo Muotka, Prof. Markku Orell and Dr. Pirkko Siikamäki.
Other information:
The course will take place if sufficient resources are available.

750363A: Biogeography, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari-Heikki Oksanen, Kvist, Laura Irmeli

Opintokohteen oppimateriaali:

Eurola, Seppo , , 1999
Cox, C. Barry , , 2005

Opintokohteen kielet: Finnish

Leikkaavuudet:

750373A Biogeography 5.0 op

ECTS Credits:
6 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 2 nd autumn and spring.
Learning outcomes:
The course introduces students to basic concepts of biogeography, patterns of distribution and historical and present factors affecting the distribution. Plant biogeography introduces students to modern and historical factors controlling the plant cover, and to the special methods of vegetation science.
Contents:
The course consists of general part and optional part on plant biogeography and vegetation science. The general part introduces basic models and theories of distribution of organisms in the environment. Historical, evolutionary, geographical, climatic and ecological explanations. Research methods used in biogeography. The part on plant biogeography and vegetation science introduces methods on factors controlling the structure and composition of vegetation, and describes major vegetation types in Finland and principal biomes in the World. Methods of vegetation science are briefly surveyed.
Learning activities and teaching methods:
24 h (z) + 40 h (b) = 64 h lectures, two final exams.
Target group:
Compulsory ECO, optional to BT1.
Recommended or required reading:
Cox, C. B. & Moore, P. D. 2005: Biogeography (7th ed.). Blackwell Science, Cambridge University Press. Eurola, S. 1999: Kasvipeitteemme alueellisuus. Oulanka Reports. Oulu 116 p., Cox, C. B. & Moore, P. D. 2000: Biogeography* (6 th ed.). Blackwell Science, Cambridge University Press. 298 p.
Assessment methods and criteria:
Two final exams.
Grading:
1-5 / Fail. Weighting: 1/3 animal biogeography exam and 2/3 plant biogeography exam.
Person responsible:
Dr. Laura Kvist and Prof. Jari Oksanen.

753629S: Bioinformatics, 4 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Savolainen Outi
Opintokohteen kielet: Finnish
Leikkaavuudet:

757619S Advanced course in bioinformatics 5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish / (English).
Timing:
M.Sc. 1 st spring.
Learning outcomes:
The aim of the course is that students learn to handle independently sequence and genome data methods in genetic perspective.
Contents:
Bioinformatics methods in genome analyses, research methods for sequence evolution, new sequence data analysing methods. Course is connected with the course 753622S.
Learning activities and teaching methods:
24 h lectures, 12 h seminars, 60 h independent studying, final exam or learning diary.
Target group:
BTg, preferably in same semester as course 753622S
Recommended optional programme components:
753327A and 750340A or equivalent knowledge. Prerequisite for course 753622S.
Assessment methods and criteria:
Final exam or learning diary.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen.

752662S: Botanical collection, 2 - 6 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Hämet-Ahti, L., Suominen, J., Ulvinen, T. & Uotila, P., , 1998
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 cr, 100 species = 2 cr.
Timing:
B.Sc. or M.Sc. degree.
Learning outcomes:
Preparation (including labels) and identification of self-collected botanical specimens.
Contents:
The collection may contain solely vascular plants or together with moss and lichen specimens, for instance.

Learning activities and teaching methods:
Vascular plants have to be pressed and dried. The samples have to be in folded paper or small box including the name and place tag. Before starting the collection work student has to consult the teacher. 100 plant species correspond to 2 credits.
Recommended optional programme components:
752303A or equivalent knowledge.
Recommended or required reading:
Hämet-Ahti et al. 1998: Retkeilykasvio (Field Flora of Finland), Ed. 4. Finnish Museum of Natural History, Helsinki. 656 pp., and other field floras.
Assessment methods and criteria:
Botanical collection is reviewed by teacher before acceptance.
Grading:
Pass / Fail.
Person responsible:
Kasvimuseo.

752362A: Botanical collection, 2 - 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Halonen, Pekka Ensio

Opintokohteen oppimateriaali:
Hämet-Ahti, L., Suominen, J., Ulvinen, T. & Uotila, P., , 1998
Opintokohteen kielet: Finnish

ECTS Credits:
2-6 cr., 100 species = 2 cr.
Timing:
B.Sc. or M.Sc. degree.
Learning outcomes:
Preparation (including labels) and identification of self-collected botanical specimens.
Contents:
The collection may contain solely vascular plants or together with moss and lichen specimens, for instance.
Learning activities and teaching methods:
Vascular plants have to be pressed and dried. The samples have to be in folded paper or small box including the name and place tag. Before starting the collection work student has to consult the teacher. 100 plant species correspond to 2 credits.
Recommended optional programme components:
752303A or equivalent knowledge.
Recommended or required reading:
Hämet-Ahti et al. 1998: Retkeilykasvio (Field Flora of Finland), Ed. 4. Finnish Museum of Natural History, Helsinki. 656 pp., and other field floras.
Assessment methods and criteria:
Botanical collection is reviewed by teacher before acceptance.
Grading:
Pass / Fail.
Person responsible:
Dr. Pekka Halonen.

750121P: Cell biology, 5 op

Voimassaolo: - 31.07.2020

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Saarela, Seppo Yrjö Olavi

Opintokohteen oppimateriaali:

Heino, Jyrki (2) , , 2004
Alberts, B. ym., , 2008
Lodish et al., , 2003

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 1 st autumn.
Learning outcomes:
The student is familiar with cellular structure and functioning in plant and animal cells, understands the social structures in multicellular species and knows why and how the genetic organizations (in nucleus, chloroplast and mitochondria) are co-operating, maintaining and regulating the cellular metabolism.Student understands the common origin and evolution of life on planet Earth, and understands the material basis and mechanisms of this continuity.
Contents:
During the recent years especially the development of molecular and microscopic and imaging techniques has increased our knowledge on cells and their social interactions. The structural and functional characteristics of plant and animal cells will be covered as well as the genetic organization maintaining and regulating the system.
Learning activities and teaching methods:
72 h lectures, three final exams (zoology, botany, genetics). Home essays and internet material.
Target group:
Compulsory to the biology and biochemistry students.
Recommended optional programme components:
Cell biology is prerequisite for the following courses: 751367A, 751388A, 752345A, 753124P. Course gives readiness for studies in molecular biology and biochemistry.
Recommended or required reading:
Alberts, B. etc. 2008: Molecular Biology of the Cell (5 th ed.). Garland Science Publishing, London, 1268 s. ISBN: 0815341067. (Lodish et al. 2004: Molecular Cell Biology (5 th ed.). Freeman, New York, 973 s.). Heino J. & Vuento M. 2004: Solubiologia (2. painos), WSOY, Porvoo 306 s. http://cc.oulu.fi/~ssaarela/; http://www.oulu.fi /genet/cellbiology/
Assessment methods and criteria:
Three final exams.
Grading:
1-5 / Fail. Final grade is average value of the three final exams.
Person responsible:
Prof. Seppo Saarela, Prof. Hely Häggman and Prof. Jaakko Lumme.

755310A: Community ecology, 3 - 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen oppimateriaali:

Morin, Peter J. , , 1999

Opintokohteen kielet: Finnish

Leikkaavuudet:

755630S	Community ecology	5.0 op

ECTS Credits:
3-4 cr.
Language of instruction:

Finnish.
Timing:
B. Sc. 3 rd or M.Sc. 1 st spring, odd years.
Learning outcomes:
Students are introduced to essential concepts of modern community ecology. Course gives ability to understand ecological community research.
Contents:
Effects of biotic (e.g. interspecific competition, predation) and abiotic (e.g. environmental disturbances) factors on the structure of communities, temporal and spatial variation of community structure and species richness at different scales, detection of human impacts on biotic communities, macroecological phenomena.
Learning activities and teaching methods:
26 h lectures, computer demonstrations, seminar.
Target group:
ECOa: compulsory 3 cr.
Recommended or required reading:
Handouts and book Morin, P. J. (1999): Community Ecology. Blackwell, 424 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Timo Muotka.

755610S: Community ecology, 3 - 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen oppimateriaali:
Morin, Peter J. , , 1999

Opintokohteen kielet: Finnish

Leikkaavuudet:

755630S	Community ecology	5.0 op

ECTS Credits:
3-4 cr.
Language of instruction:
Finnish.
Timing:
B. Sc. 3 rd or M.Sc. 1 st spring, odd years.
Learning outcomes:
Students are introduced to essential concepts of modern community ecology. Course gives ability to understand ecological community research.
Contents:
Effects of biotic (e.g. interspecific competition, predation) and abiotic (e.g. environmental disturbances) factors on the structure of communities, temporal and spatial variation of community structure and species richness at different scales, detection of human impacts on biotic communities, macroecological phenomena.
Learning activities and teaching methods:
26 h lectures, computer demonstrations, seminar.
Target group:
Optional to ECO in the B. Sc. degree and compulsory to ECOz in the M.Sc. degree.
Recommended or required reading:
Handouts and book Morin, P. J. (1999): Community Ecology. Blackwell, 424 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.

Person responsible:
Prof. Timo Muotka.

751384A: Comparative animal physiology, 8 op

Voimassaolo: - 31.07.2017
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Satu Mänttäri
Opintokohteen oppimateriaali:
Willmer, Pat , , 2000
Opintokohteen kielet: Finnish

ECTS Credits:
8 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1 st spring.
Learning outcomes:
After completing the course the student is able to form a general view of the similarities and differences in vital physiological functions between different animal species. The understanding of the regulation mechanisms of these physiological functions will be expanded by practical experiments conducted with several different animal species.
Contents:
Comparative animal physiology will be studied through the central physiological themes (nervous system, muscles, metabolism, thermoregulation, reproduction, circulation). The lectures consist of an introductory lecture on the given subject, and seminars. Physiological, cell physiological, neurophysiological, and histochemical methods are used in practical works related to the above mentioned themes. In the experiments invertebrate animals, frog, birds and mammals, including human being, will be used.
Learning activities and teaching methods:
32 h lectures, 128 h laboratory work, final exam.
Target group:
B.Sc. degree optional to BS or M.Sc. degree compulsory to BSz.
Recommended optional programme components:
750121P and 751388A or equivalent knowledge. Prerequisite for the course 751635S.
Recommended or required reading:
Course handout.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Satu Mänttäri.

751684S: Comparative animal physiology, 8 op

Voimassaolo: - 31.07.2017
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Satu Mänttäri
Opintokohteen oppimateriaali:
Willmer, Pat , , 2000

Opintokohteen kielet: Finnish

ECTS Credits:
8 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1 st spring.
Learning outcomes:
After completing the course the student is able to form a general view of the similarities and differences in vital physiological functions between different animal species. The understanding of the regulation mechanisms of these physiological functions will be expanded by practical experiments conducted with several different animal species.
Contents:
Comparative animal physiology will be studied through the central physiological themes (nervous system, muscles, metabolism, thermoregulation, reproduction, circulation). The lectures consist of an introductory lecture on the given subject, and seminars. Physiological, cell physiological, neurophysiological, and histochemical methods are used in practical works related to the above mentioned themes. In the experiments invertebrate animals, frog, birds and mammals, including human being, will be used.
Learning activities and teaching methods:
32 h lectures, 128 h laboratory work, final exam.
Target group:
B.Sc. degree optional to BS or M.Sc. degree compulsory to BSz.
Recommended optional programme components:
750121P and 751388A or equivalent knowledge. Prerequisite for the course 751635S.
Recommended or required reading:
Course handout.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Satu Mänttäri.

751657S: Comparative endocrinology, 3 op

Voimassaolo: - 31.07.2012

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Esa Juhani

Opintokohteen oppimateriaali:
Hadley, Mac E. , , 2000
Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1st spring.
Learning outcomes:
Student understands transmittance of hormonal effects, knows most important endocrine glands, hormones, chemical structure of hormones and structural evolution, knows most important effects of hormones and is able to describe the hormonal regulation of vital functions.
Contents:
Structure, function and regulation of the endocrine glands in vertebrates. See http://cc.oulu.fi/~ehohtola/ve.
Learning activities and teaching methods:
24 h lectures, essays, final exam.

Target group:
BS, ECO and TEA: optional. Arranged every second year with the course 755x11A/S if resources allow.
Recommended or required reading:
Hadley M. E. 2000: Endocrinology, 5th edition. Prentice Hall, 585 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Esa Hohtola.
Other information:
The course will take place every other year if sufficient resources are available.

751357A: Comparative endokrinology, 3 op

Voimassaolo: - 31.07.2012

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Esa Juhani

Opintokohteen oppimateriaali:
Hadley, Mac E. , , 2000
Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1st spring.
Learning outcomes:
Student understands transmittance of hormonal effects, knows most important endocrine glands, hormones, chemical structure of hormones and structural evolution, knows most important effects of hormones and is able to describe the hormonal regulation of vital functions.
Contents:
Structure, function and regulation of the endocrine glands in vertebrates. See http://cc.oulu.fi/~ehohtola/ve.
Learning activities and teaching methods:
24 h lectures, essays, final exam.
Recommended or required reading:
Hadley M. E. 2000: Endocrinology, 5th edition. Prentice Hall, 585 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Esa Hohtola.
Other information:
The course will take place every other year if sufficient resources are available.

753124P: Concepts of genetics, 4 - 7 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumme, Jaakko Ilmari

Opintokohteen oppimateriaali:
Alberts, B. ym., , 2008
Opintokohteen kielet: Finnish
Leikkaavuudet:

757109P Concepts of genetics 5.0 op

ECTS Credits:
4-7 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 1 st spring. Biology students: compulsory, Biochemistry students: parts 1 and 3 4 cr. compulsory, biophysics students.
Learning outcomes:
To understand and remember the genetic basis of life and evolution, on Mendelian and molecular level .
Contents:
Part 1. Mendelian genetics, including the ideas of quantitative and population genetics. Part 2. Molecular genetics: replication, transcription, translation, genetic code, mutations, repair of DNA. Part 3. Selected topics on developmental genetics, genetics of health and threats: viruses and diseases.
Learning activities and teaching methods:
Lectures, homework, the book.
Target group:
Biology students: compulsory (7 cr). Biochemistry students: compulsory parts 1 and 3 (4cr).
Recommended optional programme components:
Course 750121P or equivalent knowledge. This course is prerequisite to all other genetics courses.
Recommended or required reading:
Alberts et al. (2008, fifth edition) Molecular Biology of the Cell. Web page (in Finnish) http://www.oulu.fi/genet/perusteet/
Assessment methods and criteria:
Homeworks, participation, exams.
Grading:
1-5 / Fail.
Person responsible:
Prof. Jaakko Lumme.

752321A: Conservation of Biodiversity, 3 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari-Heikki Oksanen
Opintokohteen oppimateriaali:
Kuuluvainen, T., , 2004
Walls, M. & Rönkä, M., , 2004
Tiainen et al., , 2004
Opintokohteen kielet: Finnish
Leikkaavuudet:

756347A Conservation of biodiversity 5.0 op
ay752321A Conservation of Biodiversity (OPEN UNI) 3.0 op

ECTS Credits:
3 cr.
Language of instruction:
English.
Timing:
B.Sc. 3 rd autumn. NNE.

Learning outcomes:
Students know the central concepts of biodiversity, threads to biodiversity, and methods of conservation of biodiversity.
Contents:
Biodiversity and its components. Major theories of the ecological control of biodiversity. Habitat fragmentation and habitat destruction and their consequences. Metapopulation theory and networks of nature reserves. Current issues in the conservation of biodiversity.

Learning activities and teaching methods:
14 h lectures, literature, final exam.
Recommended or required reading:
Hanski I. 2005: The Shrinking World. International Ecology Institute, Oldendorf/Luhe, Germany.
Assessment methods and criteria:
Exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Jari Oksanen.

750619S: Course in microscopic techniques, 4 op

Voimassaolo: - 31.07.2014

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Anja Terttu Marjatta

Opintokohteen oppimateriaali:
Lounatmaa, K., , 1991
Rantala & Lounatmaa, , 1998
Dashek, , 2000
Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish.
Timing:
M.Sc. 1 st autumn.
Learning outcomes:
Special course gives skills for using methods, which can be utilized when examining structures of animals and plants, their development, the interaction between structure and function or localizing chemical and molecular phenomena in cells.
Contents:
Yearly variable lectures include the use of different types of microscopes and peripheral equipment, main types of preparations, preparation phases of the most common biological samples and a short survey of analytic and immuno-electron microscopy, confocal microscopy, cryotechniques and image analysis. Exercises include for example basic methods of cytogenetics, preparation of conventional light microscope and electron microscope (SEM and TEM) preparates for different purposes.
Learning activities and teaching methods:
24 h lectures, demonstrations, laboratory work, final exam. Lectures and exercises total 4 cr.
Target group:
Suitable for BS and ecophysiology students.
Recommended optional programme components:
Methods and skills learned in this course make good use in many fields.
Recommended or required reading:
Handouts, lecture material and literature are given at the start of the course.
Assessment methods and criteria:
Final exam.
Grading:

1-5 / Fail.
Person responsible:
Prof. Anja Hohtola.
Other information:
The course will take place if sufficient resources are available .

753631S: DNA analysis in population genetics, exercises, 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kuittinen, Helmi Helena

Opintokohteen kielet: Finnish

Leikkaavuudet:

757618S DNA analysis in population genetics 10.0 op

ECTS Credits:
6 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st spring.
Learning outcomes:
After the course the student can analyze nuclear and mitochondrial sequence and marker variation with population genetic methods using computer programs. The student can describe the amount of variation and linkage disequilibrium and recognize features in the data that may be a result of reproductive system, selection, population size changes or population structure. The student can test the null hypotheses with relevant tests and coalescent simulations.
Contents:
Methods and computer programs used for analyzing sequence and genotype data. Work is done mainly in the computer classroom.
Learning activities and teaching methods:
Exercise reports.
Target group:
BSg: compulsory.
Recommended optional programme components:
753616S.
Assessment methods and criteria:
Reports.
Grading:
1-5 / Fail.
Person responsible:
Dr. Helmi Kuittinen.

753616S: DNA analysis in population genetics, lectures, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: Finnish

Leikkaavuudet:

757618S DNA analysis in population genetics 10.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish.
Timing:
M.Sc. 1 st spring.
Learning outcomes:
Students will be familiar with advanced theory of population genetics of DNA sequence and markers, and with methods of analysis based on this theory.
Contents:
Basic coalescent theory, most important analysis methods, examining population structure.
Learning activities and teaching methods:
24 h lectures, seminars and exercises, independent work 60 h, exam.
Target group:
BSg: compulsory.
Recommended optional programme components:
Prerequisites: 753x14A/S, gives a theoretical basis for 753631S.
Assessment methods and criteria:
Exam.
Grading:
1-5 / Failed.
Person responsible:
Prof. Outi Savolainen.

751367A: Developmental biology-histology, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Esa Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

755320A Developmental biology-histology 5.0 op

ECTS Credits:
5-9 cr. (lectures + exams = 5 cr, lectures + exercises + exam = 9 cr.)
Language of instruction:
Finnish.
Timing:
B.Sc. 2 nd spring.
Learning outcomes:
After completing the developmental biology -part of the course the student is able to name the most important events of embryonic development and the structural changes related to them. The student is also able to describe the principles gene regulation related to embryonic development. After completing the histology-part of the course the student is able to describe the various tissue types and the microscopic structure of important organs and is also able to identify tissue types and organs from microscopic sections.
Contents:
Motto: *"It is not birth, marriage, or death, but gastrulation, which is truly the most important time in your life." Lewis Wolpert (1986).*
Developmental biology will cover gametogenesis, fertilization, forming of embryonic tissue layers (gastrulation), embryonic induction, signal molecules and the differentiation of the most important tissues and organs (organogenesis). Histology will first cover various tissue types, their cell types and matrix composition. Thereafter, the microscopic structure and tissue composition of various organs and organ systems will be covered. In both parts, drawing from microscopic slides will support lectures.
Learning activities and teaching methods:
38 h lectures and 44 h exercises, microscopic studying and drawing from the preparates.
Target group:

Compulsory to TEAbs and BS 9 cr, optional for TEAeco.
Recommended optional programme components:
750121P or equivalent knowledge.
Recommended or required reading:
Lecture notes, lecture handouts, laboratory handouts.
Assessment methods and criteria:
Exams (2 exams of lectures, 1 exam of laboratory exercises).
Grading:
1-5 / Fail. Weighting: lecture exams 2/3, laboratory exams 1/3.
Person responsible:
Prof. Esa Hohtola (lectures), Prof. Seppo Saarela (laboratory exercises).

752672S: Distribution mapping of plants, 2 - 5 op

Voimassaolo: - 31.07.2019
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-5 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd summer or M.Sc. 1 st or 2 nd summer.
Learning outcomes:
Train oneself in floristic mapping skills.
Contents:
Floristic mapping of plants with special emphasis on endangered species. Participant should agree with the Botanical Museum in advance. Field work in the provinces of Oulu and Lapland, including sample collection, identification, preparation of herbarium specimens in consultation with the responsible teacher.
Learning activities and teaching methods:
Field work, sampling and preparation of the samples.
Recommended optional programme components:
752303A, 752304A and 752608S or equivalent knowledge.
Grading:
Pass / Fail.
Person responsible:
Botanical museum.

750347A: Ecological methods I, 6 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Koivula
Opintokohteen kielet: Finnish
Leikkaavuudet:

755325A	Methods in ecology I	5.0 op

ECTS Credits:
6 cr.

Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd autumn.
Learning outcomes:
Students are familiar to scientific method and can separate scientific information from other contents of culture. Students have learned to assess the uncertainty of information and can evaluate the quality of information with respect to its applied value. Students also learn the build a valid theoretical or empirical strategy to solve scientific problems.
Contents:
The aim of the course is to introduce the students in scientific modes of argumentation and research methods in modern ecology. Both the empirical and theoretical methods and their relationship in theory formation are discussed. Hypothesis testing; observational method, experimental method and comparative method are the empirical methods introduced. Autumn period ends in a seminar where scientific publications are analysed.
Learning activities and teaching methods:
Lectures, seminar, exercises, and final exam.
Target group:
Compulsory to ECO.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Kari Koivula, Dr. Seppo Rytkönen ja Prof. Juha Tuomi.

752394A: Economic Plants, 3 op

Voimassaolo: - 31.07.2012

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Huttunen, Satu

Opintokohteen oppimateriaali:

Rousi, Arne , , 1997
Rautavaara, T., , 2002
Wiersema, John H. , , 1999
Sauer, Jonathan D. , , 1993

Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 2 nd autumn.
Learning outcomes:
After doing this course student knows the history, geography and current use of the most important nutritional and other economic plants. Students can apply their knowledge to commercial and industrial plant products. Student knows the principals of the nomenclature of cultivated plants and is able to deepen the knowledge.
Contents:
There are almost 10 000 vascular plants with economic significance, including the most essential food plants: corns, tea, coffee, oil plants, sugar plants and fibre plants. Lectures contain origin, history, significance and the future of the economic plants and their meaning for the world economics. In lectures and exhibitions the most valuable economic plants, including cultivated plants, medicinal plants and herbs, are presented. Topics: The horticulture, park construction, landscaping, use of natural plants and development and research.
Learning activities and teaching methods:
14 h lectures, literature, exhibits, book exam, final exam.
Target group:
Recommended for all students in botany.

Recommended optional programme components:
Connected to course 756311A but can also be taken separately.
Recommended or required reading:
Rousi, A. 1997: Auringonkukasta viiniköynnökseen - ravintokasvit. WSOY, Porvoo. Helsinki. Juva, 390 s.; Rautavaara T.: Hyötykasvit värikuvina 208 s.; Wiersema J.H. & Leon, B. 1999: World Economic Plants. A Standard Reference. CRC Press, 749 s. Sauer J.D. 1994: Historical Geography of Crop Plants. A select Roster, CRC Press USA, 309 s.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen.

750631S: Ecosystem ecology, 3 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari-Heikki Oksanen

Opintokohteen oppimateriaali:
Chapin, F. Stuart III , , 2002
Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
Know the central theoretical constructs and results of ecosystems ecology, and be able to apply ecosystem ecology in the analysis of ecological and environmental questions.
Contents:
Most important ecological processes, such as cycles of water, coal and nutrients, and the flux of the energy. Ecological control processes, and the effect of environmental heterogeneity. The impacts of Humans in the ecosystem processes in global and local scales.
Learning activities and teaching methods:
24 h lectures, exam.
Target group:
Ecology students.
Recommended optional programme components:
Course 750124P or equivalent knowledge.
Recommended or required reading:
Chapin, F.S., Matson, P.A. & Mooney H. A. 2002: Principles of terrestrial ecosystem ecology. Springer Verlag.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Jari Oksanen.

752322A: Effects of Air Pollutants on Plants, 5 op

Voimassaolo: - 31.07.2011

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Huttunen, Satu

Opintokohteen oppimateriaali:

AMAP, , 2006

Bell, J.N.B. & Treshow, M., , 2002

Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd or M.Sc. 1 st autumn. Every second autumn (odd numbered years). NNE.
Learning outcomes:
After doing this course student understands the main sources of air pollutants and mechanisms of transport and transformation and recognizes ecological effects of plant responses in most important ecosystems and cultivated plants. Student can evaluate risks of air pollution and climate change and know the most important air quality monitoring and research methods.
Contents:
The lectures deal with sources, emissions, dispersal and transport of primary air pollutants, and conversion of secondary air pollutants, and the removal of air pollutants from the atmosphere. Air quality control, air protection measures and basic concepts, legislation and administration are included. Environmental impact of air pollutants and their ecological significance, the effects of different air pollutants on mosses, lichens and higher plants are studied. The course initiates into the mostly used air quality monitoring methods, bioindicator methods and diagnostics of plant damage caused by air pollutants. The course includes a small research work about the effects of air pollutants on plants.
Learning activities and teaching methods:
24 h lectures, 35 h exercises and seminars, final exam.
Recommended or required reading:
AMAP Assessment 2006: Acidifying Pollutants, Arctic Haze, and Acidification in the Arctic. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. XII + 112pp. Bell JNB & Trehow M (eds.) 2002. Air pollution and plant life. Wiley. 2nd edition. 480 pages. Course and lecture handouts.
Assessment methods and criteria:
Report and final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen.

752622S: Effects of air pollutants on plants, 5 op

Voimassaolo: - 31.07.2011

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:

Bell, J.N.B. & Treshow, M., , 2002

AMAP, , 2006

Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd or M.Sc. 1 st autumn. Every second autumn (odd numbered years). NNE.

Learning outcomes:
After doing this course student understands the main sources of air pollutants and mechanisms of transport and transformation and recognizes ecological effects of plant responses in most important ecosystems and cultivated plants. Student can evaluate risks of air pollution and climate change and know the most important air quality monitoring and research methods.
Contents:
The lectures deal with sources, emissions, dispersal and transport of primary air pollutants, and conversion of secondary air pollutants, and the removal of air pollutants from the atmosphere. Air quality control, air protection measures and basic concepts, legislation and administration are included. Environmental impact of air pollutants and their ecological significance, the effects of different air pollutants on mosses, lichens and higher plants are studied. The course initiates into the mostly used air quality monitoring methods, bioindicator methods and diagnostics of plant damage caused by air pollutants. The course includes a small research work about the effects of air pollutants on plants.
Learning activities and teaching methods:
24 h lectures, 35 h exercises and seminars, final exam.
Recommended or required reading:
AMAP Assessment 2006: Acidifying Pollutants, Arctic Haze, and Acidification in the Arctic. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. XII + 112pp. Bell JNB & Trehow M (eds.) 2002. Air pollution and plant life. Wiley. 2nd edition. 480 pages. Course and lecture handouts.
Assessment methods and criteria:
Report and final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen.

752175P: Environmental ecology, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Huttunen, Satu

Opintokohteen oppimateriaali:
Jarvis, Peter J. , , 2000
Chiras, Daniel D , , 2001

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay752175P	Environmental ecology (OPEN UNI)	5.0 op

ECTS Credits:
5 cr.
Language of instruction:
Finnish.
Timing:
Spring.
Learning outcomes:
After finishing the course student understands the ecological background of most important environmental questions and has knowledge to apply this to decision making in environmental problems.
Contents:
Ecological basics of nature conservation. Effects of physical and chemical environment on living organisms, basics of population ecology, communities and ecosystems. Environmental changes and how species can adapt to them. World wide environmental problems and actions to solve them are studied within the course. Special environmental questions in Finland and in Europe.
Learning activities and teaching methods:
28 h lectures, 18 h exercises (seminars), final exam.
Recommended or required reading:
Jarvis, P. J. 2000: Ecological Principles and Environmental Issues. Prentice Hall. 303 p.; Chiras, D.D. 2001: Environmental Science 6 th edition. Jones and Bartlett Publishers 730p.
Assessment methods and criteria:

Report and final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen.
Other information:
The course will take place if sufficient resources are available.

750626S: Environmental impact assessment (EIA) and ecological inventory of natural resources, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Huttunen, Satu

Opintokohteen kielet: Finnish

ECTS Credits:
7 cr.
Language of instruction:
Finnish.
Timing:
M.Sc. degree.
Learning outcomes:
After finishing the course student get acquainted to inventory approaches of natural ecosystems and is able to apply knowledge to environmental impact assessments. Student has skills to fulfil environmental impact assessments based on different types of case studies. Additionally, student knows the legal procedure to act as responsible person for EIA.
Contents:
The course gives an overview of Environmental Impact Assessment (EIA) and its tasks according to the present legislation of the European Community. The course includes general part and 2-6 special parts which student has to attend minimum two parts (total 3-7 parts). Part 1. Introduction to EIA 25 h lectures (ecology, GIS, hydrology and socioeconomy, quality assessment). Part 2.-6. 12-14 h lectures each. E.g. hydrology, water quality, ecology, ecological inventorying of nature, economy, sociology, GIS. Course includes obligatory exercise work.
Learning activities and teaching methods:
Course is executed in cooperation with other university departments, basic module and advanced modules.
Recommended or required reading:
Modak, P. & Biswas, A.K. 1999. Conducting environmental impact assessment for developing countries. UN University Press 364p.
Person responsible:
Prof. Satu Huttunen and Prof. Bjørn Kløve.
Other information:
The course will take place if sufficient resources are available.

755609S: Evolution of life histories, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Orell, Markku Ilmari, Kari Koivula

Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:

Finnish.
Timing:
M.Sc. 1 st or 2 nd autumn.
Learning outcomes:
After completing the course the student knows the basic concepts of the classical life history theory, is familiar with major analytical tools and their applications.
Contents:
The course initiates into the processes of evolution of life histories. Important subject is the allocation of resources: weather the organism allocates on its surviving or on production of offspring. Demographic factors of populations are also handled as well as factors affecting individuals' capacity. Evolutionary explanations for differing reproduction strategies in different environments are introduced.
Learning activities and teaching methods:
48 h lectures, exercises, final exam.
Assessment methods and criteria:
Final exam.
Person responsible:
Prof. Markku Orell and Dr. Kari Koivula.
Other information:
The course will take place if sufficient resources are available.

750336A: Evolutionary ecology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kaitala Arja

Opintokohteen oppimateriaali:

Björklund, Mats, , 2009

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Language of instruction:
Finnish / (English).
Timing:
B.Sc. degree 2 nd autumn.
Learning outcomes:
To understand main principles of evolution and the concepts of natural selection, fitness and adaptation. Learn basics of life-history adaptation, speciation processes and social evolution.
Contents:
The aim of the course is to introduce a student with lectures and seminars to the main topics of evolutionary ecology, for example basic concepts of natural selection and evolution, selection level, speciation, evolution of life cycles, interactions between and within species are included. Review to the latest research results.
Learning activities and teaching methods:
36 h lectures and compulsory seminars, final exam.
Target group:
Compulsory to ECO, optional to BT1.
Recommended or required reading:
Additional reading: Björklund, Mats 2009 Evoluutiobiologia. Gaudeamus, Sterans, S. and Hoekstra, R. F. 2005: Evolution, An Introduction. Oxford University Press, New York, 575 p.
Assessment methods and criteria:
Seminar and final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Arja Kaitala.

752352A: Examination in optional topics, 2 - 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:

Körner, Christian , , 2003

Opintokohteen kielet: Finnish

Leikkaavuudet:

750349A Examinations on optional topics in biology 2.0 op

ay752352A Examination in optional topics (OPEN UNI) 2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 cr.
Timing:
B.Sc. 2 nd - 3 rd or M.Sc. 1 st -2 nd year.
Contents:
Examinations on books, which are not compulsory in any other course unit.
Learning activities and teaching methods:
Book exam.
Recommended or required reading:
BT: Literature chosen in agreement with the responsible person. ECO: Literature chosen in agreement with the responsible person. For example Körner 1999: Alpine Plant Life, Functional Plant Ecology of High Mountain Ecosystems. Springer-Verlag (2 op) ja Pohjoinen luontomme http://www.oulu.fi/northnature/Northnature.html (2 cr.)
Assessment methods and criteria:
Book exam in biology public exam day.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen or prof. Hely Häggman.

751654S: Examination on optional topics, 2 - 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750649S Examinations on optional topics in biology 2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2 nd - 3 rd or M.Sc. 1 st -2 nd year.
Contents:
Examinations on books, which are not compulsory in any other course unit.
Learning activities and teaching methods:
Book exam.
Recommended or required reading:

Literature chosen in agreement with the responsible person.
Assessment methods and criteria:
Book exam in biology public exam day.
Grading:
1-5 / Fail.
Person responsible:
Prof. Esa Hohtola or Prof. Markku Orell.

752652S: Examinations on optional topics, 2 - 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:

Körner, Christian , , 2003

Opintokohteen kielet: Finnish

Leikkaavuudet:

750649S Examinations on optional topics in biology 2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 cr.
Timing:
B.Sc. 2 nd - 3 rd or M.Sc. 1 st -2 nd year.
Contents:
Examinations on books, which are not compulsory in any other course unit.
Learning activities and teaching methods:
Book exam.
Recommended or required reading:
BT: Literature chosen in agreement with the responsible person.
ECO: Literature chosen in agreement with the responsible person. For example Körner 1999: Alpine Plant Life, Functional Plant Ecology of High Mountain Ecosystems. Springer-Verlag (2 op) ja Pohjoinen luontomme http://www.oulu.fi/northnature/Northnature.html (2 cr.)
Assessment methods and criteria:
Book exam in biology public exam day.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen or prof. Hely Häggman.

751354A: Examinations on optional topics, 2 - 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750349A Examinations on optional topics in biology 2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

2-6 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2 nd - 3 rd or M.Sc. 1 st -2 nd year.
Contents:
Examinations on books, which are not compulsory in any other course unit.
Learning activities and teaching methods:
Book exam.
Recommended or required reading:
Literature chosen in agreement with the responsible person.
Assessment methods and criteria:
Book exam in biology public exam day.
Grading:
1-5 / Fail.
Person responsible:
Prof. Esa Hohtola or Prof. Markku Orell.

753651S: Examinations on optional topics, 2 - 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: Finnish

Leikkaavuudet:

750649S Examinations on optional topics in biology 2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 cr.
Timing:
M.Sc. 1st -2nd year.
Contents:
Examinations on books, which are not compulsory in any other course unit.
Learning activities and teaching methods:
Book exam in biology public exam day.
Recommended or required reading:
Literature chosen in agreement with the responsible person.
Assessment methods and criteria:
Book exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen.

753351A: Examinations on optional topics, 2 - 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: Finnish

Leikkaavuudet:

750349A Examinations on optional topics in biology 2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 cr.
Language of instruction:
English.
Timing:
B.Sc. 2nd - 3rd or M.Sc. 1st -2nd year.
Contents:
Examinations on books, which are not compulsory in any other course unit.
Learning activities and teaching methods:
Book exam.
Recommended or required reading:
Literature chosen in agreement with the responsible person.
Assessment methods and criteria:
Book exam in biology public exam day.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen.

752605S: Excursion to Southern Finland or Abroad, 4 - 7 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari-Heikki Oksanen

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
4-7 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. or M.Sc.
Learning outcomes:
Learn to know some features of flora, vegetation and natural conditions outside the Oulu region.
Contents:
Field excursion.
Learning activities and teaching methods:
Demonstrations, field exercises, final exam.
Recommended optional programme components:
752303A and 752304A or equivalent knowledge.
Grading:
Pass / Fail.
Person responsible:
Prof. Jari Oksanen.
Other information:
The course will take place if sufficient resources are available.

752305A: Excursion to Southern Finland or Abroad, 4 - 7 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari-Heikki Oksanen
Opintokohteen kielet: Finnish

ECTS Credits:
4-7 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. or M.Sc.
Learning outcomes:
Learn to know some features of flora, vegetation and natural conditions outside the Oulu region.
Contents:
Field excursion.
Learning activities and teaching methods:
Demonstrations, field exercises, final exam.
Recommended optional programme components:
752303A and 752304A or equivalent knowledge.
Grading:
Pass / Fail.
Person responsible:
Prof. Jari Oksanen.
Other information:
The course will take place if sufficient resources are available.

750639S: Excursion to the Subarctic area, 4 op

Voimassaolo: - 31.07.2011
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Taulavuori
Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. or M.Sc. degree.
Learning outcomes:
Student learns special features of the northern areas and natural resources. Ecological and environmental problems and pollution in the northernmost parts of Fennoscandia. Students get acquainted to activities in different countries' research stations.
Contents:
Arctic ecology excursion and seminar.
Learning activities and teaching methods:
Excursion and seminar.
Target group:
Ecology students.
Grading:
Pass / Fail.
Person responsible:
Dr. Kari Taulavuori.
Other information:

The course will take place if sufficient resources are available.

753104P: Experimental course in general genetics, 6 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

757110P Experimental course in general genetics 5.0 op

ECTS Credits:
8 cr.
Language of instruction:
Finnish.
Timing:
B. Sc degree, 1 st spring.
Learning outcomes:
After passing the course students have elementary knowledge of basic phenomena of genetics, important working methods and laboratory organisms. Student has the basic ability to understand, apply and analyse simple genetical works and phenomena.
Contents:
To investigate Mendelian inheritance, gene mapping and additive? effects of genes using cross-breeding, basics of population genetics, to investigate regulation of promoter and recombination using microbial genetic methods, to investigate mitosis and meiosis using cytogenetical methods and studying basic methods of DNA techniques: isolating DNA, digesting DNA using restriction enzymes, PCR, electrophoresis and cloning.
Learning activities and teaching methods:
100 h exercises (demonstrations included), independent working, exam.
Target group:
Compulsory to the TEAbs, BS and EKO1, optional to TEAeko. Fits well for all biologists and also for others like for example biochemists.
Recommended optional programme components:
753124P or equivalent knowledge. Course is prerequisite to all the following genetics courses.
Recommended or required reading:
Course handout and web pages http://www.oulu.fi/genet/
Assessment methods and criteria:
Report, final exam.
Grading:
1-5 / Fail.
Person responsible:
N.N.

753622S: Experimental course in molecular evolution, 4 op

Voimassaolo: - 31.07.2012
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kuittinen, Helmi Helena
Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:

Finnish / English.
Timing:
M.Sc. 1st spring.
Learning outcomes:
After the course the student is able to analyze DNA sequence differences between species in practice, applying knowledge obtained in earlier studies in bioinformatics and molecular evolution. The student knows how to get information from public sequence data bases, characterize sequences, estimate nucleotide substitutions, align sequences, build phylogenetic trees and estimate their confidence. The student is able to make a hypothesis relating to molecular evolution and test it using sequence data.
Contents:
Sequence data bases, methods and computer programs for handling and analysing sequences obtained from data bases. Scientific literature. Work is done mainly in the computer classroom.
Learning activities and teaching methods:
48 h exercises including demonstrations and seminar, independent work including reports.
Target group:
Compulsory to BSg students.
Recommended optional programme components:
753629S and 753327A or equivalent knowledge.
Assessment methods and criteria:
Reports, independent work.
Grading:
1-5 / Fail.
Person responsible:
Dr. Helmi Kuittinen.

751307A: Field course in aquatic animals, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

755321A	Aquatic ecology field course	5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 1 st summer.
Learning outcomes:
To learn basic methods in identifying and sampling of freshwater animals.
Contents:
Identification of the most important freshwater fishes and invertebrates. Demonstrations of the most frequently-used sampling methods.
Learning activities and teaching methods:
Summer: 6 h lectures in Oulu and 70 h of field work and demonstrations in Oulanka research station.
Target group:
Compulsory (4 cr) to ECO and TEAeco, alternatively compulsory to TEAbs (at least 6 cr compulsory, two field courses, one animal and other botany field course).
Recommended optional programme components:
751373A or equivalent knowledge (if necessary, selection to the course 751307A can be based on success in course 751373A).
Recommended or required reading:
Handouts and lectures given during the course.
Assessment methods and criteria:
Species identification, practical and theoretical exam on the final course day.

Grading:
1-5 / Fail.
Person responsible:
Prof. Timo Muotka.

752642S: Field course in arctic-alpine ecology and vegetation, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Virtanen, Risto Juhani
Opintokohteen oppimateriaali:
Eurola, Seppo , , 1999
Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish.
Timing:
Every second year at the Kilpisjärvi biological station.
Learning outcomes:
By passing this course a student is able to identify plant and animal species, nature types, vegetation of NW Fennoscandian mountain areas, understand ecology of northern ecosystems, ecological interactions and adaptation. Advanced training in experimental and observational field research.
Contents:
Arctic-alpine ecosystems as one the main biomes of the world. Plant and animal species of arctic-alpine areas. Vegetation and ecology of NW Fennoscandian mountain areas. Plant-herbivore interactions in tundra ecosystems.
Learning activities and teaching methods:
Field course.
Target group:
Students of ecology, B.Sc. 2nd, 3rd autumn or M.Sc. 1st, 2nd autumn.
Recommended optional programme components:
752304A or equivalent knowledge.
Recommended or required reading:
Disseminated during course, internet resources. Literature on arctic-alpine ecosystems.
Assessment methods and criteria:
Field course, field exercise. Planning of the study, field work and analyzing data. Making a report with reference to scientific literature. Oral presentation of the study (Power Point).
Grading:
Pass / Fail.
Person responsible:
Dr. Risto Virtanen.
Other information:
Arranged with cooperation of the University of Joensuu. The course will take place if sufficient resources are available.

752304A: Field course in ecological botany, 5 - 6 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Annamari Markkola
Opintokohteen oppimateriaali:
Eurola, Seppo , , 1994

Eurola, Seppo , , 1992
Hämet-Ahti, L., Suominen, J., Ulvinen, T. & Uotila, P., , 1998
Opintokohteen kielet: Finnish
Leikkaavuudet:

756343A Plant ecology field course 5.0 op

ECTS Credits:
4-8 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 1 st summer. NNE.
Learning outcomes:
Student is able to identify most common boreal plant species in the field, to plan and conduct ecological field experiments and use basic methods in vegetation analyses.
Contents:
Primary vegetation succession in the coast of Bothnian Bay (4 op) and basics of boreal forest and mire vegetation classification and types at Oulanka Research Station (4 op).
Learning activities and teaching methods:
Lectures 16 h (6 h in Oulu), field demonstrations and excursions 110 h. Field exams for plant identification and mire ecology. Seminars, reports.
Target group:
Compulsory (8 cr) to ECO and TEAeco, alternatively compulsory to TEAbs (at least 6 cr compulsory, two field courses, one animal and other botany field course).
Recommended optional programme components:
752303A 3.5 cr or equivalent knowledge. This course is a prerequisite for courses 752300A, 752692S and 752642S.
Recommended or required reading:
Handout: Hanhela, P. & Halonen, P. 1995: Kasvien peruslajintuntemus; Huttunen, A: 1995: Johdatus metsä- ja suotyyppeihin: Kangas- ja lehtometsät; Eurola, S., Huttunen, A. & Kukko-oja, K. 1995: Suokasvillisuusopas. Oulanka Reports 14. 85 p.; Eurola, S., et al. 1992: Suokasviopas. Oulanka Reports 11. 205 p.; Hämet- Ahti, et al. 1998 (or previous edition): Retkeilykasvio. Luonnontieteellinen keskusmuseo, Helsinki. 656 p.; Eurola, S., Hicks, S. and Kaakinen, H. 1994: Key to Finnish mire types, pp. 12-117 in: Moore, P. D. (ed.), 1994 European mires, London Academic Press, London, 367 p.,
Assessment methods and criteria:
Reports, field exams.
Grading:
1-5 / Fail.
Person responsible:
Dr. Annamari Markkola.

751306A: Field course in terrestrial animals, 4 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Rytkönen
Opintokohteen oppimateriaali:
Chinery, Michael , , 1988
Opintokohteen kielet: Finnish
Leikkaavuudet:

755322A Terrestrial animals field course 5.0 op

ECTS Credits:
2-6,5 cr.
Language of instruction:
Finnish / English.

Timing:
B.Sc. - 1 st summer. NNE.
Learning outcomes:
The aim of the course is to learn the basics of field identification and ecology of terrestrial animals in northern Finland. The student will understand that proper skills in species identification and knowledge of species' ecology are the basis of ecological research.
Contents:
The fauna in different kinds of terrestrial habitats is studied using several ecological sampling and research methods. The spring part of the course (4 days, in Oulu) deals with identification and counting methods of birds. The second part (10 days, at the Oulanka Research Station, Kuusamo) deals with identification and ecology of invertebrates, mammals (especially small mammals), gallinaceous birds and birds of prey. The exercises take place partly in the field and partly in the laboratory. Data gained during the course is analyzed. The results are reported (in PowerPoint) and presented in the final seminar in Kuusamo.
Learning activities and teaching methods:
1. Part in Oulu: 2 h lectures, 28 h exercises May (2 cr.) 2. part in Kuusamo: 70 h demonstrations and practicals, one species and theory exam (4.5 cr).
Target group:
Compulsory (6,5 cr) to ECO and TEAeco, alternatively compulsory to TEAbs (at least 6 cr compulsory, two field courses, one animal and other botany field course).
Recommended optional programme components:
751373A or equivalent knowledge.
Recommended or required reading:
Compulsory at Oulanka: 1) Rytkönen, S. ym. 2003: 751306 Maaeläimistön tuntemus ja ekologia. - Biologian laitoksen monisteita 3/2003. Oulun yliopisto, Oulu. 2), Itämies, J. & Viro, P. 1995: Eläinten lajintuntemus, selkärangattomat. Eläintieteen laitoksen monisteita 1/1995, Oulun yliopisto, Oulu. Insect book recommended: Chinery, M. 1988 Pohjois-Euroopan hyönteisheimojen määritysopas, Tammi, Helsinki, 2. painos.
Assessment methods and criteria:
Exam, seminar presentation.
Grading:
1-5 / Fail.
Person responsible:
Dr. Seppo Rytkönen.
Other information:
Binoculars, bird identification book, suitable outfit. In Oulanka: preparation knife, preparation scissors and sharp cusp tweezers.

754616S: Field methods in freshwater biomonitoring, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

754626S	Field methods in freshwater biomonitoring	5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish.
Timing:
M.Sc. 1.-2. year.
Learning outcomes:
The course familiarises students with methods used in biomonitoring of lakes and rivers.
Contents:
Sampling methods as well as biological and ecotoxicological laboratory analysis are practiced. Survey methods used to describe the state of habitats are applied to lake and river environments.
Learning activities and teaching methods:

10 h lectures, 30 h field and laboratory exercises, group works.
Recommended optional programme components:
Courses 751307A and 754308A or equivalent knowledge.
Recommended or required reading:
Internet material, sample taking standards and instructions.
Assessment methods and criteria:
Group work.
Grading:
Pass / Fail.
Person responsible:
Prof. Timo Muotka.
Other information:
The course will take place if sufficient resources are available.

752699S: Final examination in botany, 10 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750656S	Final examination in biology	10.0 op

ECTS Credits:
10 cr.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
TEAb, BSb and ECOb student will understand profoundly plant ecology's or plant physiology's essential methods, results and theories.
Contents:
Examination on selected literature of a specific subject.
Learning activities and teaching methods:
Book exam in biology public exam day.
Target group:
TEAb, BSb and ECOb: compulsory.
Recommended or required reading:
A list of literature can be found on the notice board. The literature has to be agreed upon with the professor in advance.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen or Prof. Hely Häggman.

753699S: Final examination in genetics, 10 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: Finnish

Leikkaavuudet:

750656S Final examination in biology 10.0 op

ECTS Credits:
10 cr.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
TEAg and BSg student will understand profoundly general and molecular genetics and essential methods, results and theories in other area of genetics.
Contents:
Examination on selected literature of a specific subject. A list of literature can be found on the notice board. The literature has to be agreed upon with the professor in advance.
Learning activities and teaching methods:
Final exam.
Target group:
TEAg and BSg: compulsory.
Assessment methods and criteria:
Final exam in biology public exam day.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen.

754612S: Final examination in hydrobiology, 7 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

754623S Final examination in hydrobiology 5.0 op

ECTS Credits:
7 cr.
Language of instruction:
English.
Timing:
M.Sc. 1 st or 2 nd year.
Contents:
The examination is compulsory to the students taking the hydrobiology study package. Reading material selected in agreement with the teacher in charge.
Assessment methods and criteria:
Final exam in biology public exam day.
Grading:
1-5 / Fail.
Person responsible:
Prof. Timo Muotka.

751699S: Final examination in zoology, 10 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750656S Final examination in biology 10.0 op

ECTS Credits:
10 cr.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
TEAz and BSz student will understand profoundly certain (usually related to the pro gradu thesis) animal physiology's methods, results and theories.
TEAz and ECOz student will understand profoundly animal ecology's essential methods, results and theories.
Contents:
Examination on selected literature of a specific subject.
Learning activities and teaching methods:
Final exam.
Target group:
TEAz, ECOz and BSz: compulsory.
Recommended or required reading:
A list of literature can be found on the notice board. The literature has to be agreed upon with the professor in advance.
Assessment methods and criteria:
Final exam in biology public exam day.
Grading:
1-5 / Fail.
Person responsible:
Prof. Esa Hohtola or Prof. Markku Orell.

752186P: Foreign studies, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

750133P Studies abroad 1.0 op

Voidaan suorittaa useasti: Kyllä

Timing:
B.Sc. or M.Sc. degree.
Contents:
Botanical studies (physiology, ecology) done under international exchange programs (SOCRATES/ERASMUS, NORDPLUS, Courses are either credit transferred or substituted.) in foreign universities.
Person responsible:
Prof. Hely Häggman or Prof. Satu Huttunen.

751193P: Foreign studies, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

750133P Studies abroad 1.0 op

Voidaan suorittaa useasti: Kyllä

Timing:
B.Sc. or M.Sc. degree.
Contents:
Zoological studies (physiology, ecology) done under international exchange programs (SOCRATES/ERASMUS, NORDPLUS, ISEP) in foreign universities. Courses are either credit transferred or substituted.
Person responsible:
Prof. Esa Hohtola or Prof. Markku Orell.

753193P: Foreign studies, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: English

Leikkaavuudet:

750133P Studies abroad 1.0 op

Voidaan suorittaa useasti: Kyllä

Timing:
B.Sc. or M.Sc. degree.
Contents:
Genetics studies done under international exchange programs (SOCRATES/ERASMUS, NORDPLUS, ISEP) in foreign universities. Courses are either credit transferred or substituted.
Person responsible:
Prof. Outi Savolainen.

751393A: Foreign studies, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

750333A Studies abroad 1.0 op

Voidaan suorittaa useasti: Kyllä

Timing:
B.Sc. or M.Sc. degree.
Contents:
Zoological studies (physiology, ecology) done under international exchange programs (SOCRATES/ERASMUS, NORDPLUS, ISEP) in foreign universities. Courses are either credit transferred or substituted.
Person responsible:

Prof. Esa Hohtola or Prof. Markku Orell.

753393A: Foreign studies, 0 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Savolainen Outi
Opintokohteen kielet: English
Leikkaavuudet:

750333A Studies abroad 1.0 op

Voidaan suorittaa useasti: Kyllä

Timing:
B.Sc. or M.Sc. degree.
Contents:
Genetics studies done under international exchange programs (SOCRATES/ERASMUS, NORDPLUS, ISEP) in foreign universities. Courses are either credit transferred or substituted.
Person responsible:
Prof. Outi Savolainen.

752386A: Foreign studies, 0 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

750333A Studies abroad 1.0 op

Voidaan suorittaa useasti: Kyllä

Timing:
B.Sc. or M.Sc. degree.
Contents:
Botanical studies (physiology, ecology) done under international exchange programs (SOCRATES/ERASMUS, NORDPLUS, Courses are either credit transferred or substituted.) in foreign universities.
Person responsible:
Prof. Hely Häggman or Prof. Satu Huttunen.

752686S: Foreign studies, 0 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

750633S Studies abroad 1.0 op

Voidaan suorittaa useasti: Kyllä

Timing:
B.Sc. or M.Sc. degree.
Contents:
Botanical studies (physiology, ecology) done under international exchange programs (SOCRATES/ERASMUS, NORDPLUS, Courses are either credit transferred or substituted) in foreign universities.
Person responsible:
Prof. Hely Häggman or Prof. Satu Huttunen.

753693S: Foreign studies, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: English

Leikkaavuudet:

750633S Studies abroad 1.0 op

Voidaan suorittaa useasti: Kyllä

Timing:
B.Sc. or M.Sc. degree.
Contents:
Genetics studies done under international exchange programs (SOCRATES/ERASMUS, NORDPLUS, ISEP) in foreign universities. Courses are either credit transferred or substituted.
Person responsible:
Prof. Outi Savolainen.

751693S: Foreign studies, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

750633S Studies abroad 1.0 op

Voidaan suorittaa useasti: Kyllä

Timing:
B.Sc. or M.Sc. degree.
Contents:
Zoological studies (physiology, ecology) done under international exchange programs (SOCRATES/ERASMUS, NORDPLUS, ISEP) in foreign universities. Courses are either credit transferred or substituted.
Person responsible:
Prof. Esa Hohtola or Prof. Markku Orell.

751678S: Functional animal ecology, 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Rytkönen

Opintokohteen kielet: Finnish

Leikkaavuudet:

755624S Functional animal ecology 5.0 op

ECTS Credits:
6 cr.
Language of instruction:
Lectures in Finnish , exercises in Finnish / English.
Timing:
B.Sc. 2 nd spring or M.Sc. 1 st spring. NNE.
Learning outcomes:
The aim of the course is to understand the relationship between morphology and function by the means of general ecomorphological model. The student will get both theoretical and practical basics for ecomorphological (and. general scientific) research procedures: scientific hypothesizing, sampling, data analysis and reporting and interpreting the results.
Contents:
The course focuses on the relationship between phenotype and function, especially the correlation between animal morphology and behaviour. The course consists of two parts: A) Lectures in Finnish. However, articles about each subject are available for foreign students, including ecomorphological models and correlations, measurement error, allometry, fluctuating asymmetry and phylogenetic analyses. B) Exercises consisting of miniature studies, field and laboratory work, and seminar. The results of the mini studies, in form of PowerPoint presentations, are presented in the seminar. Before the exercises, students write a home essay (or take an exam).
Learning activities and teaching methods:
12 h lectures, 40 h exercises, seminar and essay or exam.
Target group:
Recommended for ECOe.
Recommended optional programme components:
Recommended 755306A and Basics of statistics I 806109P.
Assessment methods and criteria:
Essay or exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Seppo Rytkönen.

751378A: Functional animal ecology, 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Rytkönen

Opintokohteen kielet: Finnish

Leikkaavuudet:

755324A Functional animal ecology 5.0 op

ECTS Credits:
6 cr.
Language of instruction:
Lectures in Finnish , exercises in Finnish / English.

Timing:
B.Sc. 2 nd spring or M.Sc. 1 st spring. NNE.
Learning outcomes:
The aim of the course is to understand the relationship between morphology and function by the means of general ecomorphological model. The student will get both theoretical and practical basics for ecomorphological (and. general scientific) research procedures: scientific hypothesizing, sampling, data analysis and reporting and interpreting the results.
Contents:
The course focuses on the relationship between phenotype and function, especially the correlation between animal morphology and behaviour. The course consists of two parts: A) Lectures in Finnish. However, articles about each subject are available for foreign students, including ecomorphological models and correlations, measurement error, allometry, fluctuating asymmetry and phylogenetic analyses. B) Exercises consisting of miniature studies, field and laboratory work, and seminar. The results of the mini studies, in form of PowerPoint presentations, are presented in the seminar. Before the exercises, students write a home essay (or take an exam).
Learning activities and teaching methods:
12 h lectures, 40 h exercises, seminar and essay or exam.
Target group:
Recommended for ECOe.
Recommended optional programme components:
Recommended 755306A and Basics of statistics I 806109P.
Assessment methods and criteria:
Essay or exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Seppo Rytkönen.

756625S: Genetic transformation of plants, 4 - 8 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Häggman, Hely Margaretha

Opintokohteen kielet: Finnish

Leikkaavuudet:

756652S	Genetic transformation of plants	5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd autumn, every second year.
Learning outcomes:
The student will learn the different techniques of genetic transformation and will understand their advantages and limitations and furthermore will be able to apply the techniques e.g. in her / his own study. The student is familiar with the concept of symbiosis with different interpretations and is able to analyse and evaluate both peer-reviewed as well as non-reviewed material concerning genetically modified plants published in different media.
Contents:
Genetically transformed plants and mutant plants play an essential role in modern plant biology. The lectures will cover gene constructs, marker-genes, different genetic transformation methods, legislation, commercial cultivations with genetically modified plants and their adoption rates. The laboratory course will familiarize the students with the most common genetic transformation methods including *Agrobacterium*-mediated transformation, electroporation, biolistic transformation and VIGS.
Learning activities and teaching methods:
Lab course + demonstrations (35 h) and lectures (20 h), reports, lecture exam and final conclusions.
Target group:
BS students.

Recommended optional programme components:
7526824S or equivalent knowledge.
Recommended or required reading:
Handout and supplementary reading.
Assessment methods and criteria:
Report and final exam.
Grading:
Pass / Fail.
Person responsible:
Prof. Hely Häggman.

753630S: Genetics research seminar, 2 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kuittinen, Helmi Helena

Opintokohteen kielet: English

Leikkaavuudet:

750653S	Special seminar in biology	2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2 cr.
Language of instruction:
Finnish/English.
Timing:
M.Sc. 1 st or 2 nd year, Ph.D. students.
Learning outcomes:
After the course the student has a view of current research topics in genetics.
Contents:
Consists of research presentations from researchers and students or discussion on fresh topics in genetics. On Thursdays at 12-13 according to a separate announcement.
Target group:
Suitable for BSg and for BSg Ph.D. students.
Assessment methods and criteria:
10 participations with reports equals 2 credits.
Grading:
Pass / Fail.
Person responsible:
Dr. Helmi Kuittinen.

753617S: Genomics and gene expression practicals, 8 op

Voimassaolo: - 31.07.2013

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
8 cr.
Language of instruction:
Finnish / English.

Timing:
B.Sc. 3rd spring or M.Sc. 1st spring.
Learning outcomes:
After the course the student can study the structure of the chromosomes using traditional staining methods, localize genes in chromosomes with in-situ hybridization and study their expression with RT-PCR.
Contents:
Traditional chromosome staining methods, in-situ hybridization, RT-PCR.
Learning activities and teaching methods:
110 h demonstrations, exercises, seminars, 30 h independent small-scale research work including research plan and work report.
Target group:
BSg.
Recommended optional programme components:
753104P.
Assessment methods and criteria:
Work report.
Grading:
1-5 / Fail.
Person responsible:
N.N.

753317A: Genomics and gene expression practicals, 8 op

Voimassaolo: - 31.07.2013

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
8 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3rd or M.Sc. 1st spring.
Learning outcomes:
After the course the student can study the structure of the chromosomes using traditional staining methods, localize genes in chromosomes with in-situ hybridization and study their expression with RT-PCR.
Contents:
Traditional chromosome staining methods, in-situ hybridization, RT-PCR.
Learning activities and teaching methods:
110 h demonstrations, exercises, seminars, 30 h independent small-scale research work including research plan and work report, final exam.
Target group:
For BSg students.
Recommended optional programme components:
Course 753104P.
Assessment methods and criteria:
Work report.
Grading:
1-5 / Fail.
Person responsible:
N.N.

750103P: History of biology, 2 op

Voimassaolo: - 31.07.2011

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumme, Jaakko Ilmari

Opintokohteen oppimateriaali:

Tommila, , 2001
Tommila, , 2000
Tommila, , 2001
Tommila Päiviö (toim.), , 2002

Opintokohteen kielet: Finnish

ECTS Credits:
2 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 1 st - 3 rd year.
Learning outcomes:
Understand biology in the historical context, understand time scale.
Contents:
History shows that in the Finnish academic system the older sciences like theology and science of law suppressed the development of biological sciences. Biology in broader sense was born as useful science during the utilitarianism time period.
Learning activities and teaching methods:
Book exam.
Recommended or required reading:
Book exam from the series of book: Suomen tieteen historia 1-3 ed. P. Tommila, WSOY (parts concerning biology, also the general lines of science). Or relevant literature in English.
Assessment methods and criteria:
Exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Jaakko Lumme

753607S: Human genetics, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumme, Jaakko Ilmari

Opintokohteen oppimateriaali:

Jobling, Mark A. , , 2004

Opintokohteen kielet: Finnish

Leikkaavuudet:

757615S	Human genetics	5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish or English.
Timing:
B.Sc. or M.Sc. degree. Odd years, autumn.
Learning outcomes:
To understand human evolution and man as a biological species.
Contents:

Human evolution in Africa, spread of different human species to other continents, research methods including population genetics and genomics, molecular human genetics: inherited diseases and susceptibilities, methods.
Learning activities and teaching methods:
Lectures, home works.
Target group:
Students of genetics. Suitable also for biochemistry students and education students.
Recommended optional programme components:
753124P or equivalent knowledge.
Recommended or required reading:
http://www.oulu.fi/genet/human_genetics/
Recommended reading: Jobling et al. (2004) Human evolutionary genetics. Origins, peoples & disease. Garland Publishing, ISBN 08153 41857
Assessment methods and criteria:
Home exam, controlled exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Jaakko Lumme.
Other information:
Educational, voluntary.

753307A: Human genetics, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumme, Jaakko Ilmari

Opintokohteen oppimateriaali:

Jobling, Mark A. , , 2004

Opintokohteen kielet: Finnish

Leikkaavuudet:

757315A	Human genetics	5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish or English.
Timing:
B.Sc. or M.Sc. degree. Odd years, autumn.
Learning outcomes:
To understand human evolution and man as a biological species.
Contents:
Human evolution in Africa, spread of different human species to other continents, research methods including population genetics and genomics, molecular human genetics: inherited diseases and susceptibilities, methods.
Learning activities and teaching methods:
Lectures, home works.
Target group:
Students of genetics. Suitable also for biochemistry students and education students.
Recommended optional programme components:
753124P or equivalent knowledge.
Recommended or required reading:
http://www.oulu.fi/genet/human_genetics/
Recommended reading: Jobling et al. (2004) Human evolutionary genetics. Origins, peoples & disease. Garland Publishing, ISBN 08153 41857
Assessment methods and criteria:
Home exam, controlled exam.
Grading:
1-5 / Fail.

Person responsible:
Prof. Jaakko Lumme.
Other information:
Educational, voluntary.

756311A: Identification of garden plant species, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hyvärinen, Marko Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay756311A Identification of garden plant species (OPEN UNI) 5.0 op

ECTS Credits:
5 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2 nd summer.
Learning outcomes:
Capability to indentify approx. 400 garden and crop species.
Contents:
Independent study in the Botanical Gardens with the help of a handout.
Learning activities and teaching methods:
Independent studying in the garden.
Target group:
ECOb, TEA, BTb.
Recommended or required reading:
Hiltunen, R. & Hyvärinen, M. 2009: Puutarhakasvien lajintuntemus. Biologian laitoksen monisteita, Yliopistopaino, Oulu.
Assessment methods and criteria:
Final exam in August or beginning of September in the Botanical Gardens, see notice board for details.
Grading:
1-5 / Fail.
Person responsible:
Dr. Marko Hyvärinen.

752303A: Identification of plant species, 2 - 3 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Annamari Markkola

Opintokohteen oppimateriaali:
Hämet-Ahti, L., Suominen, J., Ulvinen, T. & Uotila, P., , 1998

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay752303A Identification of plant species (OPEN UNI) 2.0 op

ECTS Credits:
2-3,5 cr. NNE.

Language of instruction:
Finnish / English.
Timing:
B.Sc. 1 st autumn.
Learning outcomes:
Student is able to identify most common boreal plant species in herbarium specimens.
Contents:
Demonstrations (20 h) and/or independent study of ca. 350 vascular plants, mosses and lichens in the boreal vegetation zone. 3.5 cr. without the literature in the exam and 2 cr. with the literature in the exam.
Learning activities and teaching methods:
20 h demonstrations, final exam.
Target group:
Compulsory to TEA and ECO 3,5 cr, optional for BS2 2.0- 3,5 cr.
Recommended optional programme components:
Course is prerequisite for the Field course in ecological botany.
Recommended or required reading:
Booklet Hanhela, P. & Halonen, P. 1995: Plant Identification.
Assessment methods and criteria:
Species exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Annamari Markkola.

751642S: Identification of vertebrates in the field, 2 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Koivula

Opintokohteen kielet: Finnish

ECTS Credits:
2 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st spring.
Learning outcomes:
After having the course the students have a basic knowledge (a level expected from a professional biologist) about identification of vertebrate animals in the field.
Contents:
Identification exam on birds and mammals in the field. Their natural history: tracks, droppings, nests etc.
Learning activities and teaching methods:
Independent learning, field exam.
Target group:
Compulsory to ECOz.
Assessment methods and criteria:
Field exam.
Person responsible:
Dr. Kari Koivula.

750600J: Integration of research and teaching, 1 - 4 op

Opiskelumuoto: Post-graduate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
1-4 cr.
Language of instruction:
Finnish / English.
Timing:
Ph.Lic. or Ph.D. degree.
Learning outcomes:
Students get teaching experience and learn to integrate latest scientific results in subject teaching.
Contents:
Teaching in a course belonging to the B.Sc. or M.Sc. degree in the Department of Biology. Credits depend on the amount of teaching. Arranged with the professor of the student's major subject.
Learning activities and teaching methods:
Teaching in biology degree programme courses.
Target group:
Suitable for Ph.Lic. or Ph.D. students.
Grading:
Pass / Fail.
Person responsible:
Professors.

755614J: Introductory essay of Ph. D. research, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Post-graduate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

750659J Introductory essay of Ph. D. research 4.0 op

ECTS Credits:
4 cr.
Language of instruction:
English.
Timing:
Ph.D. 1 st semester.
Learning outcomes:
Student learns about theories and recent progress of his/hers own research area.
Contents:
Theories, methodology and progress of a specific research area.
Learning activities and teaching methods:
Independent work.
Target group:
Ph.D. degree: compulsory.
Assessment methods and criteria:
Ten pages long essay in English.
Grading:
Pass / Fail.
Person responsible:
Professors, supervisors.

757606J: Introductory essay of Ph.D. research, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Post-graduate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

750659J Introductory essay of Ph. D. research 4.0 op

ECTS Credits:
4 cr.
Language of instruction:
English.
Timing:
Ph.D. 1 st semester.
Learning outcomes:
Student learns about theories and recent progress of his/hers own research area.
Contents:
Theories, methodology and progress of a specific research area.
Learning activities and teaching methods:
Independent work.
Target group:
Ph.D. degree: compulsory.
Assessment methods and criteria:
Ten pages long essay in English.
Grading:
Pass / Fail.
Person responsible:
Professors, supervisors.

756632J: Introductory essay of Ph.D. research, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Post-graduate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

750659J Introductory essay of Ph. D. research 4.0 op

ECTS Credits:
4 cr.
Language of instruction:
English.
Timing:
Ph.D. 1 st semester.
Learning outcomes:
Student learns about theories and recent progress of his/hers own research area.
Contents:
Theories, methodology and progress of a specific research area.
Learning activities and teaching methods:
Independent work.
Target group:
Ph.D. degree: compulsory.
Assessment methods and criteria:
Ten pages long essay in English.
Grading:
Pass / Fail.

Person responsible:
Professors, supervisors

750629S: Kaamos symposium, 2 - 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-4 cr.
Language of instruction:
English.
Timing:
B.Sc., M.Sc., Ph.Lic. and Ph.D. autumn.
Learning outcomes:
Students get acquainted to preparing, presenting and evaluating a scientific oral presentation.
Contents:
The Kaamos Symposium consisting of presenting current research projects is held every year at the end of autumn period. Through presenting their research work and projects and obtaining feedback from the audience (students and the staff of the department) post graduate students gain experience in holding a scientific presentation.
Learning activities and teaching methods:
Own presentation and the whole symposium 4 credits, summary of five presentations and symposium 2 cr.
Target group:
Undergraduate and postgraduate biology students.
Assessment methods and criteria:
Presentation or reports.
Grading:
Pass / Fail.
Person responsible:
Professors.

040910S: Laboratory Animal Course For Scientists, 6 op

Voimassaolo: - 31.07.2012
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Laboratory Animal Centre
Arvostelu: 1 - 5, pass, fail
Opettajat: Voipio Hanna-marja
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

750322A: Laboratory techniques and instrumentation, 5 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Esa Juhani, Satu Mänttäri

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1 st autumn.
Learning outcomes:
After completing the course the student 1) knows the biologically important variable types and their scales as well as sources of measurement errors, 2) can explain the operation principles of biologically important transducers, 3) is able to apply this knowledge in planning and constructing experimental set-ups, 4) knows the principles of laboratory safety.
Contents:
Lectures: Variables, distributions, scales; random and systematic errors. Important transducers in biology: electrodes, temperature, pressure, flow force, movement, radiation and gas transducers. Disturbances of measurements, recording and storing measurement signals, elementary signal analysis. Principal concepts of electronics. Laboratory safety.
Learning activities and teaching methods:
24 h lectures, 64 h laboratory exercises: demonstrations of various transducers and larger measurement set-ups. Hands-on exercises on various laboratory instruments. Final exam.
Target group:
Optional for BS in B.Sc. degree, compulsory to BSz in M.Sc. degree.
Recommended optional programme components:
This course is a prerequisite to course 751635S.
Recommended or required reading:
Handouts and other material.
Assessment methods and criteria:
Final exam.
Grading:
Pass / Fail.
Person responsible:
Prof. Esa Hohtola and Dr. Satu Mänttäri.

750622S: Laboratory, instrumentation and measurement techniques, 5 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Satu Mänttäri, Hohtola, Esa Juhani

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1 st autumn.
Learning outcomes:
After completing the course the student 1) knows the biologically important variable types and their scales as well as sources of measurement errors, 2) can explain the operation principles of biologically important transducers, 3) is able to apply this knowledge in planning and constructing experimental set-ups, 4) knows the principles of laboratory safety.
Contents:

Lectures: Variables, distributions, scales; random and systematic errors. Important transducers in biology: electrodes, temperature, pressure, flow force, movement, radiation and gas transducers. Disturbances of measurements, recording and storing measurement signals, elementary signal analysis. Principal concepts of electronics. Laboratory safety.
Learning activities and teaching methods:
24 h lectures, 64 h laboratory exercises: demonstrations of various transducers and larger measurement set-ups. Hands-on exercises on various laboratory instruments.
Target group:
Optional for BS in B.Sc. degree, compulsory to BSz in M.Sc. degree.
Recommended optional programme components:
This course is a prerequisite to course 751635S.
Recommended or required reading:
Handouts and other material.
Assessment methods and criteria:
Final exam.
Grading:
Pass / Fail.
Person responsible:
Prof. Esa Hohtola and Dr. Satu Mänttäri.

751690S: Lectures on special topics in zoology, 2 - 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750654S Special lecture in biology 2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. degree.
Contents:
The topics are announced on the notice board.
Target group:
Optional to BSz and ECOz.
Person responsible:
Professors and docents.
Other information:
The course will take place if sufficient resources are available.

750616S: Legislation in environmental protection, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Huttunen, Satu

Opintokohteen oppimateriaali:
Hollo, Erkki J. , , 2001
Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1 st autumn - spring. Every second year.
Learning outcomes:
To familiarise students with environmental legislation in European Union with regard to environmental protection and natural resources. Student is able to apply his knowledge to different environmental questions and analyze the needed means. Student knows the environmental administration and organisations in environmental protection and natural resources.
Contents:
Environmental protection and natural resources legislation in Finland and in Europe. Environmental administration and organisations, use and protection of natural resources, prevention of environmental destruction, assessment of environmental effect as well as principles of environmental legislation and main international conventions, environmental issues in UNEP and OECD are covered.
Learning activities and teaching methods:
24 h lectures, 18 h exercises including demonstrations, literature, and final exam.
Target group:
Compulsory to students who are doing the environmental protection 25 cr study module.
Recommended or required reading:
Hollo, E. J. 2001: Ympäristönsuojeluoikeus, WSOY, 592 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen.
Other information:
The course will take place if sufficient resources are available. Also the environmental legislation course that Faculty of technology arranges is accepted.

750316A: Legislation in environmental protection, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Huttunen, Satu

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay750316A Legislation in environmental protection (OPEN UNI) 5.0 op

ECTS Credits:
5 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1 st autumn - spring. Every second year.
Learning outcomes:
To familiarise students with environmental legislation in European Union with regard to environmental protection and natural resources. Student is able to apply his knowledge to different environmental questions and analyze the needed means. Student knows the environmental administration and organisations in environmental protection and natural resources.
Contents:
Environmental protection and natural resources legislation in Finland and in Europe. Environmental administration and organisations, use and protection of natural resources, prevention of environmental destruction, assessment of environmental effect as well as principles of environmental legislation and main international conventions, environmental issues in UNEP and OECD are covered.

Learning activities and teaching methods:
24 h lectures, 18 h exercises including demonstrations, literature, and final exam.
Target group:
Compulsory to students who are doing the environmental protection 25 cr. study module.
Recommended or required reading:
Hollo, E. J. 2001: Ympäristönsuojeluoikeus, WSOY, 592 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen.
Other information:
The course will take place if sufficient resources are available. Also the environmental legislation course that Faculty of technology arranges is accepted.

752316A: Macro fungi, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Annamari Markkola

Opintokohteen oppimateriaali:

Salo, Pertti (1) , , 2006

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay752316A Macro fungi (OPEN UNI) 3.0 op

ECTS Credits:
3 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd or M.Sc. 1 st autumn. NNE.
Learning outcomes:
Student is able to identify most common macrofungal species as fresh specimens and knows basics of fungal ecology.
Contents:
Demonstrations of macrofungi in the field, basics of identification, ecology and distribution.
Learning activities and teaching methods:
14 h lectures, 25 h exercises (including excursions), independent study in fresh identification exam on fresh specimens, final exam.
Target group:
TEAeco: compulsory.
Recommended or required reading:
Course handout, Salo, P. and Nummela-Salo, U. 2002: Sienikurssi (752316). Toinen uusittu painos. Lajiesittelyt. Biologian laitoksen monisteita 2/2002, 41 p. and mushroom guides.
Assessment methods and criteria:
Species exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Annamari Markkola.

752616S: Macro fungi, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Salo, Pertti (1) , , 2006
Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd or M.Sc. 1 st autumn. NNE.
Learning outcomes:
Student is able to identify most common macrofungal species as fresh specimens and knows basics of fungal ecology.
Contents:
Demonstrations of macrofungi in the field, basics of identification, ecology and distribution.
Learning activities and teaching methods:
14 h lectures, 25 h exercises (including excursions), independent study in fresh identification exam on fresh specimens, final exam.
Target group:
TEAeco: compulsory.
Recommended or required reading:
Course handout, Salo, P. and Nummela-Salo, U. 2002: Sienikurssi (752316). Toinen uusittu painos. Lajiesittelyt. Biologian laitoksen monisteita 2/2002, 41 p. and mushroom guides.
Assessment methods and criteria:
Species exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Annamari Markkola.

750696S: Master of science seminar, 4 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Orell, Markku Ilmari
Opintokohteen kielet: Finnish
Leikkaavuudet:

750678S	Master of science seminar	5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st - 2 nd year.
Learning outcomes:
The seminar gives advanced scientific communication and information retrieval skills.
Contents:
Student gives two seminar presentations: 1) research plan 15 min presentation and 15 min discussion 2) results 30 min presentation and 15 min discussion. Results seminar presentation has to be before the student gives her M.Sc. thesis for reviewing.
Learning activities and teaching methods:

Two seminar presentations and one result seminar presentation opponent, eight research seminar participations, and eight result seminar participations. Topics and dates have to be agreed with the professor in beforehand. See notice board for the schedules and instructions.

Target group:
Compulsory to the biology students.

Assessment methods and criteria:
Two seminar presentations, one result seminar oppontenting and eight research plan seminar and eight result seminar participations. See detailes on the notice board.

Grading:
Pass / Fail.

Person responsible:
Prof. Markku Orell.

757602S: Master of science thesis in genetics, 40 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Department of Biology

Arvostelu: A,B,N,C,M,EX,L

Opintokohteen kielet: Finnish

Leikkaavuudet:

750657S	Biology subject teacher pro gradu thesis	20.0 op
750658S	Pro gradu thesis in biology	40.0 op

ECTS Credits:
20-40 cr.

Language of instruction:
Finnish / English.

Timing:
M.Sc. 1 st or 2 nd year.

Learning outcomes:
Student knows the research methods in specific field of biology. She is conversant with her field of thesis and is able to scientific thinking, estimating the results, analysing, drawing conclusions and scientific communicating.

Contents:
Literary work which in general includes experimental research work. Student gets profoundly acquainted on certain special field in biology.

Learning activities and teaching methods:
Independent research work on a scientific subject in agreement with the responsible professor and under the supervision of the Department. The supervisors may be professors of the department, docents and other teachers and researchers who have the docent's status. The student may have several supervisors, the other supervisor may be from other department, university (also abroad) or from research institute. The subject must be agreed on with the professor in advance. The research work can contain fieldwork, laboratory work, theoretical work or work on collections in museum. The work always includes a literature survey. After having completed the thesis, the student writes the Maturity Exam. The dean will order the final examiners by the proposal of the professor. Department council accepts and grades the thesis on the basis of the final examiners' opinions.

Target group:
TEAg: compulsory 20 cr, BSg: compulsory 40 cr.

Assessment methods and criteria:
Literary work.

Grading:
Approbatur - Laudatur / Fail.

Person responsible:
Professors.

755602S: Master of science thesis in zoology, 40 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750657S	Biology subject teacher pro gradu thesis	20.0 op
750658S	Pro gradu thesis in biology	40.0 op

ECTS Credits:
20-40 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
Student knows the research methods in specific field of biology. She is conversant with her field of thesis and is able to scientific thinking, estimating the results, analysing, drawing conclusions and scientific communicating.
Contents:
Literary work which in general includes experimental research work. Student gets profoundly acquainted on certain special field in biology.
Learning activities and teaching methods:
Independent research work on a scientific subject in agreement with the responsible professor and under the supervision of the Department. The supervisors may be professors of the department, docents and other teachers and researchers who have the docent's status. The student may have several supervisors, the other supervisor may be from other department, university (also abroad) or from research institute. The subject must be agreed on with the professor in advance. The research work can contain fieldwork, laboratory work, theoretical work or work on collections in museum. The work always includes a literature survey. After having completed the thesis, the student writes the Maturity Exam. The dean will order the final examiners by the proposal of the professor. Department council accepts and grades the thesis on the basis of the final examiners' opinions.
Target group:
TEAz: compulsory 20 cr, ECOz and BSz: compulsory 40 cr.
Assessment methods and criteria:
Literary work.
Grading:
Approbatur - Laudatur / Fail.
Person responsible:
Professors.

750632S: Maturity exam, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
0 cr.
Language of instruction:
Finnish / Swedish / English.
Timing:
M.Sc. degree.
Contents:
After completing the Bachelor of Science and Master of Science. Thesis, the student writes an essay in his/her native language on the thesis, to show a good command of the language and the topic of the thesis. Detailed instructions on the biology notice board.
Learning activities and teaching methods:

Four pages long essay exam. Two teachers examine the maturity exam (at least one teacher has to present the students major subject). Department council accepts the maturity exam. 4 h exam.
Target group:
Compulsory to the biology students. Exam is taken after completion of the thesis.
Assessment methods and criteria:
Four pages long essay exam.
Grading:
Pass / Fail.
Person responsible:
Professor of the student's major subject.

750604S: Metapopulation dynamics, 4 op

Voimassaolo: 01.08.2009 - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Orell, Markku Ilmari, Jari-Heikki Oksanen
Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. degree.
Learning outcomes:
The students know the principles of the theory of metapopulations, and can apply the theory for developing testable ecological hypotheses, concerning, for instance, the conservation of threatened species.
Contents:
The general theory of metapopulations, spatially explicit (or nature-like) metapopulation models, the genetic structure of metapopulations, application of metapopulation models in conservation of endangered species.
Learning activities and teaching methods:
24 h lectures, 16 h exercises, seminar. Teachers from different study subjects.
Recommended optional programme components:
Course 756323S or equivalent knowledge.
Recommended or required reading:
Hanski, I. 1999: Metapopulation Ecology. Oxford University Press, Oxford, 313 p and current scientific articles.
Person responsible:
Prof. Jari Oksanen and Prof. Markku Orell.

750647S: Methods in ecology II, 7 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Rytkönen
Opintokohteen kielet: Finnish
Leikkaavuudet:

755329A	Methods in ecology II	5.0 op
755629S	Methods in ecology II	5.0 op

ECTS Credits:
7 cr.

Language of instruction:
Finnish exercises also English if necessary.
Timing:
M. Sc. 1 st year.
Learning outcomes:
The aim of the course is to learn in practice how to apply scientific method in ecological research. The student learns how to select appropriate methods for different ecological problems, and a toolkit for study design and data analysis.
Contents:
Continuation to course Ecological methods I 6cr (750347A). This course focuses on applying the scientific method in ecological research. The course consists mainly of computer exercises in the following subjects: sampling, sample size determination, experimental design and statistical analysis esp. analysis of variance, comparative methods (independent contrasts - analysis), multivariate methods (cluster analysis, ordination) and meta-analysis. Also other current issues can be included. The course ends in a Master Thesis seminar where students can discuss and develop their thesis plans with students and instructors.
Learning activities and teaching methods:
Lectures, seminar, exercises and final exam.
Target group:
Compulsory to ECOz and ECOb.
Recommended optional programme components:
Course 750347A. Recommended: Basics of statistics I 806109P.
Recommended or required reading:
Handout.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Pass.
Person responsible:
Prof. Jari Oksanen and Dr. Seppo Rytkönen.

753612S: Methods in genomics and genomics evolution, 6 op

Voimassaolo: 01.08.2009 - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: Finnish

Leikkaavuudet:

757620S Methods in genomics and genomics evolution 5.0 op

ECTS Credits:
6 cr.
Timing:
M.Sc. 1st spring.
Learning outcomes:
Student knows focal features of genome structure, evolution and research methods. Purpose of the course is to give a conseption of common bases, approach and question phrasing in gene expression, gene function, genome structure and gene mapping.
Contents:
Genome structure, composition, comparative genomics, recombination and evolutionary factors affecting genome composition.
Learning activities and teaching methods:
24 h lectures, 24 h seminars, independent work 70 h, exam, reports.
Target group:
BSg.
Assessment methods and criteria:
Reports and exam.
Grading:

1-5 / Fail.
Person responsible:
Prof. Outi Savolainen.

750160P: Minor subject examination in biology, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen oppimateriaali:

Campbell, Neil A. , , 2002
Campbell, Neil A. , , 1999

Opintokohteen kielet: Finnish

Leikkaavuudet:

750179P Minor subject examination in biology 5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Book in English.
Timing:
B.Sc. / M.Sc.
Learning outcomes:
The book exam gives to the non-biology student basics in biology so that he/she can follow the hydrobiology courses arranged by the biology degree programme.
Contents:
Basics in biology.
Learning activities and teaching methods:
Book exam.
Target group:
A book exam compulsory to non-biology students who do the hydrobiology study package.
Recommended or required reading:
Campbell, N. A. & Reece J. B. & Mitchell, L.G. 1999: Biology, 5 th ed., Pearson Education Inc., 1175 p. Campbell, N. A. & Reece J. B. 2002: Biology, 6 th ed., Pearson Education Inc., 1247 p.
Assessment methods and criteria:
Book exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Timo Muotka.

752692S: Mire ecology, 5 op

Voimassaolo: 01.08.2003 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Virtanen, Risto Juhani

Opintokohteen oppimateriaali:

Eurola, Seppo , , 1995
Eurola, Seppo , , 1992

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay752692S Mire ecology 5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish.
Timing:
Every second year at the Oulanka research station.
Learning outcomes:
By passing this course a student is able to identify plant species (bryophytes and vascular plants), mire types, vegetation of boreal areas, species indicator values, determine mire types, interpret ecology of mire systems and make inventories on mire landscapes.
Contents:
Plant species (bryophytes and vascular plants), mire types, vegetation of boreal areas. Regional patterns in mire vegetation, mire types and underlying ecological gradients. Mire hydrotopography and peat stratigraphy. Red list status of mire vegetation.
Learning activities and teaching methods:
Field course, field exercises. Mapping exercises and reporting the results.
Target group:
B.Sc. 2 nd autumn or M.Sc. 1 st or 2 nd autumn. Students of plant ecology.
Recommended optional programme components:
752304A or equivalent knowledge.
Recommended or required reading:
To be announced.
Assessment methods and criteria:
Mire type and species exams.
Grading:
Mire types and species exam. 1-5 / Fail.
Person responsible:
Dr. Risto Virtanen.
Other information:
Organised together with the University of Joensuu. The course will take place if sufficient resources are available.

755615S: Molecular ecology, 2 - 5 op

Voimassaolo: - 31.07.2012

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kvist, Laura Irmeli

Opintokohteen oppimateriaali:

Beebee, Trevor J. C. , , 2004

Opintokohteen kielet: Finnish

ECTS Credits:
2-5 cr.
Language of instruction:
English.
Timing:
M.Sc. 1 st spring.
Learning outcomes:
This course introduces the usage of molecular biology methods and genetic theories in ecology. The aim is that students know the basic laboratory methodology, can apply them into variety of ecological questions and is familiar with basics of population genetics and phylogenetics in order to be able to analyze and interpret genetic data.
Contents:

Initiation to structure and evolution of proteins and DNA, identification of species, sex and individuals, behavioural ecology (mating systems, cooperation, mating success). Basics of population genetics (variation, effective population size, bottlenecks, population structure, gene flow), relationships between molecular and adaptive variation, phylogenetic methods, phylogeography and conservation genetics.
Learning activities and teaching methods:
20 h lectures, 4 h seminars, 21 h laboratory exercises, 27 h computer exercises. Final exam from lectures, seminar, participation to exercises.
Target group:
ECOz.
Recommended optional programme components:
753114P or equivalent knowledge.
Recommended or required reading:
Beebee, T and Rowe G.2004. An introduction to molecular ecology. Oxford University Press.
Assessment methods and criteria:
Lecture exam and exercises essay.
Grading:
1-5 / Fail.
Person responsible:
Dr. Laura Kvist.

753627S: Molecular evolution, 4 op

Voimassaolo: - 31.12.2019

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kuittinen, Helmi Helena

Opintokohteen oppimateriaali:
Graur, Dan , , 2000
Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2nd autumn or M.Sc. 1st autumn.
Learning outcomes:
After the course the student knows some basic methods that are used to study the history of living organisms and the evolutionary mechanisms. The student understands the basic evolutionary mechanisms affecting the genome structure and nucleotide content. The student knows the main concepts in the field and can read scientific articles in molecular evolution.
Contents:
Basic methods of estimation of nucleotide substitution rates, building of phylogenetic trees with distance based methods and parsimony. Evolution of the genome structure and size. Scientific articles.
Learning activities and teaching methods:
24 h lectures, 12 h exercises,, 50 h independent studies including home work.
Target group:
Optional for BS in B.Sc. degree, compulsory to BSg in M.Sc. degree.
Suitable for all biologists and biochemists.
Recommended optional programme components:
753124P or equivalent knowledge.
Recommended or required reading:
Additional reading Graur, D. and Li, W.-H. 1999: Fundamentals of Molecular Evolution. Sinauer, Massachusetts.
Assessment methods and criteria:
Exam/home exam, homework.
Grading:
1-5 / Fail.
Person responsible:

Dr. Helmi Kuittinen.

753327A: Molecular evolution, 4 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kuittinen, Helmi Helena
Opintokohteen oppimateriaali:
Graur, Dan , , 2000
Opintokohteen kielet: Finnish
Leikkaavuudet:

757312A Molecular evolution 5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2nd autumn or M.Sc. 1st autumn.
Learning outcomes:
After the course the student knows some basic methods that are used to study the history of living organisms and the evolutionary mechanisms. The student understands the basic evolutionary mechanisms affecting the genome structure and nucleotide content. The student knows the main concepts in the field and can read scientific articles in molecular evolution.
Contents:
Basic methods of estimation of nucleotide substitution rates, building of phylogenetic trees with distance based methods and parsimony. Evolution of the genome structure and size. Scientific articles.
Learning activities and teaching methods:
24 h lectures, 12 h exercises, 40 h independent studies including home work.
Target group:
Optional for BS in B.Sc. degree, compulsory to BSg in M.Sc. degree.
Suitable for all biologists and biochemists.
Recommended optional programme components:
753124P or equivalent knowledge.
Recommended or required reading:
Additional reading Graur, D. and Li, W.-H. 1999: Fundamentals of Molecular Evolution. Sinauer, Massachusetts.
Assessment methods and criteria:
Exam/home exam, homework.
Grading:
1-5 / Fail.
Person responsible:
Dr. Helmi Kuittinen.

750364A: Molecular methods I, 4 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kuittinen, Helmi Helena
Opintokohteen kielet: Finnish
Leikkaavuudet:

757311A Molecular methods I 5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
BS: B.Sc. 2 nd spring, ECO: M.Sc. 1 st spring.
Learning outcomes:
After the course the student is able to use the basic methods of DNA work. The student can isolate DNA from different organisms, estimate the quality and quantity of the DNA, amplify DNA fragments with the polymerase chain reaction, design PCR primers, sequence DNA, and do fragment analysis. The student is able to evaluate his results and optimize methods to some degree.
Contents:
Contents: Isolation of genomic DNA, amplification of DNA by PCR, primer design, DNA sequencing, and fragment analysis (for example, microsatellites). Computer programs needed for DNA-sequence and fragment analysis.
Learning activities and teaching methods:
48 h exercises including demonstrations, 50 h independent work including homework and reports.
Target group:
Compulsory to BS, suitable for ECO students who are interested in population and evolutionary ecology.

Recommended optional programme components:
Course 753104A.
Assessment methods and criteria:
Reports.
Grading:
1-5 / Fail
Person responsible:
Dr. Helmi Kuittinen.

750365A: Molecular methods II, 4 op

Voimassaolo: - 31.07.2017

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna-Maria Pirttilä

Opintokohteen kielet: Finnish

Leikkaavuudet:

757617S Molecular methods II 5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
BS: B.Sc. 3 rd spring.
Learning outcomes:
The student knows how to study gene expression at different levels (transcription, translation) and understands the benefits and limitations of each method used.
Contents:
The course consists of laboratory work elaborating principles of gene expression by molecular biology.
Learning activities and teaching methods:
50 h exercises including demonstrations, 50 h independent work, work reports.
Target group:
Compulsory to BS.
Recommended optional programme components:
Course 750364A.
Assessment methods and criteria:

Work reports.
Grading:
1-5 / Fail.
Person responsible:
Dr. Anna Maria Mattila.

750303A: Nature conservation and land use, 3 op

Voimassaolo: 01.08.2009 - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Jäkäläniemi, Anne Marjatta
Opintokohteen kielet: Finnish
Leikkaavuudet:

756342A	Identification of plant species	3.0 op

ECTS Credits:
3 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1 st or 2 nd spring and summer.
Learning outcomes:
The student understands the main goals of conservation at international, national and regional levels and can implement these goals in practice.
Contents:
The course will give general knowledge of conservation ecology and its use in the society policy making. The central themes are (1) conservation, monitoring and management of species and vegetation types, (2) the social impacts of conservation and (3) land use planning. The topics will be explored both at international and local levels.
Learning activities and teaching methods:
Before the course each pair of students will prepare an electronic poster presentation on a chosen theme. The students will present the posters during the course. Course materials and info will be gathered and updated in the OPTIMA-database (https:\\optima.oulu.fi). Course will be held at the Oulanka research station.
Target group:
Students of biology and geography.
Recommended optional programme components:
For biology students Nature conservation (752321A), basic field courses (751306A, 751307A, 752304A). For geography students Nature conservation (752321A), Field course in physical geography (790310A).
Recommended or required reading:
Course materials and info can be found in the OPTIMA database (see above).
Grading:
Pass / Fail.
Person responsible:
Dr. Anne Jäkäläniemi.
Other information:
The course will take place if sufficient resources are available.

750603S: Nature conservation and land use, 3 op

Voimassaolo: 01.08.2009 - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail

Opettajat: Jäkäläniemi, Anne Marjatta

Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd or M.Sc. 1 st or 2 nd spring and summer.
Learning outcomes:
The student understands the main goals of conservation at international, national and regional levels and can implement these goals in practice.
Contents:
The course will give general knowledge of conservation ecology and its use in the society policy making. The central themes are (1) conservation, monitoring and management of species and vegetation types, (2) the social impacts of conservation and (3) land use planning. The topics will be explored both at international and local levels.
Learning activities and teaching methods:
Before the course each pair of students will prepare an electronic poster presentation on a chosen theme. The students will present the posters during the course. Course materials and info will be gathered and updated in the OPTIMA-database (https:\\optima.oulu.fi). Course will be held at the Oulanka research station.
Target group:
Students of biology and geography.
Recommended optional programme components:
For biology students Nature conservation (752321A), basic field courses (751306A, 751307A, 752304A). For geography students Nature conservation (752321A), Field course in physical geography (790310A).
Recommended or required reading:
Course materials and info can be found in the OPTIMA database (see above).
Grading:
Pass / Fail.
Person responsible:
Dr. Anne Jäkäläniemi.
Other information:
The course will take place if sufficient resources are available.

751636S: Neurobiology, 3 op

Voimassaolo: - 31.07.2011

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Esa Juhani

Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish.
Timing:
M.Sc. degree.
Learning outcomes:
Student understands basics of electric function of single nerve cell, nerve and muscle cell nets and synapses. Knows most important nervous system transmitters, is able to build simple electrophysiological measurement systems and use histochemical methods suitable for nerve tissues.
Contents:
During the lectures the students are introduced with different subjects of neurobiology in groups or in pairs. Topics: neurons, neuronal tissues, sensory systems in various animal species and different biotopes. The practical work includes neurobiological and electrophysiological methods and instrumentation, computer models, and histochemical methods.

Learning activities and teaching methods:
80 h exercises (lectures included), final exam.
Recommended optional programme components:
751388A or equivalent knowledge.
Person responsible:
Prof. Esa Hohtola.
Other information:
The course will be arranged if sufficient resources are available.

750642S: Optimatisation and game theories, 3 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomi Juha

Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish / English.
Timing:
M. Sc. degree.
Contents:
How to apply optimising principle into ecological problems. The emphasis is on the evolutionary ecological questions and how to analyse them with different optimising methods. Practicals include simple optimization exercises and game theory problems. Course includes modelling project where biological problems are solved with the help of taught methods.
Learning activities and teaching methods:
14 h lectures, 14 h exercises, exam.
Target group:
Ecology students.
Recommended optional programme components:
Basic knowledge of ecology and evolution ecology, no necessary mathematical skills. Concept of derivative is basic in all optimising methods.
Assessment methods and criteria:
Modelling project and final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Juha Tuomi.
Other information:
The course will take place if sufficient resources are available.

750199P: Optional examinations in environmental protection, 2 - 6 op

Voimassaolo: - 31.12.2018

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumme, Jaakko Ilmari

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay750199P	Optional examinations in environmental protection (OPEN UNI)	2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 cr, depending on the books selected.
Language of instruction:
Most books are in English, exam in Finnish, Swedish, English or German.
Timing:
B.Sc. or M.Sc. degree.
Learning outcomes:
To understand biodiversity and its protection in global context.
Contents:
Depends on the book you select to read.
Learning activities and teaching methods:
Written exam, essay style. Biology public exam day also during the summer.
Target group:
Biology, geography, geology, environmental engineering , exchange students.
Recommended or required reading:
Books are listed on web page: http://www.oulu.fi/genet/biodiversity/diversity.
Assessment methods and criteria:
Exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Jaakko Lumme.

750399A: Optional examinations in environmental protection, 2 - 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumme, Jaakko Ilmari

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 cr, depending on books selected.
Language of instruction:
Most books are in English, exam in Finnish, Swedish, English or German.
Timing:
B.Sc. or M.Sc. degree.
Learning outcomes:
To understand biodiversity and its protection in global context.
Contents:
Depends on the book you select to read.
Learning activities and teaching methods:
Written exam, essay style.
Target group:
Biology, geography, geology, environmental engineering , exchange students.
Recommended or required reading:
Books are listed on web page: http://www.oulu.fi/genet/biodiversity/diversity.
Assessment methods and criteria:
Exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Jaakko Lumme.

750699S: Optional examinations in environmental protection, 2 - 6 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Lumme, Jaakko Ilmari
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 cr, depending on books selected.
Language of instruction:
Most books are in English, exam in Finnish, Swedish, English or German.
Timing:
B.Sc. or M.Sc. degree.
Learning outcomes:
To understand biodiversity and its protection in global context.
Contents:
Depends on the book you select to read.
Learning activities and teaching methods:
Written exam, essay style. Biology public exam day also during the summer.
Target group:
Biology, geography, geology, environmental engineering , exchange students.
Recommended or required reading:
Books are listed on web page: http://www.oulu.fi/genet/biodiversity/diversity.
Assessment methods and criteria:
Exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Jaakko Lumme.

750031Y: Orientation course for new students, 1 op

Voimassaolo: - 31.07.2017
Opiskelumuoto: General Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Vanhatalo, Minna-Liisa
Opintokohteen kielet: Finnish
Leikkaavuudet:

750032Y Orientation course for new students 2.0 op

ECTS Credits:
2 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 1 st autumn - spring.
Learning outcomes:
The aim of the course is to introduce new biology students to the university, academic studies, the department and the studies of biology, give knowledge of the social relevance of the degree programme.
Contents:
Students orientate themselves with the help of small groups to the academic studies. During the course students make their first personal study plan.
Learning activities and teaching methods:
Tutorials, presentations and representation seminar of major subjects.

Target group:
Compulsory to the biology students.
Assessment methods and criteria:
Participation to the tutorials, presentations, seminar and doing the personal study plan for the first year.
Grading:
Pass / Fail.
Person responsible:
Ph.Lic. Minna Vanhatalo.

756615S: Physiology of forest trees, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Anja Terttu Marjatta, Häggman, Hely Margaretha

Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Timing:
M.Sc. 1 st or 2 nd spring.
Learning outcomes:
The student is familiar with the basic features of forest tree physiology and further is also able understand and evaluate the value of practical applications.
Contents:
Forest trees are long-living, often wind-pollinated, tall organisms. Juvenile phase may be long and their adult phase is characterized by both reproductive and vegetative growth which causes competition on both carbohydrates and nutrients. Trees are also characterized by the physiological properties cold- and drought resistance, water relations, carbon allocation and mineral nutrition. Partly due to forest tree's economical importance biotechnological applications have been developed e.g. for production of health promoting substances or vegetative propagation. Forest trees are interesting from the point of molecular biology- what makes a tree tree? The course will cover these topics but the emphasis may vary during the years.
Learning activities and teaching methods:
Lectures, literature, final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Hely Häggman and Prof. Anja Hohtola.

756621S: Plant adaptations to herbivory, 2 op

Voimassaolo: - 31.07.2019

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomi Juha

Opintokohteen kielet: Finnish

ECTS Credits:
2 cr.
Timing:
M.Sc. degree.
Contents:
Plants have different means to avoid or tolerate herbivory. The emphasis is on the importance and evolution of chemical defence mechanisms and on the theory of optimal defence. The course will also introduce how herbivory can affect the interactions between plant species and biodiversity of a plant community.

Learning activities and teaching methods:
20 h lectures, 10 h seminar.
Recommended optional programme components:
752300A and 756623A or equivalent knowledge. Topic is closely related also with the courses 756618S and 752653S.
Person responsible:
Prof. Juha Tuomi.
Other information:
The course will take place if sufficient resources are available.

756332A: Plant developmental biology, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Häggman, Hely Margaretha

Opintokohteen kielet: Finnish

Leikkaavuudet:

756353A	Plant developmental biology	5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2 nd spring.
Learning outcomes:
The student has a comprehensive view on plant development and is aware of the recent methods used in the research of plant developmental biology.
Contents:
Modern methods in plant biology and especially the mutant or genetically modified plants have been in a key role to understand factors, mechanisms and regulation affecting plant development. The lectures include cell level information (cell division, growth and differentiation), embryo development, meristem formation and maintenance, organ development and cell death as a role of normal plant development. Moreover, the role of environmental factors in plant development will be covered.
Learning activities and teaching methods:
20 h lectures, home essay and final exam.
Target group:
Compulsory to BS (4-6 cr). For ECO 4-6 credits are compulsory which can include course 752337A (both lectures and practicals) or lectures from 752337A (2 cr) and this course (4 cr). Lectures from this course are optional to TEA in addition to course 752337A (both lectures and practicals) = 8 credits.
Recommended optional programme components:
755337A.
Recommended or required reading:
Lectures and supplementary material.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Hely Häggman.

752300A: Plant ecology, 7 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomi Juha

Opintokohteen kielet: Finnish

Leikkaavuudet:

756344A Plant ecology 5.0 op

ECTS Credits:
7 cr.
Language of instruction:
Lectures Finnish, Exercises Finnish / English.
Timing:
B.Sc. 2nd autumn. NNE.
Contents:
The main subject of this course is the heterogeneity of environment and the capacity of plants to adapt flexibly to different light and nutrient conditions. For carbon economy the main questions are variation in photosynthetic potential, extrinsic factors which restrict the photosynthesis and the structural and physiological adaptations to different light conditions. Nutrient economy is not only dependent on the soil of the habitat but also on the capacity of plant to change the ions from the surface of soil particles. Symbiosis has a great importance on nutrient economy of boreal plants. The balance between benefits and costs defines whether the symbiosis with the nitrogen fixation bacteria or with mycorrhizal fungi is beneficial for the plant or not. There is competition between plants for soil nutrients and for light. How is it possible that plants competing for the same basic nutrients can live in the same habitat? Isn't the niche theory valid for plants?
Learning activities and teaching methods:
34 h lectures and final exam, 40 h demonstrations and exercises in field and laboratory, 12 h seminars on the literature of plant ecology; 4 h final seminars.
Target group:
Compulsory to ECO, optional BT1.
Recommended optional programme components:
750124P and 752304A, or equivalent knowledge.
Assessment methods and criteria:
Lecture exam, laboratory diary and seminar presentation.
Grading:
1-5 / Fail.
Person responsible:
Prof. Juha Tuomi.

752359A: Plant ecology and forestry, 3,5 op

Voimassaolo: - 31.07.2014

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kubin, Eero

Opintokohteen oppimateriaali:
Metähallitus, , 1997
Snellman, V., , 1994
Meriluoto, Markku , , 1998

Opintokohteen kielet: Finnish

ECTS Credits:
3,5 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2 nd or 3 rd spring.

Learning outcomes:
Student learns main characters of forestry and forest sites, environmental impacts of forestry and is able to use the knowledge in different habitat inventory and mapping.
Contents:
Structure of forests, growth of forest trees and succession in different forest types. Introduction to methods in forest management. Ecological specialities of northern areas and sustainable use of natural resources.
Learning activities and teaching methods:
18 h lectures, field excursion in May, and final exam.
Recommended or required reading:
Metsätalouden ympäristöopas. Metsähallitus 1997, 130 p.; Snellman, V. (ed.) 1994: Tutkimus metsien kestävän käytön perustana. Metsäntutkimuslaitoksen tiedonantoja 253, 192 p.; Meriluoto, M. ja Soininen, T. 1998: Metsäluonnon arvokkaat elinympäristöt. Metsälehti Kustannus, 192 p. or Environmental Guidelines to Practical Forest Management. Metsähallitus 1998, 124 p. and other relevant literature in English.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Eero Kubin.

756304A: Plant ecophysiology in changing environments, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Huttunen, Satu

Opintokohteen oppimateriaali:

Lambers, Hans , , 1998
Prasad, M.N.V (ed.), , 1997
Hall, D.O. et al., , 1993

Opintokohteen kielet: Finnish

ECTS Credits:
5-10 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd or M.Sc. 1 st spring.
Learning outcomes:
After finishing the course student understands interactions between plant and environment, and has become acquainted to most important experimental methods in physiological plant ecology and student can apply research parameters. Student can apply the knowledge to plant production and environmental protection issues.
Contents:
The aim of the course is to initiate the students into the basics of plant ecophysiology in changing environments. The physical, chemical (abiotic) and biotic factors in the environment affects plant's growth and survival. Plant ecophysiology is an experimental science, which studies the physiological functions and adjustments underlining the ecological observations from the viewpoint of growth and survival. Different environmental stresses restrict the plant growth. Plant ecophysiology is experimental science which studies the physiological functions and regulation mechanisms on growth, survival, abundance and distribution. Effects of abiotic and biotic factors are studied. How elevated temperature, CO_2, drought stress, nutrient imbalance, air pollutants, metals, UV radiation and plant pathogens affect on plants' gas exchange, primary metabolism, carbon allocation and growth.
The exercises can also focus on the effects of environmental factors on photosynthesis, respiration, transport of photosynthetic products, water economy, energy economy and nutrient economy. Special features of ecophysiology of boreal plants are also dealt with.
Learning activities and teaching methods:
24 h lectures and demonstrations, 24 h exercises, final exam and report.
Target group:
ECOb, BSb, Ph.D. students.
Recommended optional programme components:
Course is related both to plant ecology and plant physiology basic studies.

Recommended or required reading:
Hans Lambers, F.Stuart Chapin III, Thijs L. Pons 1998: Plant Physiological Ecology. Springer Verlag. 540 s.,M.N. V. Prasad (Ed.): Plant Ecophysiology John Wiley & Sons. Inc. 542 p., Hall. D.O. et al. 1993 (or newer) Photosynthesis and production in a changing environment. A field and laboratory manual. Chapman & Hall UNEP. 464 p.
Assessment methods and criteria:
Seminar and report.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen and Dr. Kari Taulavuori.

756604S: Plant ecophysiology in changing environments, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Huttunen, Satu

Opintokohteen oppimateriaali:
Lambers, Hans , , 1998
Prasad, M.N.V (ed.), , 1997
Hall, D.O. et al., , 1993
Opintokohteen kielet: Finnish

ECTS Credits:
5-10 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd or M.Sc. 1 st spring.
Learning outcomes:
After finishing the course student understands interactions between plant and environment, and has become acquainted to most important experimental methods in physiological plant ecology and student can apply research parameters. Student can apply the knowledge to plant production and environmental protection issues.
Contents:
The aim of the course is to initiate the students into the basics of plant ecophysiology in changing environments. The physical, chemical (abiotic) and biotic factors in the environment affects plant's growth and survival. Plant ecophysiology is an experimental science, which studies the physiological functions and adjustments underlining the ecological observations from the viewpoint of growth and survival. Different environmental stresses restrict the plant growth. Plant ecophysiology is experimental science which studies the physiological functions and regulation mechanisms on growth, survival, abundance and distribution. Effects of abiotic and biotic factors are studied. How elevated temperature, CO_2, drought stress, nutrient imbalance, air pollutants, metals, UV radiation and plant pathogens affect on plants' gas exchange, primary metabolism, carbon allocation and growth.
The exercises can also focus on the effects of environmental factors on photosynthesis, respiration, transport of photosynthetic products, water economy, energy economy and nutrient economy. Special features of ecophysiology of boreal plants are also dealt with.
Learning activities and teaching methods:
24 h lectures and demonstrations, 24 h exercises, final exam and report.
Target group:
ECOb, BSb, Ph.D. students.
Recommended optional programme components:
Course is related both to plant ecology and plant physiology basic studies.
Recommended or required reading:
Hans Lambers, F.Stuart Chapin III, Thijs L. Pons 1998: Plant Physiological Ecology. Springer Verlag. 540 s.,M.N. V. Prasad (Ed.): Plant Ecophysiology John Wiley & Sons. Inc. 542 p., Hall. D.O. et al. 1993 (or newer) Photosynthesis and production in a changing environment. A field and laboratory manual. Chapman & Hall UNEP. 464 p.
Assessment methods and criteria:
Seminar and report.
Grading:

1-5 / Fail.
Person responsible:
Prof. Satu Huttunen and Dr. Kari Taulavuori.

752609S: Plant evolution and systematics, exercises, 2 op

Voimassaolo: - 31.08.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Annamari Markkola
Opintokohteen oppimateriaali:
Bell, Peter R. , , 2000
Willis, K. J. , , 2002
Rikkinen, Jouko , , 1999
Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish.
Timing:
M.Sc. degree. Cryptogams in spring and spermatophyte in autumn.
Learning outcomes:
Students will learn a general picture of the diversity of plants and several other kingdoms as well as to understand evolutionary history of plants.
Contents:
The course provides an insight into the evolution plants and evolutionary processes reflected by the systematic classification of the plant kingdom. Moreover, many other kingdoms (e.g. Fungi, Bacteria and Stramenopila) and their diversity are highlighted. The practicals concentrate on the structure of plants, fungi and algae as well as their life cycles.
Learning activities and teaching methods:
28 h exercises spring semester (cryptogams, 2 cr). 30 h exercises autumn semester (spermatophyte, 2 cr.); independen studying with the handout.
Target group:
M.Sc., compulsory to ECOb and BSb.
Recommended or required reading:
Literature: Handouts: Eskelinen, A., Taulavuori, K., Kauppi, M., Kauppi, A. & Markkola, A. 2008. 752309 Kasvien evoluutio ja systematiikka: itiöllisten eliöiden rakenne ja elinkierrot, Oulun yliopisto, and Kauppi, M. & Kauppi, A. 1999: Siemenkasvien järjestelmä ja luokittelun perusteet, 75209. - Oulun yliopiston kasvitieteen monisteita, Biologian laitos, Oulu. Supplementary reading: Bell, P.R. & Helmsley, A.R. 2000: Green Plants. Their origin and diversity. 2 nd ed. Cambridge University Press., Willis, K.J. & McElwain, J.C. 2002: The evolution of plants. Oxford University Press., Rikkinen, J. 1999: Leviä, sieniä ja leväsieniä, johdatus levien ja sienten monimuotoisuuteen. Yliopistopaino, Helsinki. 194 p.
Assessment methods and criteria:
Two course exams.
Grading:
1-5 / Fail.
Person responsible:
Dr. Annamari Markkola.

752309A: Plant evolution and systematics, lectures, 3 op

Voimassaolo: - 31.12.2019
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hyvärinen, Marko Tapio

Opintokohteen oppimateriaali:

Bell, Peter R. , , 2000
Willis, K. J. , , 2002
Rikkinen, Jouko , , 1999

Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3rd spring.
Learning outcomes:
Students will learn a general picture of the diversity of plants and several other kingdoms as well as to understand evolutionary history of plants.
Contents:
The course provides an insight into the evolution plants and evolutionary processes reflected by the systematic classification of the plant kingdom. Moreover, many other kingdoms (e.g. Fungi, Bacteria and Stramenopila) and their diversity are highlighted. Also basic principles and concepts of systematics and classification are presented.
Learning activities and teaching methods:
28 h lectures.
Target group:
Compulsory to ECO; optional to TEA and BS.
Recommended or required reading:
Literature: Handouts: Eskelinen, A., Taulavuori, K., Kauppi, M., Kauppi, A. & Markkola, A. 2008. 752309 Kasvien evoluutio ja systematiikka: itiöllisten eliöiden rakenne ja elinkierrot, Oulun yliopisto, and Kauppi, M. & Kauppi, A. 1999: Siemenkasvien järjestelmä ja luokittelun perusteet, 75209. - Oulun yliopiston kasvitieteen monisteita, Biologian laitos, Oulu. Supplementary reading: Bell, P.R. & Helmsley, A.R. 2000: Green Plants. Their origin and diversity. 2 nd ed. Cambridge University Press., Willis, K.J. & McElwain, J.C. 2002: The evolution of plants. Oxford University Press., Rikkinen, J. 1999: Leviä, sieniä ja leväsieniä, johdatus levien ja sienten monimuotoisuuteen. Yliopistopaino, Helsinki. 194 p.
Assessment methods and criteria:
Lecture exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Marko Hyvärinen.

756627S: Plant hormones, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Anja Terttu Marjatta, Häggman, Hely Margaretha

Opintokohteen oppimateriaali:

Taiz, Lincoln , , 2006

Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Timing:
M.Sc. 1 st or 2 nd spring, every second year.
Learning outcomes:
The student will be familiarized with the hormone action, understands hormone interactions and the significance of the hormone balance as well as the molecular mechanisms.
Contents:

Plant hormones are signalling molecules with profound effects on growth and development at trace quantities. Until quite recently plant development was considered to be regulated by auxins, gibberellins, cytokinins, ethylene and abscisic acid. New analytical and molecular methods have evidenced e.g. new plant hormone receptors and signalling pathways. A variety of new signalling molecules or hormone-like molecules such as brassinosteroids, oligisaccharins, jasmonic acid, salicylic acid and peptide hormones. During the lectures the mode of action of these hormones and the latest literature is used to gain the most recent view of the topic.
Learning activities and teaching methods:
20 h and exam.
Target group:
Suitable for BSb and ecophysiologists.
Recommended optional programme components:
752345A 9 cr.
Recommended or required reading:
Chapters concerning plant physiology from Taiz &Zeiger: Plant physiology - Most recent edition.
Grading:
1-5 / Fail.
Person responsible:
Prof. Anja Hohtola and prof. Hely Häggman.

752653S: Plant pathology, 4 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Huttunen, Satu
Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd year. Every second year (even numbered years).
Learning outcomes:
After finishing the course student has knowledge on most important plant diseases and epidemics, and student is able to apply basic plant pathology diagnostics.
Contents:
The most important abiotic and biotic plant diseases and their ecology. During the lectures and exercises, students become familiar with the main diseases of woody plants (forest pathology), agricultural, garden and wild plants. New research methods, disease diagnosis and plant protection aspects are studied and discussed.
Learning activities and teaching methods:
14 h lectures, 18 h exercises (demonstrations included), display and final exam.
Recommended or required reading:
Valkonen, J., Bremer, K. & Tapio, E. 1996: Kasvi sairastaa - oppi kasvitaudeista. Yliopistopaino. Helsinki University Press. 179 p.; Agrios, G.N. 1997: Plant Pathology 4 th edition 633p. Academic Press.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Satu Huttunen.

756619S: Plant reproductive biology, 2 - 4 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomi Juha

Opintokohteen kielet: Finnish

ECTS Credits:
2-4 cr.
Timing:
M.Sc. or Ph.D. degree.
Contents:
The main theme is to apply to special questions in plant evolution ecology, especially the evolution if different plant reproductive traits and ecological and genetic mechanisms that modify these traits. The course will cover topics such as plant sex allocation, pollination biology, inbreeding and avoidance of inbreeding depression, and the importance of frequency-dependent selection in the evolution of plant reproductive systems.
Learning activities and teaching methods:
Lectures, seminars and scientific articles.
Target group:
Suitable for M.Sc. and Ph.D. degree.
Person responsible:
Prof. Juha Tuomi.
Other information:
The course will take place if sufficient resources are available.

756638S: Plant symbiosis, 4 op

Voimassaolo: 01.08.2009 - 31.07.2013

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna-Maria Pirttilä

Opintokohteen kielet: English

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd spring or M.Sc. 1 st or 2 nd spring.
Learning outcomes:
The student knows the concept of symbiosis, understands the extent of diversity of plant symbiotic interactions both at the community and molecular level.
Contents:
Practically every plant is living in symbiosis with other organisms. Lately new forms of symbiosis have been discovered, extending the diversity of plant interactions, and the significance of plant symbiosis in biotechnology and biocontrol has increased. Various forms of symbiosis, their importance for the plant and interaction at the molecular level are covered.
Learning activities and teaching methods:
Lectures 20 h, 10 h laboratory work / demonstrations, exam.
Target group:
BS and ecophysiology students.
Recommended optional programme components:
Studies in plant physiology.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Anna Maria Mattila.

756338A: Plant symbiosis, 4 op

Voimassaolo: 01.08.2009 - 31.07.2012
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Anna-Maria Pirttilä
Opintokohteen kielet: English

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd spring or M.Sc. 1 st or 2 nd spring.
Learning outcomes:
The student knows the concept of symbiosis, understands the extent of diversity of plant symbiotic interactions both at the community and molecular level.
Contents:
Practically every plant is living in symbiosis with other organisms. Lately new forms of symbiosis have been discovered, extending the diversity of plant interactions, and the significance of plant symbiosis in biotechnology and biocontrol has increased. Various forms of symbiosis, their importance for the plant and interaction at the molecular level are covered.
Learning activities and teaching methods:
Lectures 20 h, 10 h laboratory work / demonstrations, exam.
Target group:
BS and ecophysiology students.
Recommended optional programme components:
Studies in plant physiology.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Anna Maria Mattila.

756323A: Population biology of plants, 5 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Tuomi Juha
Opintokohteen oppimateriaali:
Silvertown, Jonathan , , 2001
Opintokohteen kielet: Finnish
Leikkaavuudet:

756351A	Basics in population ecology	5.0 op
756651S	Basics in population ecology	5.0 op

ECTS Credits:
5 cr.
Language of instruction:
Finnish.

Timing:
BSc. 3 rd autumn.
Contents:
Demography and life history strategies of plants with emphasis on dynamics of structured plant populations in space and time. Moreover, ecological and evolutionary genetics of plants and interactions between plants and their environment are addressed. In exercises dynamics of populations is analysed with matrix models and simulation programs.
Learning activities and teaching methods:
32 h lectures, 18 h computer exercises, seminar, final exam.
Target group:
ECO: compulsory.
Recommended or required reading:
Silvertown & Charlesworth 2001: Introduction to Plant Population Biology (4 th edition), Blackwell Science .
Grading:
1-5 / Fail.
Person responsible:
Prof. Juha Tuomi.

755607S: Population ecology, 7 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Orell, Markku Ilmari

Opintokohteen oppimateriaali:

Morris, William F. , , 2002
Akçakaya, H. R. , , 1999
Lande, Russell , , 2003

Opintokohteen kielet: Finnish

Leikkaavuudet:

755626S	Advanced population ecology	6.0 op

ECTS Credits:
7 cr.
Language of instruction:
Finnish / English
Timing:
M.Sc. 1 st autumn.
Learning outcomes:
Student learns central methodologies how to derive population vital parameters from various kind of long-term data to apply the information to population viability analysis. The focus is to link modeling methods to real data.
Contents:
Introduction to the mechanisms and factors, which affect the structure, size and dynamics of a population. Topics include e.g. intraspecific relationships of species, predator-prey and parasite-host interactions, competition and the structure of environment and changes in it. Information of the relations between age distribution, birth rate, mortality rate and migration of the population are needed in viability analyses of a population. The aim of the course is to initiate into the methods by which the data of individuals is leaden to the parameters describing the condition and dynamics of the population.
Learning activities and teaching methods:
36 h lectures, 33 h computer exercises, independent work, exam.
Target group:
ECOz: compulsory.
Recommended or required reading:
Supplementary reading Morris, W.F & Doak, D.F. Quantitative conservation biology. Theory and practice of population viability analysis. Akçakaya, H.R., Burgman, M.A. & Ginzburg, L.R. Applied population ecology. Principles and computer exercises using RAMAS ® EcoLab. Lande, R., Engen,S. & Sæther, B-E. Stochastic population dynamics in ecology and conservation.
Assessment methods and criteria:

Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Markku Orell.

750615S: Practical training, 10 - 15 op

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5-9 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd summer, M.Sc. 1 st autumn.
Learning outcomes:
The aim of the course is for students to gain work experience in their own field of biology. Student applies the theoretical knowledge gained during the studies in practice.
Contents:
Minimum training period is two months full day work (5 cr.). Students obtain 5 - 9 credits depending on the length and intensity of the training. For three months trainig students can get 7 cr if the work is versatile.
Student can also do the training period during her exchange period or train otherwise abroad. For two months work abroad student gets 7 credits and 9 credits for three months work abroad.
Learning activities and teaching methods:
The trainee has to keep a journal of the work and its background factors. This journal and a summary of 6-8 pages have to be handed in to the responsible contact person after the training period. The summary should contain information on the training place, the ongoing research, the trainee's own work and its results. The journal is returned to the student after the summary has been approved. The student has also to be given a reference of the work. Offered training placements are announced in the department's office. Entering for the practical training is made in 3rd autumn. Normally, the student has to find him/herself a placement in public or private sectors or abroad.
Target group:
Compulsory to BS and ECO in the M.Sc. degree.
Recommended optional programme components:
About 80 credit amount of biology courses.
Assessment methods and criteria:
Journal and final report.
Grading:
Pass / Fail.
Person responsible:
The supervisors of the practical training are Prof. Markku Orell (ECOz), Prof. Satu Huttunen (ECOb), Prof. Hely Häggman (ECOb), Prof. Esa Hohtola (BSz) and Prof. Outi Savolainen (BSg).
Other information:
The student has to contact the professor and discuss about the suitability of the internship place in beforehand.

751660S: Preparation of an insect collection, 2 - 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Aspi

Opintokohteen kielet: Finnish

ECTS Credits:
2-6 cr / 100 species = 2 cr.
Timing:
M.Sc. degree.
Learning outcomes:
Preparation (including labels) and identification of self-collected insects.
Contents:
Preparation of a collection on one insect order. The specimens have to be preserved adequately, identified and provided with labels. In consultation with the responsible teacher.
Grading:
Pass / Fail.
Person responsible:
Dr. Jouni Aspi.

756602S: Pro gradu thesis, 40 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Department of Biology

Arvostelu: A,B,N,C,M,EX,L

Opintokohteen kielet: Finnish

Leikkaavuudet:

750657S	Biology subject teacher pro gradu thesis	20.0 op
750658S	Pro gradu thesis in biology	40.0 op

ECTS Credits:
20-40 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
Student knows the research methods in specific field of biology. She is conversant with her field of thesis and is able to scientific thinking, estimating the results, analysing, drawing conclusions and scientific communicating.
Contents:
Literary work which in general includes experimental research work. Student gets profoundly acquainted on certain special field in biology.
Learning activities and teaching methods:
Independent research work on a scientific subject in agreement with the responsible professor and under the supervision of the Department. The supervisors may be professors of the department, docents and other teachers and researchers who have the docent's status. The student may have several supervisors, the other supervisor may be from other department, university (also abroad) or from research institute. The subject must be agreed on with the professor in advance. The research work can contain fieldwork, laboratory work, theoretical work or work on collections in museum. The work always includes a literature survey. After having completed the thesis, the student writes the Maturity Exam. The dean will order the final examiners by the proposal of the professor. Department council accepts and grades the thesis on the basis of the final examiners' opinions.
Target group:
TEAb: compulsory 20 cr, ECOb and BSb: compulsory 40 cr.
Assessment methods and criteria:
Literary work.
Grading:
Approbatur - Laudatur / Fail.
Person responsible:
Professors.

753394A: Quantitative genetics and plant and animal breeding, 6 op

Voimassaolo: 01.08.2009 - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Savolainen Outi
Opintokohteen kielet: Finnish
Leikkaavuudet:

757616S Quantitative genetics and plant and animal breeding 5.0 op

ECTS Credits:
6 cr.
Language of instruction:
Finnish or English.
Timing:
B.Sc. 3rd or M.Sc. Even years, autumn.
Learning outcomes:
To know the basic theory of quantitative genetics, statistical methods and experimental settings, both from the point of view of breeding and evolution. Also, to understand the mutual dependence of human kind and the domesticated plants and animals, global consequences, threats and opportunities.
Contents:
Basic theory, heritability and its estimates, selection, maintenance of variability in evolution, QTL mapping, association mapping, GMO. Also: domestication of plants, and animals, conscious and unconscious levels of breeding, associated diseases, present breeding methods, including genetic modification, global consequences.
Learning activities and teaching methods:
Lectures, homeworks, mathematical and computer classes, seminar.
Target group:
Genetics students.
Recommended optional programme components:
After courses Molecular evolution 753x27A/S and Population genetics 753x14A/S.
Recommended or required reading:
Web page (in Finnish) http://www.oulu.fi/genet/jalostus
Assessment methods and criteria:
Home exam, controlled exam, homeworks, seminar.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen and Prof. Jaakko Lumme.

753694S: Quantitative genetics and plant and animal breeding, 6 op

Voimassaolo: 01.08.2009 - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Savolainen Outi
Opintokohteen kielet: Finnish
Leikkaavuudet:

757616S Quantitative genetics and plant and animal breeding 5.0 op

ECTS Credits:
6 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3rd or M.Sc. Even years, autumn.

Learning outcomes:
To know the basic theory of quantitative genetics, statistical methods and experimental settings, both from the point of view of breeding and evolution. Also, to understand the mutual dependence of human kind and the domesticated plants and animals, global consequences, threats and opportunities.
Contents:
Basic theory, heritability and its estimates, selection, maintenance of variability in evolution, QTL mapping, association mapping, GMO. Also: domestication of plants, and animals, conscious and unconscious levels of breeding, associated diseases, present breeding methods, including genetic modification, global consequences.
Learning activities and teaching methods:
Lectures, homeworks, mathematical and computer classes, seminar.
Target group:
BTg.
Recommended optional programme components:
Courses 753x27A/S and 753x14A/S
Recommended or required reading:
Web page (in Finnish) http://www.oulu.fi/genet/jalostus
Assessment methods and criteria:
Home exam, controlled exam, homeworks, seminar.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen and Prof. Jaakko Lumme.

751674S: Reindeer biology, 3 op

Voimassaolo: - 31.07.2012

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Saarela, Seppo Yrjö Olavi, Orell, Markku Ilmari

Opintokohteen oppimateriaali:
Huttu-Hiltunen, V., Nieminen, M., Valmari, A. & Westerling, B., , 1993
Nieminen, Mauri , , 1994

Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd autumn. Odd numbered years.
Learning outcomes:
After completing the course the student is able to apply his/her knowledge in basic studies in biology to understand special adaptive traits in the ecology (pastureland ecology) and physiology (development and growth) of semi-domesticated reindeer in the arctic habitats. In the course the student gets updated information on reindeer husbandry and the legislation. In addition to the student is able to attach great value to reindeer not only as a biological but also its importance for society of northern latitudes.
Contents:
Special topics are focused on the ecology and physiology of the reindeer, its development, growth and health in the wild, and its Adaptation to present conditions of reindeer husbandry. Legislation of reindeer husbandry. Students have to pass a book exam in advance to be accepted to this course.
Learning activities and teaching methods:
8 h lectures, 20 h exercises, literature, final exam.
Recommended or required reading:
Book exam before the course: Huttu-Hiltunen, V., Nieminen, M., Valmari, A. & Westerling, B. 1993: Porotalous. Opetushallitus, 220 p. and Nieminen, M.1994: Poro, ruumiinrakenne ja elintoiminnat, 169 p., or relevant literature in English.
Person responsible:
Prof. Markku Orell and Prof. Seppo Saarela.

Other information:
The course will take place if sufficient resources are available.

750661S: Research group seminar, 2 - 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
2-4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. or Ph.D. degree.
Contents:
Workshop type seminars in different fields of biology help by research groups. Advanced or postgraduate studies. 2 cr. per different seminar series.
Learning activities and teaching methods:
26 h seminars / workshops.
Target group:
M.Sc. or Ph.D. degree.
Assessment methods and criteria:
Active participation to seminars.
Grading:
Pass / Fail.
Person responsible:
Professors.

750662J: Research plan seminar, 1 - 2 op

Opiskelumuoto: Post-graduate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomi Juha

Opintokohteen kielet: English

Leikkaavuudet:

920004J-02 Research Plan and Seminar, seminar 1.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
4 cr.
Language of instruction:
English.
Timing:
Ph. Lic. and Ph.D. students. Special announcement.
Learning outcomes:
Student can make clear well-grounded research plan and is able to evaluate other students' plans.
Contents:
Seminars on the research plans of post-graduate students Presentation of own research plan, two opponent times and participation in 8 seminars in all. Student has to give seminar presentation within one year after starting Ph.D. studies.
Target group:
Compulsory to Ph.D. students.

Person responsible:
Prof. Juha Tuomi and Dr. Laura Kvist.

754618S: Research seminar in fish ecology, 2 - 4 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Muotka, Timo Tapani
Opintokohteen kielet: Finnish
Leikkaavuudet:

750653S	Special seminar in biology	2.0 op

ECTS Credits:
2-4 cr.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
The course aims to give students knowledge of fish ecology research done in University of Oulu and interest organizations. Lectures are given by university researchers, postgraduate students and guest lectures.
Contents:
Different topics.
Learning activities and teaching methods:
20 h lectures, 2-4 home essays from the lecture topics.
Recommended optional programme components:
Course 751307A or equivalent knowledge.
Recommended or required reading:
Course material.
Assessment methods and criteria:
Home essays.
Grading:
Pass / Fail.
Person responsible:
Prof. Timo Muotka.

750613S: Research training, 2 - 15 op

Opiskelumuoto: Advanced Studies
Laji: Practical training
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-14 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. degree.
Learning outcomes:
Student applies the education given knowledge and skills in working life to gain hands-on experience.
Contents:

Work on special projects in the different biology research groups at the department or elsewhere or independent project work including field and/or laboratory work or work at the biological stations. The work is not included to other study modules in biology.
Learning activities and teaching methods:
The topic and the study plan have to be agreed on in advance. The student has to keep diary and prepare a report on the work.
Assessment methods and criteria:
Report.
Grading:
Pass / Fail.
Person responsible:
Professor of the student's major subject.

750313A: Research training, 2 - 15 op

Opiskelumuoto: Intermediate Studies
Laji: Practical training
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-14 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. degree.
Learning outcomes:
Student applies the education given knowledge and skills in working life to gain hands-on experience.
Contents:
Work on special projects in the different biology research groups at the department or elsewhere or independent project work including field and/or laboratory work or work at the biological stations. The work is not included to other study modules in biology.
Learning activities and teaching methods:
The topic and the study plan have to be agreed on in advance. The student has to keep diary and prepare a report on the work.
Assessment methods and criteria:
Report.
Grading:
Pass / Fail.
Person responsible:
Professor of the student's major subject.

756607S: Restoration ecology, 2 - 6 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Tolvanen, Anne Kristiina
Opintokohteen kielet: Finnish

ECTS Credits:
2-6 cr.
Timing:
M.Sc. degree.

Learning outcomes:
Lectures: the student understands the ecological principles of restoration and remembers the basics of restoration options in different ecosystems. Exercises and excursion: the student is able to evaluate the need for restoration and possibilities of an ecosystem to regenerate, and apply the restoration techniques in practical restoration planning.
Contents:
Land-use impacts and ecosystem malfunctions caused by humans, ecological principles of restoration, prevention and restoration of manmade damage in the ecosystems. Examples from restoration options and practical techniques in terrestrial and aquatic ecosystems, and cultural landscapes.
Learning activities and teaching methods:
24 h lectures, exercises and an excursion. Total 45 h.
Target group:
ECO.
Recommended or required reading:
Andre Clewell, James Aronson 2008: Ecological Restoration, Principles, Values, and Structure of an Emerging Profession, Island Press, 230 p. and articles in the Restoration Ecology journal.
Grading:
1-5 / Fail.
Person responsible:
Prof. Anne Tolvanen.

756618S: Secondary metabolism of plants, 4 op

Voimassaolo: - 31.07.2014

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Anja Terttu Marjatta

Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Timing:
M.Sc. 1 st or 2 nd spring, odd years.
Learning outcomes:
The students will be made familiar with plant secondary metabolism, and the biosynthetic pathways involved. The possible role of secondary metabolites will be touched upon.
Contents:
General introduction to phenolic compounds, terpenoids, sterols, alcaloids; their synthesis and meaning for the plant. The economic importance and potential of plant secondary metabolites as fine chemicals and important traits of plants concerning quality and resistance will be discussed. The technological and economic feasibility of the large-scale culture of plant cells for the production of secondary metabolites are touched. Introduction to isolation and processing of useful metabolites will be discussed.
Learning activities and teaching methods:
Lectures and seminars, literature, final exam.
Recommended or required reading:
Literature agreed on lectures.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Anja Hohtola .

753692S: Seminar in ecological and conservation genetics, 4 op

Voimassaolo: 01.08.2009 - 31.07.2013

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Ruokonen, Minna Johanna

Opintokohteen oppimateriaali:

Conner, Jeffrey K. , , 2004
Frankham, Richard , , 2002

Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. studies, 1 st or 2 nd year, spring.
Learning outcomes:
The student will lean to apply genetics and to understand the role of genetic factors in ecological and conservation issues.
Contents:
Genetics of ecologically important traits, interaction between the species and between the environment and the species. Factors related to fitness, importance of genetic factors, especially in a changing environment. Genetic diversity as a part of biodiversity and how to preserve it. Genetics of threatened species.
Learning activities and teaching methods:
Reading literature on the topic, group discussions, independent working, and seminar presentation.
Target group:
BSg, other biologists (BSz,b, ECOz,b, TEA) as well as others interested, Ph.D. students.
Recommended optional programme components:
Courses Concepts of genetics (753124P, 753104P), Molecular evolution (753x27A/S) and Basics in population genetics (753351A).
Recommended or required reading:
Recent scientific articles. Additional reading: Conner, J.K., Hartl, D.L.: A Primer of Ecological Genetics, and Frankham, R., Ballou, J.D., Briscoe, D.A.: Introduction to Conservation Genetics. Cambridge University Press.
Assessment methods and criteria:
Participation into the seminars, seminar presentation.
Grading:
Pass / Fail.
Person responsible:
Dr. Minna Ruokonen.
Other information:
The course will take place if sufficient resources are available.

752695S: Seminar on special topics in botany, 2 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750653S	Special seminar in biology	2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2 cr.
Language of instruction:
Finnish / English.
Timing:

M.Sc., Ph.D. degree.
Contents:
Current special problems in botany. Lectures by specialists and latest literature. Topics vary every year.
Target group:
BSb and ECOb.
Person responsible:
Professors and docents.

756633S: Soil biology, 3 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Sutinen, Marja-Liisa Kaarina

Opintokohteen oppimateriaali:
Mälkönen, E., , 2003
Bardgett, Richard D. , , 2005

Opintokohteen kielet: Finnish

ECTS Credits:
2 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. degree.
Contents:
Soil formation, physical properties and chemical properties. Course main themes are glacier carried soil and formations, soil microclimate and water relations, nutrients, soil characters as plant distribution affecting factor, forest regeneration and tree line. Exercises include soil measuring methods.
Learning activities and teaching methods:
16-18 h lectures, 2-4 h exercises, final exam.
Recommended optional programme components:
Recommended for the course 756612S.
Recommended or required reading:
Mälkönen, E., (2003) Metsämaa ja sen hoito. Kustannusosakeyhtiö Metsälehti.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.

Person responsible:
Dr. Marja-Liisa Sutinen.

756612S: Soil ecology, 3 - 5 op

Voimassaolo: - 31.07.2019

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Annamari Markkola

Opintokohteen oppimateriaali:
Smith, Sally E. , , 1997
Van der Hejden, M.G.A. & Sanders. I.R., , 2003

Bardgett, Richard D. , , 2005
Opintokohteen kielet: Finnish

ECTS Credits:
3-5 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd year spring.
Learning outcomes:
Student will learn common basics of soil organisms and their interactions.
Contents:
Current soil ecological research and methods, planning and conducting experiments.
Learning activities and teaching methods:
Lectures, exercises, seminars, exam.
Recommended or required reading:
Additional reading Smith, S.E. & Read, D.J. 1997. Mycorrhizal symbiosis. Academic Press, San Diego and London. 605 p.; Van der Hejden, M.G.A. & Sanders, I.R. (eds) 2002. Mycorrhizal ecology. Springer, Berlin. 469 p.; Bardgett, R. D. 2005. The biology of soil: a community and ecosystem approach. Biology of Habitats series. Oxford University Press, Oxford, UK. 256 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Annamari Markkola.
Other information:
The course will take place if sufficient resources are available.

751648S: Special course in aquatic invertebrates, 2 - 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

754627S Special course in aquatic invertebrates 5.0 op

ECTS Credits:
2-4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd year. Every third year.
Learning outcomes:
Quantitative research material sampling of benthic invertebrates, identification of the species in various inland waters (mainly stream environments).
Contents:
Sampling and research material training.
Learning activities and teaching methods:
20-40 h lectures and exercises (data analysis and reporting).
Target group:
The course is primarily aimed at students specialising in the benthic invertebrates; maximum of 8 students admitted.
Recommended optional programme components:
Courses 751307A and 754308A.

Recommended or required reading:
Course material.
Assessment methods and criteria:
Report.
Grading:
Pass / Fail.
Person responsible:
Prof. Timo Muotka.
Other information:
The course will take place if sufficient resources are available.

754619S: Special course in fish ecology, 8 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
8 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
Guide students in independent research work.
Contents:
The course consists of four sections: 1. Field course where student gather in groups experimental and correlative field materials, 2. Statistical analysis of the data, 3. Making a research report, and 4. Final seminar where the results and conclusions are presented.
Learning activities and teaching methods:
40-60 h field work, 4-6 h supervised computer exercises, 80 h independent work (analysis, report making), 10-15 h final seminar.
Recommended optional programme components:
Courses 751307A and 754618S or equivalent knowledge.
Recommended or required reading:
Course material.
Assessment methods and criteria:
Report.
Grading:
Pass / Fail.
Person responsible:
Prof. Timo Muotka.
Other information:
The course will take place if sufficient resources are available.

752691S: Special course/Signal transduction in plants, 2 - 4 op

Voimassaolo: - 31.07.2014

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Häggman, Hely Margaretha

Opintokohteen oppimateriaali:
Buchanan, Bob B. , , 2000
Opintokohteen kielet: Finnish

ECTS Credits:
2-4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd spring.
Learning outcomes:
The student knows the basic mechanisms and components involved in signal transduction. She / he is also able to read and understand the plant signal transduction pathways not covered during the course.
Contents:
The course will cover the basics of plant signal transduction and also some specific examples such as light induced signal transduction, plant hormones as signalling molecules, signalling to regulate functioning of stomata and plant developmental biology or biological interactions related signalling.
Learning activities and teaching methods:
20 h lectures, independent work, presentations, workshops.
Target group:
Suitable for BS subject majors and ecophysiologists.
Recommended optional programme components:
752345A, 756332A and lectures of 752682S or equivalent knowledge helps in following the course.
Recommended or required reading:
Parts from book: Buchanan, Gruissern, Jones 2000: Biochemistry & Molecular Biology of Plants. Courier Companies Inc. 1367 s. and other literature provided during the course.
Person responsible:
Prof. Hely Häggman.
Other information:
The course will take place if sufficient resources are available.

753613S: Special seminar in genetics, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750653S	Special seminar in biology	2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
4 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd year.
Contents:
Subject varies and will be announced each year separately.
Learning activities and teaching methods:
24 h lectures, literature, 40 h independent studies, final exam.
Recommended optional programme components:
753124P or equivalent knowledge.
Person responsible:
Professors and docents of genetics.

752667S: Special topics in plant ecology, 2 - 5 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

750654S Special lecture in biology 2.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-5 cr.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd year.
Contents:
Subject varies every year and will be announced separately.
Person responsible:
Professors and docents.

754621S: Specific topics on hydrobiology, 4 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Muotka, Timo Tapani
Opintokohteen kielet: Finnish
Leikkaavuudet:

754624S Specific topics on hydrobiology 5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
4 cr.
Language of instruction:
Finnish.
Timing:
M.Sc. 1 st or 2 nd year.
Learning outcomes:
Give student advanced skills in variable subjects in hydrobiology.
Contents:
Variable topics. Mainly species identification.
Learning activities and teaching methods:
Laboratory exercise, sample taking, in the field about 20 h.
Recommended or required reading:
Specific for every course topic.
Assessment methods and criteria:
Course specific.
Person responsible:
Prof. Timo Muotka.
Other information:
The course will take place if sufficient resources are available.

754620S: Stream biology, 4 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Muotka, Timo Tapani
Opintokohteen oppimateriaali:
Allan, J. David , , 2007
Opintokohteen kielet: Finnish
Leikkaavuudet:

754628S Stream ecology 5.0 op

ECTS Credits:
4 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd year / M.Sc. 1 st or 2 nd year. Every 2 nd year.
Learning outcomes:
Basic principles of the structure and function of aquatic ecosystems.
Contents:
Interspecific competition, predation and environmental disturbance as factors regulating aquatic communities. Prey choice mechanisms of aquatic predators and avoidance behaviour of prey species. Trophic interactions in aquatic ecosystems. Biomanipulation as a management tool in water protection.
Learning activities and teaching methods:
20 h lectures, home essays.
Recommended optional programme components:
Course 754308A or equivalent knowledge.
Recommended or required reading:
Handouts and Allan, J. D. & Castillo, M. M. (2007). Stream Ecology: Structure and Function of Running Waters. Springer Verlagen.
Assessment methods and criteria:
Home essays.
Grading:
Pass / Fail.
Person responsible:
Prof. Timo Muotka.

754320A: Stream ecology, 4 op

Voimassaolo: - 31.12.2019
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Muotka, Timo Tapani
Opintokohteen oppimateriaali:
Allan, J. David , , 2007
Opintokohteen kielet: Finnish
Leikkaavuudet:

754628S Stream ecology 5.0 op

ECTS Credits:
3 cr.

Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd year, M.Sc. 1 st or 2 nd year. Every 2 nd year.
Learning outcomes:
Basic principles of the structure and function of aquatic ecosystems.
Contents:
Interspecific competition, predation and environmental disturbance as factors regulating aquatic communities. Prey choice mechanisms of aquatic predators and avoidance behaviour of prey species. Trophic interactions in aquatic ecosystems. Biomanipulation as a management tool in water protection.
Learning activities and teaching methods:
20 h lectures, home essays.
Recommended optional programme components:
Course 754308A or equivalent knowledge.
Recommended or required reading:
Handouts and Allan, J. D. & Castillo, M. M. (2007). Stream Ecology: Structure and Function of Running Waters. Springer Verlagen.
Assessment methods and criteria:
Home essays.
Grading:
Pass / Fail.
Person responsible:
Prof. Timo Muotka.

756626S: Stress physiology of plants, 4 op

Voimassaolo: - 31.07.2020

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Häggman, Hely Margaretha

Opintokohteen kielet: Finnish

ECTS Credits:
4 cr.
Timing:
M.Sc. 1 st or 2 nd spring, arranged every second year if resources allow.
Learning outcomes:
The student will understand how the stress will affect plant metabolism and how the plant is able to cope with it.
Contents:
The course will cover both abiotic and biotic stresses affecting plant metabolism at biochemical or molecular level. The signal transduction caused by the stresses will be followed as well as plant defence reactions. Plant pathogen biocontrol methods are introduced.
Learning activities and teaching methods:
20 h lectures, independent exercises or seminar and exam.
Target group:
Mainly for BS but also suitable for ECO.
Recommended optional programme components:
Course 752653S completes this course.
Recommended or required reading:
Lecture handouts and literature given during the course.
Grading:
1-5 / Fail.
Person responsible:
Prof. Hely Häggman.

756622S: Structure and dynamics of plant communities, 5 op

Voimassaolo: - 31.07.2017
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari-Heikki Oksanen
Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.
Timing:
M.Sc. degree.
Learning outcomes:
The student knows the most important processes controlling the structure and dynamics of plant communities, and the major theories concerning those processes. The students can apply theories in the research of plant communities.
Contents:
Models on structure of communities, in particular the neutral models, and assembly rules. The estimation of biological diversity. The relationship between species and their environment, and its consequences: the analysis of ecological communities and bioindication. The course follows the scientific development, and its contents will be adjusted for the current scientific literature, and the exact contents will vary among years.
Learning activities and teaching methods:
24 h lectures, essay.
Recommended or required reading:
Current article collection and course handout.
Person responsible:
Prof. Jari Oksanen.
Other information:
The course will take place if sufficient resources are available.

756605S: Studies in Botany in other Finnish Universities, 0 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

750655S Studies in other Finnish universities 1.0 op

Voidaan suorittaa useasti: Kyllä

Contents:
Botanical studies done in other Finnish universities.
Person responsible:
Prof. Satu Huttunen or Prof. Hely Häggman.

757605S: Studies in Genetics in other Finnish Universities, 0 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Savolainen Outi

Opintokohteen kielet: Finnish

Leikkaavuudet:

750655S Studies in other Finnish universities 1.0 op

Voidaan suorittaa useasti: Kyllä

Contents:
Genetical studies done in other Finnish universities.
Person responsible:
Prof. Outi Savolainen.

755605S: Studies in Zoology in other Finnish Universities, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750655S Studies in other Finnish universities 1.0 op

Voidaan suorittaa useasti: Kyllä

Contents:
Zoological studies done in other Finnish universities.
Person responsible:
Prof. Esa Hohtola or Prof. Markku Orell.

756105P: Studies in botany in other Finnish universities, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750155P Studies in other Finnish universities 1.0 op

Voidaan suorittaa useasti: Kyllä

Contents:
Botanical studies done in other Finnish universities.
Person responsible:
Prof. Satu Huttunen or Prof. Hely Häggman.

756305A: Studies in botany in other Finnish universities, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750355A Studies in other Finnish universities 1.0 op

Voidaan suorittaa useasti: Kyllä

Contents:
Botanical studies done in other Finnish universities.
Person responsible:
Prof. Satu Huttunen or Prof. Hely Häggman.

757105P: Studies in genetics in other Finnish universities, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: Finnish

Leikkaavuudet:

750155P Studies in other Finnish universities 1.0 op

Voidaan suorittaa useasti: Kyllä

Contents:
Genetical studies done in other Finnish universities.
Person responsible:
Prof. Outi Savolainen.

757305A: Studies in genetics in other Finnish universities, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: Finnish

Leikkaavuudet:

750355A Studies in other Finnish universities 1.0 op

Voidaan suorittaa useasti: Kyllä

Contents:
Genetical studies done in other Finnish universities.
Person responsible:
Prof. Outi Savolainen.

755105P: Studies in zoology in other Finnish universities, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750155P Studies in other Finnish universities 1.0 op

Voidaan suorittaa useasti: Kyllä

Contents:
Zoological studies done in other Finnish universities.
Person responsible:
Prof. Esa Hohtola or Prof. Markku Orell.

755305A: Studies in zoology in other Finnish universities, 0 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

750355A Studies in other Finnish universities 1.0 op

Voidaan suorittaa useasti: Kyllä

Contents:
Zoological studies done in other Finnish universities.
Person responsible:
Prof. Esa Hohtola or Prof. Markku Orell.

752656S: Taxonomy and ecology of plants, 2 - 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-4 cr.
Timing:
M.Sc. 1 st or 2 nd year. See announcements at the notice board of the department.
Learning outcomes:
By passing this course a student is able to identify species of the given taxonomic group, understand the ecology of the species, and know their distribution and systematic position.
Contents:
A laboratory or field course. Species identification by means of macroscopic or microscopic characters. Making a collection of specimens, sampling and handling of the material. Preparation of herbarium specimens. Field instruction on species mapping and quantitative approach. Species' characters (morphological and chemical). Inventory methods on red listed species. Alternative themes (lichens, polypores and other fungi, and bryophytes).
Learning activities and teaching methods:
Demonstrations, identification exercises and field exercises.
Target group:
Students of plant ecology.
Recommended optional programme components:

752303A or equivalent knowledge.
Recommended or required reading:
Material given in the course.
Assessment methods and criteria:
Species exam.
Grading:
1-5 / Fail.
Person responsible:
Botanical museum.
Other information:
Course subject vary (lichens, polypore and other fungi, bryophytes).

755311A: Thermal biology and energetics, 3 op

Voimassaolo: - 31.07.2012

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Esa Juhani

Opintokohteen oppimateriaali:
Cossins, Andrew R. , , 1987
Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Timing:
B.Sc. 3 rd or M.Sc. 1 st spring. Takes place in turns with the course 751x57A/S.
Learning outcomes:
After completing the course the student 1) can explain the physical concept of temperature and the effect of temperature on biological reactions rates, 2) understands the mechanisms of heat transfer between the organism and the environment, 3) knows the physiological and behavioural mechanisms of animal temperature tolerance and temperature regulation, including their adaptations, 4) knows the basic concepts of energetics and can solve mathematical problems related to animal energetics.
Contents:
The physical concept of temperature, effects of temperature on reaction rates, heat transfer between the organism and the environment (conduction, convection, radiation, evaporation) and adaptations of heat transfer, biological temperature, temperature and its measurement in biology, temperature regulation, poikilothermy and homeothermy, endothermy and its evolution, thermal adaptation, basic concepts of energetics, energy flow in biology, energy expenditure and its measurement in animals, allometry of energy expenditure, special energetic adaptations (e.g. hibernation, torpor, winter sleep), energetics of flight and migration. Details see: http://cc.oulu.fi /~ehohtola/tb
Learning activities and teaching methods:
32 h lectures, 8 h guided familiarisation to literature and 4 h mathematical exercises, exam.
Target group:
Optional TEA, ECO, AO.
Recommended optional programme components:
751388A and 750124P are recommended but do not have to be completed. Basics of chemistry are needed. Can be completed as part of course the Winter Ecology and Physiology.
Recommended or required reading:
Given in the course, Supplementary reading Cossins, A.R. & Bowler, K. 1987: Temperature Biology of Animals, Chapman & Hall, London 339 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Esa Hohtola.
Other information:
The course will take place if sufficient resources are available.

755611S: Thermal biology and energetics, 3 op

Voimassaolo: - 31.07.2012
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Hohtola, Esa Juhani
Opintokohteen oppimateriaali:
Cossins, Andrew R. , , 1987
Opintokohteen kielet: Finnish

ECTS Credits:
3 cr.
Timing:
B.Sc. 3 rd or M.Sc. 1 st spring. Takes place in turns with the course 751x57A/S.
Learning outcomes:
After completing the course the student 1) can explain the physical concept of temperature and the effect of temperature on biological reactions rates, 2) understands the mechanisms of heat transfer between the organism and the environment, 3) knows the physiological and behavioural mechanisms of animal temperature tolerance and temperature regulation, including their adaptations, 4) knows the basic concepts of energetics and can solve mathematical problems related to animal energetics.
Contents:
The physical concept of temperature, effects of temperature on reaction rates, heat transfer between the organism and the environment (conduction, convection, radiation, evaporation) and adaptations of heat transfer, biological temperature, temperature and its measurement in biology, temperature regulation, poikilothermy and homeothermy, endothermy and its evolution, thermal adaptation, basic concepts of energetics, energy flow in biology, energy expenditure and its measurement in animals, allometry of energy expenditure, special energetic adaptations (e.g. hibernation, torpor, winter sleep), energetics of flight and migration. Details see: http://cc.oulu.fi/~ehohtola/tb
Learning activities and teaching methods:
32 h lectures, 8 h guided familiarisation to literature and 4 h mathematical exercises, exam.
Target group:
BS, TEA, ECO: optional.
Recommended optional programme components:
751388A and 750124P are recommended but do not have to be completed. Basics of chemistry are needed. Can be completed as part of course the Winter Ecology and Physiology.
Recommended or required reading:
Given in the course, Supplementary reading Cossins, A.R. & Bowler, K. 1987: Temperature Biology of Animals, Chapman & Hall, London 339 p.
Assessment methods and criteria:
Final exam.
Grading:
1-5 / Fail.
Person responsible:
Prof. Esa Hohtola.
Other information:
The course will take place if sufficient resources are available.

750618S: Thursday seminar in biology, 2 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Hohtola, Esa Juhani
Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2 cr.
Language of instruction:
English.
Timing:
M.Sc. 1 st and 2 nd year, Ph.Lic. or Ph.D. degree.
Learning outcomes:
Students get knowledge about the current results and theories in biology.
Contents:
Lectures in English on current topics in biology given by guest lecturers. See seminar programme: http://cc.oulu.fi/~ehohtola/tose.htm
Learning activities and teaching methods:
Guest lectures on Thursdays 12 am-1 pm in the auditorium YB 210 (Kuusamonsali). See notice boards for the lecture schedule. Attendance at 10 lectures with a one-page report for each corresponds to 2 ECTS credits.
Target group:
Undergraduate and postgraduate students interested in biology.
Assessment methods and criteria:
10 participations and 10 one page long reports.
Grading:
Pass / Fail.
Person responsible:
Prof. Esa Hohtola.

750033Y: Tutorial for new students, 1 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Vanhatalo, Minna-Liisa

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2 cr.
Language of instruction:
Finnish.
Timing:
B.Sc. 3 rd autumn /M.Sc. 1 st autumn.
Learning outcomes:
Course develops students' skills to guide, make presentations, work in group and organize. It also advances planning, arrangement and guidance abilities as well as responsibility.
Contents:
The student guides a group of new students during the orientation course introducing them to the university, academic learning environment, the department, curriculum and other students with the help of small group meetings and presentations.
Learning activities and teaching methods:
Tutorials and presentations.
Target group:
Optional studies.
Recommended optional programme components:
Course 750031Y.
Assessment methods and criteria:
Tutorials for new students.
Grading:
Pass / Fail.
Person responsible:
Ph.Lic. Minna Vanhatalo.

751668S: Wildlife management and game animal ecology, 6 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Jouni Aspi
Opintokohteen kielet: Finnish
Leikkaavuudet:

755628S Wildlife management and game animal ecology 5.0 op

ECTS Credits:
7 cr.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd or M.Sc. 1 st autumn. NNE.
Learning outcomes:
After carrying out the study module the student will be able to recognize special ecological traits of the game animals and relate them to the general ecological framework. The student will be also to appraise the basics of durable hunting of game animals. The student will be also able to appraise the basics of durable hunting of game animals and critically judge different wildlife management methods from the scientific starting point.
Contents:
The ecology of game species, their life histories, population dynamics and predator-prey relationships. Hunting ecology: man as predator, management and hunting of the game species. The impact of forestry on the game species' populations. Students are also introduced to wildlife management in practice and to the social aspect of wildlife-human relationship.
Learning activities and teaching methods:
24 h lectures, one-day excursion to a game breeding area, seminar with written reports and final exam.
Assessment methods and criteria:
Seminar with report and final exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Jouni Aspi, Dr. Kari Koivula.
Other information:
The course will take place if sufficient resources are available.

751368A: Wildlife management and game animal ecology, 6 op

Voimassaolo: - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Jouni Aspi
Opintokohteen kielet: Finnish
Leikkaavuudet:

755328A Wildlife management and game animal ecology 5.0 op

ECTS Credits:
7 cr.
Language of instruction:
Finnish / English.
Timing:

B.Sc. 3 rd or M.Sc. 1 st autumn. NNE.
Learning outcomes:
After carrying out the study module the student will be able to recognize special ecological traits of the game animals and relate them to the general ecological framework. The student will be also to appraise the basics of durable hunting of game animals. The student will be also able to appraise the basics of durable hunting of game animals and critically judge different wildlife management methods from the scientific starting point.
Contents:
The ecology of game species, their life histories, population dynamics and predator-prey relationships. Hunting ecology: man as predator, management and hunting of the game species. The impact of forestry on the game species' populations. Students are also introduced to wildlife management in practice and to the social aspect of wildlife-human relationship.
Learning activities and teaching methods:
24 h lectures, one-day excursion to a game breeding area, seminar with written reports and final exam.
Assessment methods and criteria:
Seminar with report and final exam.
Grading:
1-5 / Fail.
Person responsible:
Dr. Jouni Aspi, Dr. Kari Koivula.
Other information:
The course will take place if sufficient resources are available.

750625S: Winter ecology and physiology, 3 - 8 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Taulavuori

Opintokohteen oppimateriaali:
Havas, Paavo , , 1987
Marchand, Peter J. , , 1996

Opintokohteen kielet: English

Leikkaavuudet:

750677S Winter ecology 5.0 op

ECTS Credits:
3-8 cr.
Language of instruction:
English.
Timing:
B.Sc. 3 rd or M.Sc. 1 st spring. NNE.
Learning outcomes:
Student obtains basic knowledge of animal and plant acclimations and adaptations to winter, and can evaluate the effects of cold temperatures and snow on overwintering, and learns central methodology in winter ecology and physiology.
Contents:
Three independent units: 1) Thermal biology and energetics 3 cr (32 h lectures and 4 h exercises); 2) Winter ecology and physiology course (7 h lectures and 13 h laboratory practicals and 4 h seminar in Oulu, and 4 day long field excursion to the Oulanka Research Station (total about 50 h, 3 cr); 3) Book exam on a common exam day 2 cr: Marchand, P. J. 1996: Life in the cold. An introduction to winter ecology. Examinations on the parts are held independently from each other. Selected literature will be provided.
Learning activities and teaching methods:
Lectures, exercises, report and seminar presentation.
Recommended optional programme components:
Courses 750124P, 752304A, 750121P, 751306A, 751307A and 752345A or equivalent knowledge.
Recommended or required reading:
Havas, P. & Sulkava, S. 1987: Suomen luonnon talvi. Kirjayhtymä, Helsinki, 222 s.; Marchand, P. J. 1996: Life in the cold. An introduction to winter ecology. (3rd edition). University Press of New England. 304 p.

Assessment methods and criteria:
Seminar presentation and book exam.
Grading:
Seminar: Pass / Fail, book exam: 1-5, Fail.
Person responsible:
Prof. Markku Orell, Prof. Esa Hohtola and Dr. Kari Taulavuori.

750325A: Winter ecology and physiology, 3 - 8 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Taulavuori

Opintokohteen oppimateriaali:

Havas, Paavo , , 1987
Marchand, Peter J. , , 1996

Opintokohteen kielet: English

Leikkaavuudet:

750377A Winter ecology 5.0 op

ECTS Credits:
3-8 cr.
Language of instruction:
English.
Timing:
B.Sc. 3 rd or M.Sc. 1 st spring. NNE.
Learning outcomes:
Student obtains basic knowledge of animal and plant acclimations and adaptations to winter, and can evaluate the effects of cold temperatures and snow on overwintering, and learns central methodology in winter ecology and physiology.
Contents:
Three independent units: 1) Thermal biology and energetics 3 cr (32 h lectures and 4 h exercises); 2) Winter ecology and physiology course (7 h lectures and 13 h laboratory practicals and 4 h seminar in Oulu, and 4 day long field excursion to the Oulanka Research Station (total about 50 h, 3 cr); 3) Book exam on a common exam day 2 cr: Marchand, P. J. 1996: Life in the cold. An introduction to winter ecology. Examinations on the parts are held independently from each other. Selected literature will be provided.
Learning activities and teaching methods:
Lectures, exercises, report and seminar presentation.
Recommended optional programme components:
Prerequisites courses 750124P, 752304A, 750121P, 751306A, 751307A and 752345A or equivalent knowledge.
Recommended or required reading:
Marchand, P. J. 1996: Life in the cold. An introduction to winter ecology. (3rd edition). University Press of New England. 304 p.
Assessment methods and criteria:
Seminar presentation and book exam.
Grading:
Seminar: Pass / Fail, book exam: 1-5, Fail.
Person responsible:
Prof. Markku Orell, Prof. Esa Hohtola and Dr. Kari Taulavuori.