Opasraportti

FSci - Courses in English for exchange students (2017 - 2018)

Courses in English for exchange students at the Faculty of Science

This Course Catalogue lists courses taught in English that are available for exchange students at the Faculty of Science (study fields of biology, geography, mathematics and physics) during academic year 2017-18.

When preparing your study plan please use the information provided under the **Courses** tab in this catalogue. Read carefully the information of each course you wish to take (language of instruction, target group, course content, timing, preceding studies, additional information etc.).

For information on the exchange application process please see www.oulu.fi/university/studentexchange. All exchange applicants must submit their exchange application through SoleMOVE by the deadline given, proposed study plan is attached to the on-line application.

Accepted exchange students are required to register to all courses. Course registration takes place once you have received your University of Oulu login information close to the start of your exchange period. When registering you will be able to find detailed information on teaching and schedule under **Instruction** tab.

Teaching periods for 2017-18
Autumn term 2017
Period 1: Sept 4 - Oct 27, 2017
Period 2: Oct 30 – Dec 22, 2017

Spring term 2018
Period 3: Jan 8 – March 9, 2018
Period 4: March 12 – May 11, 2018

For arrival and orientation dates see www.oulu.fi/university/studentexchange/academic-calender

Any questions on courses at the Faculty of Science should be addressed to:

Heli Vaara
study.science(at)oulu.fi

Further information on application process and services for incoming exchange students:
www.oulu.fi/university/studentexchange or international.office(at)oulu.fi

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

757619S: Advanced course in bioinformatics, 5 op

752682S: Advanced course in plant biology, 9 op
802628S: Advanced studies special course, 2 - 18 op
802656S: Algebraic numbers, 5 op
755321A: Aquatic ecology field course, 5 op
765642S: Astrophysics of Interacting Binary Stars, 5 op
764638S: Basic Neuroscience, 5 op
764338A: Basic Neuroscience, 5 op
755333A-02: Basic identification of animals, invertebrate, 0 op
755333A-01: Basic identification of animals, vertebrate, 0 op
756351A: Basics in population ecology, 5 op
757313A: Basics in population genetics, 5 op
757313A-02: Basics in population genetics, exercises, 0 op
757313A-01: Basics in population genetics, lectures, 0 op
755608S: Bird ecology and conservation, 2 op
765635S: Celestial mechanics I, 5 op
764622S: Cell membrane biophysics, 10 op
764322A: Cell membrane biophysics, 10 op
766645S: Cluster Physics, 5 op
756347A: Conservation of biodiversity, 5 op
766655S: Cosmic Rays, 8 op
765658S: Cosmology, 5 op
765358A: Cosmology, 5 op
757618S: DNA analysis in population genetics, 10 op
802664S: Differential geometry, 10 op
792301A: Economic Geography and its Applications, 5 op
761687S: Electromagnetic waves, 5 op
761673S: Electron and ion spectroscopy, 8 op
764632S: Electrophysiological recordings, 6 op
791302A: Environment and society, 5 op
750349A: Examinations on optional topics in biology, 2 - 10 op
800323A: Field extensions, 5 op
755324A: Functional animal ecology, 5 op
790101P: GIS-basics and Cartography, 5 op
790340A: Geographies of global development, 5 op
755333A: Identification of animals, 6 op
756355A: Identification of plant species, brief, 3 op
Compulsory
756355A-01: Identification of plant species, monocotyledons, brief, 0 op
756355A-02: Identification of plant species, dicotyledons, brief, 0 op
756354A: Identification of plant species, extensive, 5 op
Compulsory
756354A-01: Identification of plant species, monocotyledons, extensive, 0 op
756354A-02: Identification of plant species, dicotyledons, extensive, 0 op
765686S: Interstellar Matter, 5 op
765386A: Interstellar Matter, 5 op
766678S: Introduction to Atmospheric Processes and Climate Change, 5 op
802668S: Introduction to Functional Analysis, 5 op
800149P: Introduction to LateX, 2 op
765301A: Introduction to Nonlinear Dynamics, 5 op
765601S: Introduction to Nonlinear Dynamics, 5 op
756650S: Introduction to molecular ecology, 5 op
756650S-02: Introduction to molecular ecology, exercises, 0 op
756650S-01: Introduction to molecular ecology, lectures, 0 op
802635S: Introduction to partial differential equations, 10 op
790102P: Introduction to the systematic Physical Geography, 5 op
750629S: Kaamos symposium, 2 - 4 op
802320A: Linear Algebra, 5 op
752316A: Macro fungi, 3 op
761118P: Mechanics 1, 5 op
Compulsory
761118P-01: Mechanics 1, lectures and exam, 0 op
761118P-02: Mechanics 1, lab. exercises, 0 op
791626S: Methodological special themes in Physical Geography, 5 op
755325A: Methods in ecology I, 5 op

755329A: Methods in ecology II, 5 op
757620S: Methods in genomics and genomics evolution, 5 op
761618S: Molecular quantum mechanics, 5 op
761652S: NMR Imaging, 10 op
761688S: NMR spectroscopy in solids, 5 op
802665S: Numerical Analysis, 5 op
802660S: Operator theory and integral equations, 10 op
750399A: Optional examinations in environmental protection, 2 - 6 op
791635A: Physical Geography of Fennoscandia, 5 op
765684S: Physics of the Solar System I, 5 op
765384A: Physics of the solar system I, 5 op
756615S: Physiology of forest trees, 5 op
756344A: Plant ecology, 5 op
756604S: Plant ecophysiology in changing environments, 5 op
761653S: Plasma physics, 8 op
791613S: Position based analyses and services in geography, 5 op
800683S: Project in mathematics, 10 op
763312A: Quantum mechanics I, 10 op
763612S: Quantum mechanics I, 10 op
763613S: Quantum mechanics II, 10 op
763313A: Quantum mechanics II, 10 op
763693S: Quantum optics in electric circuits, 6 op
790106A: Region, culture and society, 5 op
792319A: Regional politics, policy and development: Northern Europe, 5 op
765307A: Research Project of Astronomy I, 5 op
Compulsory
765307A-01: Research Project of Astronomy I: Data processing in astronomy, 0 op
765307A-02: Research Project of Astronomy I: Study project, 0 op
791627S: Research in regional geography, 5 op
766676S: Research project in physics, 5 op
750613S: Research training, 2 - 15 op
755632S: Restoration ecology, 5 op
750654S: Special lecture in biology, 2 - 5 op
790350A: Special themes in Regional Development and Regional Policy, 5 op
790346A: Substituting written exam (Phy.g), 5 op
791632S: Sustainable development and global tourism, 5 op
755322A: Terrestrial animals field course, 5 op
750618S: Thursday seminar in biology, 2 op
767301A: Time Series Analysis in Astronomy, 5 op
767601S: Time Series Analysis in Astronomy, 5 op
790620S: Tourism planning and development, 5 op
790320A: Tourism planning and development, 5 op
790161A: Tourism, sustainability and environment, 5 op
791629S: Traditions and current issues in tourism research, 5 op
761310A: Wave motion and optics, 5 op
Compulsory
761310A-01: Wave motion and optics, lectures and exam, 0 op
761310A-02: Wave motion and optics, lab. exercises, 0 op
755328A: Wildlife management and game animal ecology, 5 op
750377A: Winter ecology and physiology, 5 op
790349A: World regional geography, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

757619S: Advanced course in bioinformatics, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Phillip Watts
Opintokohteen kielet: Finnish
Leikkaavuudet:

753629S Advanced course in bioinformatics 4.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
English.
Timing:
M.Sc. 2nd spring.
Learning outcomes:
The main objective of this course is to provide students with understanding and experience of the main techniques required to manipulate, analyse and interpret next generation sequence data. Students will understand different technologies; be capable of manipulating data files and assess data quality; assemble and map reads; identify genes and variants; complete some basic analyses of genome data.
Contents:
During the course, students will manipulate an example data set to provide a comprehensive experience of contemporary bioinformatics techniques required to identify genes and polymorphisms, as well as familiarity with the command terminal and basic LINUX commands. This course builds on Basics of bioinformatics (757314A) and complements the theory learnt in Introduction to population genetics (757313A), Introduction to molecular ecology (756650S) and Experimental course in evolutionary genomics (757621S). Lectures provide the core understanding of the main steps and principals behind data analyses, but the core content will be practical experience of handling and analysing large data sets.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Contact hours: 12 hrs lectures, 40 hrs computer exercises, 56 hr independent study. Continuous assessment (coursework) and a final exam.

Target group:
Bioscience and Ecology M.Sc.
Prerequisites and co-requisites:
Basics of bioinformatics (757314A) or equivalent knowledge, Introduction to population genetics (757313A), Molecular evolution (757312A).
Recommended optional programme components:
-
Recommended or required reading:
Good guide for much of this is the De Wit P. et al 2012: The simple fool's guide to population genomics via RNA-Seq: an introduction to high-throughput sequencing data analysis. Molecular Ecology Resourses. Molecular Ecology Resources. Volume 12, Issue 6, pages 1058–1067, November 2012 and other course material.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Continuous assessment, learning diary and project report.
Grading:
1-5 / Fail.
Person responsible:
Dr. Phillip Watts.
Working life cooperation:
No.
Other information:
-

752682S: Advanced course in plant biology, 9 op

Voimassaolo: - 31.07.2018
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Anna-Maria Pirttilä, Häggman, Hely Margaretha
Opintokohteen kielet: Finnish

ECTS Credits:
9 ECTS credits / 240 hours of work.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1st or 2nd spring, every second year.
Learning outcomes:
The student will be able to evaluate how gene expression affects plant development and metabolism, learns both holistic and specific methods of studying gene expression. She/he is also 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 exercises include methodology used in gene expression analyses. The seminars will familiarize in the most recent literature.
Mode of delivery:
Face-to-face teaching, independent studying.
Learning activities and teaching methods:
30 h seminar, 68 h exercises (demonstrations included), reports.
Target group:
BSb: compulsory MSc studies either course Advanced course in plant biology (752682S) 9 cr or Genetic transformation of plants (756625S) 8 cr.
Prerequisites and co-requisites:
Basics of plant biology lectures and exercises (756346A, 756341A) and Molecular methods I (757311A) or equivalent knowledge.
Recommended optional programme components:
-
Recommended or required reading:
Jones R, Ougham H, Thomas H, Waaland S (2013) The Molecular Life of Plants, Wiley-Blackwell, ISBN 978-0-470-87012-9; Alberts, B. ym. 2014: Molecular Biology of the Cell (6e), Garland Science Publishing, London, 1464 s. ISBN: 9780815345244
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Essay, learning diary.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Prof. Hely Häggman (lectures) and Doc. Anna Maria Pirttilä (excercises).
Working life cooperation:
Yes.
Other information:
-

802628S: Advanced studies special course, 2 - 18 op

Opiskelumuoto: Advanced Studies
Laji: Course

Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

802656S: Algebraic numbers, 5 op

Voimassaolo: 01.01.2012 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS cr
Language of instruction:
Finnish and English
Timing:
3/4 year, 1st period
Learning outcomes:
As usual in my mathematical studies I shall be ableto solve problems arising from the subject andto prove essential theorems starting from the given definitions using the tools applied in the course. More detailed; For example, when I pass the course with the grade 1/5, I shall recognize most definitions and I am able to solve closely related problems. Also I am able to rewrite short proofs with some understanding. When I pass the course with the grade 5/5, then I shall understand well the given definitions with the proofs of the theorems deduced from them.Further, I am able to solve challenging problems which demand independent deductions with several stages and applications of appropriate tools.
Contents:
First we revise some basics of rings and fields which are needed to proceed ahead field extensions. In particular, divisibility in an integral domain is carefully studied yielding to applications in the theory of polynomial algebra and algebraic integers. The theory of algebraic numbers is strongly based on polynomial algebra, where the properties of zeros and divisibility of polynomials are considered. The definition of an algebraic number will be generalized to the algebraic elements of field extensions going forward to algebraic fields.Considered as most important algebraic fields we get number fields which are finitely generated subfields of the field A of all complex algebraic numbers. In particular, we study quadratic number fields. Further, we shall consider the divisibility and factorization of algebraic integers with some applications to Diophantine equations.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
28 h lectures, 14 h exercises, 91 h independent study
Target group:
Mathematics majors
Prerequisites and co-requisites:
Basics in Algebra, Alcebraic structures, Matrix algebra, Linear algebra, Basics in Number Theory
Recommended or required reading:
I.N. Stewart and D.O. Tall: Algebraic number theory, Mollin, Richard A., Advanced number theory with applications,
Course material: http://cc.oulu.fi/~tma/OPETUS.html
Grading:
1-5, i
Person responsible:
Tapani Matala-aho
Working life cooperation:
-

755321A: Aquatic ecology field course, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Muotka, Timo Tapani, Kaisa-Leena Huttunen
Opintokohteen kielet: Finnish
Leikkaavuudet:

751307A Field course in aquatic animals 4.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 1st summer. ECOGEN 1st summer.
Learning outcomes:
To learn basic methods in biological freshwater sampling and to identify the most common freshwater taxa.
Contents:
Basics of freshwater ecology. Demonstrations of the most frequently-used biological sampling methods. Identification of the most common freshwater fishes, invertebrates and zooplankton.
Mode of delivery:
Face-to-face teaching and independent studying.
Learning activities and teaching methods:
Summer: 50 h of field work and demonstrations at the Oulanka research station, 83 h of independent studying including a reading package.
Target group:
Compulsory (5 cr) to ECO. TEAeco: either Aquatic animals field course 5 cr (755321A) or Terrestrial animals field course 5 cr (755322A) is compulsory for biology major, the other field course can be included to the ecology minor. TEAbs, alternatively compulsory to TEAbs either Aquatic animals field course 5 cr or Terrestrial animals field course 5 cr. TEA: at least 10 cr compulsory, two field courses, one animal and other Plant ecology field course (756343A).
Prerequisites and co-requisites:
Basic identification of animals (755333A) or equivalent knowledge (if necessary, selection to the course 755321A can be based on success in course 755333A).
Recommended optional programme components:
This course is a prerequisite for the following: Winter ecology and physiology (750377A), Special course in aquatic invertebrates (754627S), Assessment and monitoring of the ecological status of water bodies (754625S), Field methods in freshwater biomonitoring (754626S).
Recommended or required reading:
Reading package, handouts and lectures given before / during the course.
Assessment methods and criteria:
On the final course day species identification exam on the species met during the course, practical exam on the sampling methods and
theoretical exam based on the literature and demonstration material.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
1-5 / Fail.
Person responsible:
Prof. Timo Muotka.
Working life cooperation:
No.
Other information:
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765642S: Astrophysics of Interacting Binary Stars, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Vitaly Neustroev
Opintokohteen kielet: English, Finnish

Ei opintojaksokuvauksia.

764638S: Basic Neuroscience, 5 op

Voimassaolo: 01.01.2009 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

764338A Basic Neuroscience 5.0 op

ECTS Credits:
5 ECTS cr
Language of instruction:
Finnish (Exam can be done in English on the basis of the course book)
Timing:
3th - 5th spring (depending on whether included in BSc or MSc degree)
Learning outcomes:
Student will be able to explain basic oganization and functions of the nervous system.
Contents:
General organization and function of the peripheral and central nervous system are introduced based on a course book. Objective of the course is to provide students with a broad view of the basic principles of nervous system function based on recent knowledge.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 28 h, self-study 105 h
Target group:
Primarily the students of the degree programme in physics, especially the biomedical physics students. Also the other students of the University of Oulu.
Prerequisites and co-requisites:
No specific prerequisites
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lectures and the course book Dale Purves et al.: Neuroscience, 4th edition or newer, Sinauer Associates Inc., MA, USA, 2008.
Assessment methods and criteria:
Final exam
Grading:
Numeerinen arviointiasteikko 0 – 5, missä 0 = hylätty
Person responsible:
Esa-Ville Immonen, Kyösti Heimonen
Working life cooperation:
Ei sisällä työharjoittelua
Other information:
Course page

764338A: Basic Neuroscience, 5 op

Voimassaolo: 01.01.2009 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

764638S Basic Neuroscience 5.0 op

ECTS Credits:
5 ECTS cr
Language of instruction:
Finnish (Exam can be done in English on the basis of the course book)
Timing:
3th - 5th spring (depending on whether included in BSc or MSc degree)
Learning outcomes:
Student will be able to explain basic oganization and functions of the nervous system.
Contents:
General organization and function of the peripheral and central nervous system are introduced based on a course book. Objective of the course is to provide students with a broad view of the basic principles of nervous system function based on recent knowledge.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 28 h, self-study 105 h
Target group:
Primarily the students of the degree programme in physics, especially the biomedical physics students. Also the other students of the University of Oulu.
Prerequisites and co-requisites:
No specific prerequisites
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lectures and the course book Dale Purves et al.: Neuroscience, 4th edition or newer, Sinauer Associates Inc., MA, USA, 2008.
Assessment methods and criteria:
Final exam
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Esa-Ville Immonen, Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
Course website

755333A-02: Basic identification of animals, invertebrate, 0 op

Voimassaolo: 01.08.2016 - 31.07.2019
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Marko Mutanen
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

755333A-01: Basic identification of animals, vertebrate, 0 op

Voimassaolo: 01.08.2016 - 31.07.2019
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Koivula, Pudas, Tuula Kaarina
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

756351A: Basics in population ecology, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kvist, Laura Irmeli
Opintokohteen kielet: Finnish
Leikkaavuudet:

755336A	Population ecology	10.0 op
756323A	Population biology of plants	5.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3rd autumn.
Learning outcomes:
Basic skills in methods of population biology.
Contents:
Demography and life history strategies with emphasis on dynamics of structured populations in space and time, with an emphasis on conservation biology. Usage of matrix models to calculate basic population parameters and analyze population viability. Metapopulation dynamics and ecological and evolutionary genetics and interactions between populations and their environment are addressed. In exercises, dynamics of populations are analysed with matrix models and simulation programs.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
32 h lectures, 18 h computer exercises, seminar.
Target group:
ECO: compulsory.
Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
Recommended or required reading:
Silvertown & Charlesworth 2001: Introduction to Plant Population Biology (4 th edition), Blackwell Science.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
1-5 / Fail.

Person responsible:
Doc. Laura Kvist
Working life cooperation:
No.
Other information:
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757313A: Basics in population genetics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumi Viljakainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

753314A Basics in population genetics 8.0 op

ECTS Credits:
5 cr / 133 hours of work.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 2nd spring BSg, M.Sc. 1st spring, ECOGENgen 1st spring, genetics: compulsory in M.Sc. degree.
Learning outcomes:
Student can explain the fundamental population genetics concepts and models and basics in phylogenetics, and is able to apply these in analysis of data.
Contents:
Fundamentals of population genetics (genetic variation, inbreeding, genetic drift, effective population size, mutation, selection, population structure, gene flow), phylogenetic methods and phylogeography. Usage of molecular methods for identification of species, sex and individuals, behavioral ecology (mating systems, cooperation, mating success) and conservation.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
22 h lectures, 4 h seminars, 24 h exercises (problem solving, laboratory and computer exercises), take-home exam.
Target group:
B.Sc. 2nd spring BSg, M.Sc. 1st spring, ECOGENgen 1st spring, genetics: compulsory in M.Sc. degree.
Prerequisites and co-requisites:
Concepts of genetics (757109P) and Experimental course in general genetics (757110P) or equivalent knowledge and Molecular evolution (757312A).
Recommended optional programme components:
Compulsory prequisite for courses Experimental course in evolutionary genomics (757621S), Advanced course in bioinformatics (757619S) and DNA analysis in population genetics (757618S). Recommended prerequisite for course Quantitative genetics (805338A).
Recommended or required reading:
Hamilton, M. B. 2009: Population genetics, Wiley-Blackwell.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Take-home exam, problem solving, laboratory and computer exercises, seminar.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Doc. Lumi Viljakainen.

Working life cooperation:
No.
Other information:
Note that Introduction to population genetics and Introduction to Molecular ecology courses are alternative; students cannot get credits from both.

757313A-02: Basics in population genetics, exercises, 0 op

Voimassaolo: 01.08.2015 - 31.12.2019
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

757313A-01: Basics in population genetics, lectures, 0 op

Voimassaolo: 01.08.2015 - 31.12.2019
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Lumi Viljakainen, Kvist, Laura Irmeli
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

755608S: Bird ecology and conservation, 2 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Koivula, Seppo Rytkönen
Opintokohteen kielet: Finnish

ECTS Credits:
2 ECTS credits / 53 hours of work.
Language of instruction:
English
Timing:
M.Sc. degree. Every second year (arranged if resources allow).
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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
24 h lectures, exam.
Target group:

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Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
Exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Doc. Seppo Rytkönen and Doc. Kari Koivula.
Working life cooperation:
No.
Other information:
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765635S: Celestial mechanics I, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jürgen Schmidt
Opintokohteen kielet: English, Finnish

Ei opintojaksokuvauksia.

764622S: Cell membrane biophysics, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

764322A	Cell membrane biophysics	10.0 op

ECTS Credits:
10 ECTS cr
Language of instruction:
English
Timing:
3rd-5th autumn (depending on whether included in BSc or MSc degree). Lectured every second year (during odd years).
Learning outcomes:
After finishing the course the student is able to describe the basics of cell membrane structure and function, to present the basic biophysical models describing the electrical function of the cell membrane, and to solve problems and calculations concerning these models. In addition, the student will be able make and present a short review and a talk on the basis of scientific literature or articles of this field.
Contents:
During the course the students will become acquainted with the central biophysical phenomena of the cell membrane, for example: the physical structure and properties of the cell membrane, lipids and proteins in the membrane, permeation and selectivity, ion channels and their kinetics. In addition they will learn to know the

basics about the theory of the different cell membrane recording methods, the models describing the electrical function of the cell membrane and the analysis of cell membrane signals.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 34 h, calculation exercises 20 h, seminar 4 h, seminar presentation, weekly assignments, self-study 206 h
Target group:
Students of Biomedical physics (voluntary in BSc minor, mandatory in MSc). Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Introduction to biomedical physics (764163P) and Foundations of cellular biophysics (764115P) are recommended to be done before this course.
Recommended optional programme components:
764680 Neural information processing is recommended to be done after this course.
Recommended or required reading:
Lectures, lecture handouts; D. Johnston, S. Wu: Foundations of Cellular Neurophysiology, MIT Press, Cambridge MA, 1995 (partly); B. Hille: Ion channels of excitable membranes, Sinauer Associates Inc., Sunderland, Massachusetts USA, 3rd edition, 2001 (partly).
Assessment methods and criteria:
Home exam, final exam, seminar presentation
Grading:
Numerical grading scale 0 – 5, where 0 = failed
Person responsible:
Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
Course website

764322A: Cell membrane biophysics, 10 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Kyösti Heimonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

764622S Molecular biophysics 10.0 op

ECTS Credits:
10 ECTS cr
Language of instruction:
English
Timing:
3rd or 5th autumn (depending on whether included in BSc or MSc degree). Lectured every second year (during odd years). Recommended timing is during master studies.
Learning outcomes:
After finishing the course the student is able to describe the basics of cell membrane structure and function, to present the basic biophysical models describing the electrical function of the cell membrane, and to solve problems and calculations concerning these models. In addition, the student will be able make and present a short review and a talk on the basis of scientific literature or articles of this field.
Contents:
During the course the students will become acquainted with the central biophysical phenomena of the cell membrane, for example: the physical structure and properties of the cell membrane, lipids and proteins in the membrane, permeation and selectivity, ion channels and their kinetics. In addition they will learn to know the basics about the theory of the different cell membrane recording methods, the models describing the electrical function of the cell membrane and the analysis of cell membrane signals.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 34 h, calculation exercises 20 h, seminar 4 h, seminar presentation, weekly assignments, self-study 206 h
Target group:
Students of Biomedical physics (voluntary in BSc minor, mandatory in MSc). Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Introduction to biomedical physics (764163P) and Foundations of cellular biophysics (764115P) are recommended to be done before this course.
Recommended optional programme components:
764680 Neural information processing is recommended to be done after this course.
Recommended or required reading:
Lectures, lecture handouts; D. Johnston, S. Wu: Foundations of Cellular Neurophysiology, MIT Press, Cambridge MA, 1995 (partly); B. Hille: Ion channels of excitable membranes, Sinauer Associates Inc., Sunderland, Massachusetts USA, 3rd edition, 2001 (partly).
Course material availability can be checked here.
Assessment methods and criteria:
Home exam, final exam, seminar presentation
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
Course website

766645S: Cluster Physics, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 credits
Language of instruction:
English
Timing:
Lectures not given every year.
Learning outcomes:
After the course students can explain what is a cluster and are able to describe various formation mechanisms of clusters. Students can explain principles of spectroscopic methods studying the structure and properties of clusters, and are able to present information obtained from the specific details of the experimental spectra. Students are also able to provide examples of experimental methods on producing various type of clusters. Students will learn also to present principles of the data handling and information evaluation of the experiments.
Contents:
The course serves as an introduction to the materials research of nanostructures using electron spectroscopy. The scope of the course is in experimental methods of studying the properties of clusters. The course starts by short introductional part to clusters and then extents to the formation mechanisms of clusters. Few specific cluster sources will be reviewed. The course continues on focusing to the spectroscopy of clusters through example cases of present research. The studies of the development of metallicity and size dependent phase transformations in addition to methods resolving the surface and bulk structures of clusters will be overviewed. The course includes demonstrations where the students are familiarized with the spectroscopic equipment as well as the data handling of the measurements.
Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures, exercises, groupworks, self study
Target group:
Recommended for all students attending to the *SR master's degree programme.* The course is suitable for project works and provides a good base for the bachelor and master thesis at ELSP-lab.
Prerequisites and co-requisites:
Recommend course for background is 761673S Electron and Ion Spectroscopy.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lecture notes
Assessment methods and criteria:
One written examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Kari Jänkälä
Working life cooperation:
No work placement period
Other information:
Kurssin sivu

756347A: Conservation of biodiversity, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Phillip Watts

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay756347A	Conservation of biodiversity (OPEN UNI)	5.0 op
752321A	Conservation of Biodiversity	3.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
English.
Timing:
B.Sc. 3rd 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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
28 h lectures, literature, exam.
Target group:
Biology students. Students who are participating in environmental conservation or tourism minor.
Prerequisites and co-requisites:
No
Recommended optional programme components:
-
Recommended or required reading:

Hanski I. 2005: The Shrinking World. International Ecology Institute, Oldendorf/Luhe, Germany.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
1-5 / Fail.
Person responsible:
Dr. Phillip Watts.
Working life cooperation:
No.
Other information:
-

766655S: Cosmic Rays, 8 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
8 credits
Language of instruction:
English
Timing:
Roughly every third year.
Learning outcomes:
After passing the course the student is able to describe in physical terms the properties, origins, temporal variability, atmospheric effects and experimental methods of cosmic rays, and is able to apply physical theories describing the acceleration and modulation of cosmic rays to explain the properties of cosmic rays.
Contents:
This is an optional physics course at an advanced level on cosmic rays. Cosmic rays are energetic particles from space that can pass through the geomagnetic field and the atmosphere and cause radiation even on the ground. Cosmic rays are energized, e.g., in supernova shocks and solar bursts. Cosmic rays can be used to study the Sun, the heliosphere and the more distant universe.
Contents briefly: Components of cosmic rays, composition, energy spectrum and origin of galactic cosmic rays, acceleration of cosmic rays, solar cosmic rays and their production in flares and coronal mass ejections, modulation of cosmic rays in the heliosphere, Parker's theory, temporal variation of cosmic rays, reactions in the atmosphere and possible climatic effects, detection of cosmic rays in Oulu and elsewhere.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 44 h, 10 exercises (20 h), self-study 149 h
Target group:
Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Recommended courses: 766355A Basics of space physics or 761353A Basics of plasma physics, or equivalent knowledge.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Parts from: T.K. Gaisser, Cosmic rays and particle physics, Cambridge Univ. Press; P.K.F. Grieder, Cosmic rays at the Earth, Elsevier, 2001.
Lecture notes: K. Mursula ja Ilya Usoskin: Cosmic rays.
Course material availability can be checked here.
Assessment methods and criteria:
One written examination

Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Ilya Usoskin
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/766655S/

765658S: Cosmology, 5 op

Voimassaolo: 29.10.2013 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

765358A	Introduction to Cosmology	5.0 op

Ei opintojaksokuvauksia.

765358A: Cosmology, 5 op

Voimassaolo: 29.10.2013 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

765658S	Introduction to Cosmology	5.0 op

Ei opintojaksokuvauksia.

757618S: DNA analysis in population genetics, 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Tanja Pyhäjärvi
Opintokohteen kielet: Finnish
Leikkaavuudet:

753631S	DNA analysis in population genetics, exercises	6.0 op
753616S	Spesific questions in population genetic and biology	4.0 op

ECTS Credits:
10 cr / 267 hours of work.
Language of instruction:
English.

Timing:
M.Sc. 1st spring.
Learning outcomes:
Deep understanding of population genetic and coalescence theory. Neutral theory and other theories related to genetic polymorphisms. Effect of mutation, linkage disequilibrium and recombination. The relationship between genetic variation, demographic history, mating systems, selection, population structure etc. Identification of natural selection.
Contents:
Basics of coalescence theory, DNA sequence analysis methods, investigation of population structure.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
24 h lectures, 3 h seminar, 6 h exercises, 36 h computer exercises, 201 h independent work, reports, take home exam.
Target group:
BSg compulsory.
Prerequisites and co-requisites:
Basics of population genetics (757313A), Basics of bioinformatics (757314A) is recommended.
Recommended optional programme components:
-
Recommended or required reading:
Matthew B. Hamilton: Population Genetics.
Assessment methods and criteria:
Lectures, exercises, reports, seminar presentation, independent work.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
1-5 / Fail.
Person responsible:
Doc. Tanja Pyhäjärvi.
Working life cooperation:
No.
Other information:
-

802664S: Differential geometry, 10 op

Voimassaolo: 01.06.2014 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
10 ECTS cr
Language of instruction:
English or Finnish
Timing:
4th or 5th year
Learning outcomes:
After completing the course succesfully, students know the basic concepts of differential geometry and masters differential calculus on manifolds.
Contents:
Manifolds, vector fields, tensor fields and differential forms.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 56 h and exercises 28 h
Target group:
Major students in mathematics and physics

Prerequisites and co-requisites:
Bachelor's degree in mathematics or equivalent
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
Lectures. Recommended reading is given on the first lecture.
Assessment methods and criteria:
Final exam or written work and talk.
Grading:
1-5 or pass/fail
Person responsible:
Esa Järvenpää
Working life cooperation:
No

792301A: Economic Geography and its Applications, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Toni Ahlqvist

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS
Language of instruction:
The lectures and related materials are in English. The examination can be answered either in English or in Finnish. The essay and the seminar can be carried out in either in English or in English.

Timing:
2nd year, 1st semester
Learning outcomes:
The course approaches economic geography as applied to the perspectives of regional development and policy. The aim of the course is to familiarize the student with current issues and related theoretical debates in economic geography. After the course, student is able to outline the main features of the central theories in economic geography, and to apply these theories in the context of regional development and policy.

Contents:
Lectures approach economic geography from varied angles, with emphasis on regional development and policy. The course material contains scientific papers connected to each lecture. The course also includes an essay and related seminar. In the essay and seminar, students deepen and enrich the content of the lectures by means of theoretical reflection and practical case studies.

Mode of delivery:
10 hours of lectures (in English), article package, examination and practicals (an essay and a seminar). Participation in the lectures is obligatory.
Learning activities and teaching methods:
Lectures, essay and seminar
Target group:
Obligatory for students of the regional development and regional policy, for others voluntary.
Prerequisites and co-requisites:
-
Recommended optional programme components:
The course is part of minor studies of regional development and regional policy.
Recommended or required reading:
Lectures and articles.
Assessment methods and criteria:
Examination, essay and seminar
Read more about assessment criteria at the University of Oulu webpage.
Grading:

1–5.
Person responsible:
Toni Ahlvist
Working life cooperation:
No.
Other information:
Exchange students are asked to contact Toni Ahlqvist before taking the course.

761687S: Electromagnetic waves, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Vaara, Juha Tapani

Opintokohteen kielet: English, Finnish

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
English
Timing:
Lectured every second year (even years) in the spring term
Learning outcomes:
The student can derive the basic results on electromagnetic waves starting from Maxwell's equations. He can analyse the various physical circumstances of wave propagation and is able to apply the theory to quantitative solution of problems. Suitable for teachers.
Contents:
Maxwell's equations, electromagnetic waves, waveguides, generation of electromagnetic waves, electromagnetism and special relativity, scattering and absorption of electromagnetic waves.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 30 h, 10 exercises (20 h), self-study 105 h
Target group:
Primarily for the students of the degree programme in physics and chemistry. Also for the other students of the University of Oulu. Teacher students.
Prerequisites and co-requisites:
761312A Electromagnetism 2 or equivalent skills in basic theory of electromagnetism
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
I.S. Grant and W.R. Phillips, Electromagnetism, Second edition (Wiley & Sons, chapters 10-14); F.H. Read, Electromagnetic Radiation (Wiley & Sons, chapters 3,4,8).
Assessment methods and criteria:
One written examination. Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Juha Vaara
Working life cooperation:
No
Other information:
https://wiki.oulu.fi/display/766632S/

761673S: Electron and ion spectroscopy, 8 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
8 credits
Language of instruction:
English
Timing:
Not every year
Learning outcomes:
After passing the course of Electron and Ion spectroscopy students are able to explain the basic concepts of electron spectroscopy. Students recognize the special characters of synchrotron radiation and can explain the basics of measuring the electron and ion spectra. The student can give an example of a calculational method, which she/he can use to interpret the experimental electron spectrum.
Contents:
The course gives an introduction to the basics of electron and ion spectroscopy research at the department of physics. The main goal is the understanding of the electron structure and its dynamics when atoms or molecules are excited by energetic photon or electron beam. Besides the basic ideas of electron spectroscopy, experimental set ups are described in details. The theoretical methods used in the interpretation of experimental spectra will be overviewed.
The course starts with a general overview to basics nature of electronic states and the transitions involved in spectroscopy. The conventional sources of ionization and the synchrotron radiation (SR) in spectroscopic research will be overviewed. Then the experimental apparatus for electron and ion spectroscopy will be presented and the handling of the data and experimental interpretation is covered. The course includes two laboratory exercises where the students familiarize to the experimental devices and learn to use datahandling software.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 40 h, exercises 16 h, laboratory exercises 8 h, self-study 149 h
Target group:
Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Basic knowledges of atomic physics.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lecture notes
Assessment methods and criteria:
One written examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Marko Huttula
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/761673S/

764632S: Electrophysiological recordings, 6 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Roman Frolov

Opintokohteen kielet: Finnish

ECTS Credits:
3-6 ECTS cr
Language of instruction:
English
Timing:
4th or 5th autumn (organized only during odd years, or even more rarely)
Learning outcomes:
After taking the course student can describe principles of the electrophysiological methods and their benefits and limitations. The student can also analyze some of the results produces by the recordings. In addition the student can and has done successfully all the central work phases belonging to the methods in question, and thus is independently able to continue to practice them further if necessary.
Contents:
The course provides theoretical and hands-on practical introduction on the electrophysiological methods that enable recording electrical signals generated by the nervous system ranging from the single neurons to currents generated by single ion channels embedded on the cellular membranes (intracellular and patch-clamp recordings). Laboratory exercises are given on each technique to transfer theoretical knowledge into practical skills and to familiarize students with the typical instrumentation. The course also introduces basic data analysis methods that enable evaluating the recording quality and investigating function of the system under study.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
10-20 h laboratory demonstrations, 25-50 practical laboratory work, self-study 45-90 h
Target group:
Organized on need-to-know basis only for the 4th year or older MSc or PhD students of biomedical physics.
Prerequisites and co-requisites:
764322A/764622S Cell membrane biophysics, 764338A/764638S Basic neuroscience and 764680S Neural information processing have to be passed.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Materials are agreed upon and given to students during the course.
Assessment methods and criteria:
Practical laboratory skills and work reports are evaluated.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Roman Frolov, Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
Course website

791302A: Environment and society, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Rusanen Jarmo Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay791302A	Environment and society (OPEN UNI)	5.0 op

ECTS Credits:
5 ECTS
Language of instruction:
Finnish and English.
Timing:

2nd year, 1st semester (autumn semester).
Learning outcomes:
Student is able to define and interpret different normative systems of the environmental conservation, environmental organisations as part of the environmental issues.
Contents:
Current environmental issues, environmental guidance system, environment as conflict.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
Lectures (8 h) and seminar work.
Target group:
Voluntary.
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is part of minor studies of Environment protection.
Recommended or required reading:
Will be announced later.
Assessment methods and criteria:
Written seminar report.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Jarmo Rusanen
Working life cooperation:
No.
Other information:
Exchange students are asked to contact prof. Rusanen before taking this course.

750349A: Examinations on optional topics in biology, 2 - 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

751354A	Examinations on optional topics	2.0 op
752352A	Examination in optional topics	2.0 op
753351A	Examinations on optional topics	2.0 op

ECTS Credits:
2-10 ECTS credits / 53-267 hours of work.
Language of instruction:
Depends on the book.
Timing:
B.Sc. degree 2.-3. year or M.Sc. degree 1.-2. year.
Learning outcomes:
Student independently concerns him/herself to special issues in animal physiology or animal ecology.
Contents:
Examinations on books, which are not compulsory in any other course unit.
Mode of delivery:
Independent studying: book exam.
Learning activities and teaching methods:
Book exan in Examinarium.
Target group:
-
Prerequisites and co-requisites:

No.
Recommended optional programme components:
-
Recommended or required reading:
Literature chosen in agreement with the responsible teacher.
Assessment methods and criteria:
Book exan in Examinarium.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
1-5 / Fail.
Person responsible:
Prof. Jari Oksanen (ECOb), Prof. Timo Muotka (ECOa), Doc. Kari Taulavuori (ECOb), Doc. Seppo Rytkönen (ECOa), Doc. Annamari Markkola (ECOb), Prof. Outi Savolainen (BSg) and Prof. Hely Häggman (BSb).
Working life cooperation:
-
Other information:
-

800323A: Field extensions, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapani Matala-aho

Opintokohteen kielet: Finnish

Leikkaavuudet:

802333A	Permutations, Fields and Galois Theory	10.0 op
800343A	Algebra 2	8.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
Finnish and English
Timing:
2/3 year, 3rd period
Learning outcomes:
An ultimate target is to deepen students algebraic mindset and to give completeness e.g. for advanced courses in algebraic numbers, number theory, cryptography, and group theory.
Contents:
Under the inspection are factor structures of rings, quotient rings and field extensions. As examples we study finite fields, fields of rational functions and quotient fields of formal series as well as basics of number fields. An ultimate target is to deepen students algebraic mindset and to give completeness e.g. for advanced courses in algebraic numbers, number theory, cryptography, and group theory.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
28 h lectures, 14 h exercises, 91 h independent study
Target group:
Mathematics majors
Prerequisites and co-requisites:
802354A Basics in Algebra, 802355A Algebraic Structures, 802120P Introduction to Matrices, 802320A Linear Algebra
Recommended or required reading:
http://cc.oulu.fi/~tma/OPETUS.html
Assessment methods and criteria:
As usual in my mathematical studies I shall be ableto solve problems arising from the subject andto prove essential theorems starting from the given definitions using the tools applied in the course. More detailed; For

example, when I pass the course with the grade 1/5, I shall recognize most definitions and I am able to solve closely related problems. Also I am able to rewrite short proofs with some understanding. When I pass the course with the grade 5/5, then I shall understand well the given definitions with the proofs of the theorems deduced from them.Further, I am able to solve challenging problems which demand independent deductions with several stages and applications of appropriate tools.
Grading:
1-5, i
Person responsible:
Tapani Matala-aho
Other information:
Replaces part of the course 802333A Permutations, fields and Galois theory

755324A: Functional animal ecology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Rytkönen

Opintokohteen kielet: Finnish

Leikkaavuudet:

751378A Functional animal ecology 6.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Lectures in Finnish, exercises in Finnish / English.
Timing:
B.Sc. 2nd spring or M.Sc. 1st 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).
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
12 h lectures, 40 h exercises, seminar and essay (or exam).
Target group:
Recommended for ecology students.
Prerequisites and co-requisites:
Recommended Evolution, systematics and morphology of animals, practicals (750374A), Introduction to statistics 5 cr (806118P) and A second course in statistics 5 cr (806119P).
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
Essay or exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.

Person responsible:
Doc. Seppo Rytkönen.
Working life cooperation:
No.
Other information:
-

790101P: GIS-basics and Cartography, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay790101P GIS-basics and Cartography (OPEN UNI) 5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS
Language of instruction:
Finnish, partly in English. English speaking students are asked to contact prof. Rusanen before the course.
Timing:
1 year, 2nd semester
Learning outcomes:
Course gives basic information about Geographical Information System and about the theory of cartography. After the course the student can use ArcGIS program and he/she is able to produce cartographic presentations.
Contents:
Basics of GIS, theories of cartography and statistical graphics and use of ArcGIS program.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
16 h lectures, 56 h practicals.
Target group:
Common course to all 1st year students of Geography.
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is part of the minor studies of GIS.
Recommended or required reading:
Paul A Longley, Michael G Goodchild, David J. Maguire & David W. Rhind (2005). Geographic Information Systems and Science. 2 nd edition. 516 p
Assessment methods and criteria:
Exam on exam day.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Professor Rusanen
Working life cooperation:
No
Other information:
English speaking students are asked to contact prof. Rusanen before the course.

790340A: Geographies of global development, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Ridanpää

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay790340A Geographies of global development (OPEN UNI) 5.0 op

ECTS Credits:
5 ECTS
Language of instruction:
Finnish or English.
Timing:
2nd or 3rd year, 1st or 2nd semesters (autumn or spring semesters).
Learning outcomes:
This course gives knowledge of global development problems from geographical point of view. After the course the student can explain what development indicates and what kind of social and economic phenomena will explain both development and under development. He/she is also able to compare different actions that are aimed to diminish the uneven development based on different theories and strategies.
Contents:
The course familiarizes students to the theories that aim to explain differences in uneven development. Under development, and its social, cultural and economic aspects will be studies from national, regional and local level. This course also quires to political programs and strategies that are aimed to stabiles equalizes uneven development.
Mode of delivery:
Book exam.
Learning activities and teaching methods:
Book exam.
Target group:
Compulsory for teachers, others obligatory.
Prerequisites and co-requisites:
-
Recommended optional programme components:
–
Recommended or required reading:
- Potter, R.B.T, T. Binns, J.A.Elliot & D.Smith (2004). Geographies of development.

Assessment methods and criteria:
Exam on examinarium.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Juha Ridanpää
Working life cooperation:
No.

755333A: Identification of animals, 6 op

Voimassaolo: 01.08.2016 - 31.07.2019

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Koivula

Opintokohteen kielet: Finnish

Leikkaavuudet:

755334A Identification of animals, vertebrates 4.0 op

ECTS Credits:

6 ECTS credits / 162 hours of work.
Language of instruction:
Finnish / English
Timing:
B.Sc. degree 1st autumn and spring.
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 (9 h lectures in Finnish, 16 h exercises, exam), the Finnish vertebrate fauna is studied using stuffed museum samples. In the spring semester (9 h lectures in Finnish, 16 h exercises, exam) the invertebrate taxons (mostly family- or genus-level) common in Finland are studied using museum samples.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
18 h lectures in Finnish, 32 h exercises, independent studying, 2 exams.
Target group:
Biology students: compulsory.
Prerequisites and co-requisites:
No.
Recommended optional programme components:
This course is needed for attending courses Terrestrial animals field course (755322A) and Aquatic ecology field course (755321A).
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.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Two species exams.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Doc. Kari Koivula.
Working life cooperation:
No.
Other information:
-

756355A: Identification of plant species, brief, 3 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Annamari Markkola

Opintokohteen kielet: Finnish

Leikkaavuudet:

756342A	Identification of plant species	3.0 op

ECTS Credits:
3 ECTS credits / 80 hours of work.
Language of instruction:
Finnish / English.
Timing:
BSc 1st autumn.
Learning outcomes:
Student is able to identify most common boreal plant species in herbarium specimens.
Contents:

Demonstrations and/or independent stud of ca. 350 vascular plants, mosses and lichens in the boreal vegetation zone. In the identification exam student has to know specimens scientific name and family in latin.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
16 h demonstrations and learning from the herbarium samples. 350 plant species. In the identification exam student has to know specimens scientific name and family in latin.
Target group:
BSc degree, BS: compulsory 3 cr.
Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
Recommended or required reading:
Booklet Hanhela, P. & Halonen, P. 1995: Plant Identification.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Two species identification subexams (756355A-01 and 756355A-02) 3 cr with the help of handout.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Doc. Annamari Markkola
Working life cooperation:
No.
Other information:
-

Compulsory

756355A-01: Identification of plant species, monocotyledons, brief, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Annamari Markkola
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

756355A-02: Identification of plant species, dicotyledons, brief, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Annamari Markkola
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

756354A: Identification of plant species, extensive, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies

Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Annamari Markkola
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Finnish / English.
Timing:
BSc 1st autumn.
Learning outcomes:
Student is able to identify most common boreal plant species in herbarium specimens.
Contents:
Demonstrations and/or independent stud of ca. 350 vascular plants, mosses and lichens in the boreal vegetation zone. In the identification exam student has to know specimens scientific name and family in latin.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
16 h demonstrations and learning from the herbarium samples. 350 plant species. In the identification exam student has to know specimens scientific name and family in latin.
Target group:
BSc degree: ECO and TEA 5 cr compulsory.
Prerequisites and co-requisites:
No.
Recommended optional programme components:
Course done as 5 cr (756654S) is prerequisite for the Plant ecology field course (756643S) and for the advanced plant species identification courses (752608S and 752625S).
Recommended or required reading:
Booklet Hanhela, P. & Halonen, P. 1995: Plant Identification.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Two species identification subexams (756354A-01 and 756354A-02). 5 cr without the course handout.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
1-5 / Fail.
Person responsible:
Doc. Annamari Markkola.
Working life cooperation:
No.
Other information:
-

Compulsory

756354A-01: Identification of plant species, monocotyledons, extensive, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Annamari Markkola
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

756354A-02: Identification of plant species, dicotyledons, extensive, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Annamari Markkola
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

765686S: Interstellar Matter, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Sébastien Comerón Limbourg
Opintokohteen kielet: Finnish, English

Ei opintojaksokuvauksia.

765386A: Interstellar Matter, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Sébastien Comerón Limbourg
Opintokohteen kielet: English, Finnish

Ei opintojaksokuvauksia.

766678S: Introduction to Atmospheric Processes and Climate Change, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English, Finnish

ECTS Credits:
5 ECTS Credits
Learning outcomes:
After the course students know the basic structure of the Earth's atmosphere and climate system, and can describe the basic processes affecting radiative transfer in the atmosphere and Earth's energy balance, especially those related to greenhouse gasses, aerosol particles, and clouds.
Contents:
The course serves as an introduction to atmospheric and climate science, and highlights climate relevant processes related to molecular clusters and aerosol particles. Review of blackbody radiation, kinetic theory of

gasses and atmospherically relevant phase transitions; absorption and scattering of electromagnetic radiation by gas molecules, aerosol particles and cloud droplets; energy balance of the Earth system, radiative forcing, feedback and climate sensitivity; sources and sinks of aerosol particles and greenhouse gasses, aerosol-cloud-precipitation interactions; structure and thermodynamics of the atmosphere, energy redistribution within the Earth system; observed and predicted climate changes.

802668S: Introduction to Functional Analysis, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Ei opintojaksokuvauksia.

800149P: Introduction to LateX, 2 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761115P	Laboratory Exercises in Physics 1	5.0 op
761115P-03	Laboratory Exercises in Physics 1, Introduction to LateX	0.0 op

ECTS Credits:
2 ECTS cr
Language of instruction:
Finnish (in english if needed)
Timing:
2-3 year of studies, before making the Bachelor's thesis
Learning outcomes:
After completing the course, student

- is able to describe the principles of LaTeX document preparation system
- can form basic template of LaTeX document and modify it to his/her needs
- knows basic commands when writing mathematical text
- is able to use different environments (e.g. enumertions, equations)
- can recognize and fix errors in LaTeX code
- is able to write Bachelor's and Master's thesis using LaTeX

Contents:
Bachelor's and Master's thesis are written using LaTeX document preparation system. This course introduces basics in LaTeX by giving basic knowledge of the principles of LaTeX.
Mode of delivery:
Lectures / exercises (computer class)
Learning activities and teaching methods:
Face-to-face teaching
Target group:
Major students
Prerequisites and co-requisites:
First year math studies
Recommended optional programme components:
Must be completed before Bachelor's thesis.
Recommended or required reading:

Lecture notes
Tobias Oetiker Hubert Partl, Irene Hyna and Elisabeth Schlegl, *The Not So Short Introduction to LATEX2#* (http://tobi.oetiker.ch/lshort/lshort.pdf)
Kopka, H. and Daly, P. W., *Guide to LaTeX (4th Edition)*, Addison-Wesley Professional, 2003

Assessment methods and criteria:
Participation in lectures/exercises and home work.
Grading:
Pass/Fail
Person responsible:
Markus Harju
Working life cooperation:
-

765301A: Introduction to Nonlinear Dynamics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jürgen Schmidt
Opintokohteen kielet: English, Finnish
Leikkaavuudet:

765601S	Introduction to Nonlinear Dynamics	5.0 op

Ei opintojaksokuvauksia.

765601S: Introduction to Nonlinear Dynamics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jürgen Schmidt
Opintokohteen kielet: English, Finnish
Leikkaavuudet:

765301A	Introduction to Nonlinear Dynamics	5.0 op

Ei opintojaksokuvauksia.

756650S: Introduction to molecular ecology, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Lumi Viljakainen, Kvist, Laura Irmeli
Opintokohteen kielet: English
Leikkaavuudet:

750645S	Molecular ecology	2.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
English.
Timing:
B.Sc. 2 nd spring or M.Sc. 1 st spring, ECOGEN ECO and BS.
Learning outcomes:
This course introduces genetic theories, basics of phylogenetics and usage of molecular biology methods in ecology. The aim is that students know the basic methodology, can apply them into variety of genetic and ecological questions and is familiar with basics of population genetics and phylogenetics in order to be able to analyze and interpret genetic data.
Contents:
Basics of population genetics (variation, effective population size, bottlenecks, population structure, gene flow), relationships between molecular and adaptive variation, phylogenetic methods and phylogeography. Usage of molecular methods for identification of species, sex and individuals, behavioural ecology (mating systems, cooperation, mating success) and conservation.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
20 h lectures, 36 h exercises (laboratory and computer exercises), seminar, final exam.
Target group:
M.Sc. degree: 1st spring ECO optional, ECOGEN eco 1st spring compulsory.
Prerequisites and co-requisites:
Concepts of genetics (757109P), Experimental course in general genetics (757110P) and Molecular evolution (757312A) or equivalent knowledge.
Recommended optional programme components:
ECO: Basics in population ecology (756351A) and Advanced course in population ecology (755626S).
ECOGENeco: Basics in population ecology (756351A).
Recommended or required reading:
Beebee, T and Rowe G.2004 or 2008. An introduction to molecular ecology. Oxford University Press.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Final exam and seminar.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Doc. Laura Kvist.
Working life cooperation:
No.
Other information:
Note that Introduction to Molecular ecology and Introduction to population genetics courses are alternative; students cannot get credits from both.

756650S-02: Introduction to molecular ecology, exercises, 0 op

Voimassaolo: 01.08.2015 - 31.07.2019

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumi Viljakainen, Kvist, Laura Irmeli

Opintokohteen kielet: English

756650S-01: Introduction to molecular ecology, lectures, 0 op

Voimassaolo: 01.08.2015 - 31.07.2019

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kvist, Laura Irmeli, Lumi Viljakainen
Opintokohteen kielet: English

802635S: Introduction to partial differential equations, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Valeriy Serov
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

790102P: Introduction to the systematic Physical Geography, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Geography
Arvostelu: 1 - 5, pass, fail
Opettajat: Jan Hjort
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay790102P Introduction to the systematic physical geography (OPEN UNI) 5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS cr
Language of instruction:
Finnish and English (Lectures are only in Finnish, but this course can be completed also in English with some extra readings. Practicals are also organized in English.)
Timing:
1 year, 2nd semester
Learning outcomes:
This introductory course will give information about systematic fields of Physical Geography and its contemporary research. After the course, the student recognizes the most essential phenomena of geosphere (geomorphology), hydrosphere (hydrogeography), biosphere (biogeography), atmosphere (climatology), and he/she is able to do conclusions about the factors that influence those phenomena. The aim of the practical's is that the student can use basic methods of the research of Physical Geography.
Contents:
Geomorphology, climatology, hydrogeography, biogeography; and geosphere, atmosphere, hydrosphere and biosphere. The students will learn how nature works and how to resolve multiple environmental questions. Practical's are focused to the importance of the material compilation and its technical use.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
20 h lectures, 56 h practicals.
Target group:
Common course to all 1st year students of Geography.
Prerequisites and co-requisites:

-
Recommended optional programme components:
Course is part of the minor studies of Geography.
Recommended or required reading:
- Strahler, Alan (2013). Introducing Physical Geography.
- More material from the practicals.

Assessment methods and criteria:
Exam on an exam day.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Jan Hjort and Olli-Matti Kärnä
Working life cooperation:
No.
Other information:
Exchange students are asked to contact prof. Hjort before the course.

750629S: Kaamos symposium, 2 - 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Muotka, Timo Tapani

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-4 ECTS credits / 53-107 hours of work.
Language of instruction:
English.
Timing:
M.Sc. 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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Own presentation and the whole symposium 2 cr (postgraduate students). Summary of five presentations and symposium 2 cr (undergraduate students). Poster 0,5 cr (postgraduate students).
Target group:
Undergraduate biology students (2 cr) and postgraduate biology students (2-4 cr).
Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
Recommended or required reading:
Abstract book.
Assessment methods and criteria:
Presentation or reports.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / Fail.
Person responsible:
Prof. Timo Muotka.

Working life cooperation:
No.
Other information:
-

802320A: Linear Algebra, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

802119P Linear Algebra II 5.0 op

ECTS Credits:
5 ECTS cr
Language of instruction:
Finnish and English
Timing:
2nd year, 2nd period
Learning outcomes:
On successful completion of this course, the student will be able to
- apply the definition of linear space and concepts associated with linear spaces such as basis
- work with linear mappings and their matrix representations
- apply the definition of inner product space and concepts associated with inner product spaces such as orthogonality
- prove results related to linear spaces
Contents:
The aim of the course is to provide the student with the knowledge needed in almost all later courses in mathematics: abstract vector spaces and subspaces, linear independence and bases, inner product spaces, linear mappings and concepts associated with linear mappings such as kernel, eigenvalues and eigenvectors.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
28 h lectures, 14 h exercises, 91 h independent study
Target group:
Mathematics majors and minors students
Prerequisites and co-requisites:
802120P Introduction to Matrices
Recommended optional programme components:
-
Recommended or required reading:
http://cc.oulu.fi/~tma/OPETUS.html
Assessment methods and criteria:
Final exam
Grading:
1-5, fail
Person responsible:
Tapani Matala-aho
Working life cooperation:
No
Other information:
-

752316A: Macro fungi, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Annamari Markkola
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay752316A	Macro fungi (OPEN UNI)	3.0 op

ECTS Credits:
3 ECTS credits / 80 hours of work.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3 rd 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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
14 h lectures, 25 h exercises including excursions, identification exam.
Target group:
Optional.

Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
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.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Species identification exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Doc. Annamari Markkola.
Working life cooperation:
No.
Other information:
-

761118P: Mechanics 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op

766323A Mechanics 6.0 op
761323A Mechanics 6.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work
- 761118P-01, Lectures and exam (4 cr)
- 761118P-02, Lab. exercises (1 cr)

Language of instruction:
The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:
Autumn

Learning outcomes:
The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:
We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton's laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:
For the students of the University of Oulu.

Prerequisites and co-requisites:
Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:
Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:
Both parts (761118P-01 and 761118P-02) will be graded separately. The final grade of the course is the weighted average of the grades of part 1 (4 cr) and part 2 (1 cr).
761118P-01: Three midterm exams or final examination
761118P-02: Two laboratory exercises
Read more about assessment criteria at the University of Oulu webpage.

Grading:
Numerical grading scale 0 – 5, where 0 = fail

Person responsible:
Juha Vaara

Working life cooperation:
No work placement period

Other information:
https://wiki.oulu.fi/display/761118P

Compulsory

761118P-01: Mechanics 1, lectures and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766343A Mechanics 7.0 op
761111P-02 Basic mechanics, lab. exercises 0.0 op
761111P-01 Basic mechanics, lectures and exam 0.0 op
761111P Basic mechanics 5.0 op
761121P Physical Measurements I 3.0 op
761101P Basic Mechanics 4.0 op
761323A Mechanics 6.0 op
766323A Mechanics 6.0 op

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton's laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course: Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Three small midterm exams or final examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Juha Vaara

Working life cooperation:

No work placement period

Other information:

Course website

761118P-02: Mechanics 1, lab. exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766343A Mechanics 7.0 op
761111P-01 Basic mechanics, lectures and exam 0.0 op
761111P-02 Basic mechanics, lab. exercises 0.0 op
761111P Basic mechanics 5.0 op
761101P Basic Mechanics 4.0 op
761323A Mechanics 6.0 op
766323A Mechanics 6.0 op

Other information:
Course website

791626S: Methodological special themes in Physical Geography, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Geography
Arvostelu: 1 - 5, pass, fail
Opettajat: Jan Hjort
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Required proficiency level:
Quatitative research methods in Geography
ECTS Credits:
5 ECTS
Language of instruction:
Finnish and English if needed.
Timing:
1st or 2nd MSc-year, 2nd semester.
Learning outcomes:
The objective is that the student can critically apply spatial modelling methods to solve study problems in Physical Geography, understands the principles of the modelling techniques and acknowledges the importance of theory in scientific research.
Contents:
A special course that focuses on methodological literature and spatial modelling methods in Physical Geography. Spatial analysis and modelling are central development fields in Physical Geography. The course goes deeply into the spatial modelling of processes in Physical Geography utilizing novel analysis techniques. In addition, the focus is on scientific argumentation and importance of theory in spatial analysis. The course prepares the student for the preparation of MSc thesis.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
Lectures, practicals and practical work
Target group:
MSc students in Physical Geography.
Prerequisites and co-requisites:
Course Quantitative research methods in Geography have to be done.
Recommended optional programme components:

-
Recommended or required reading:
-
Assessment methods and criteria:
Written report.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5.
Person responsible:
Professor Hjort and PhD student in Physical Geography.
Working life cooperation:
No.
Other information:
Course will be organized in English if needed.

755325A: Methods in ecology I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Rytkönen, Kari Koivula

Opintokohteen kielet: Finnish

Leikkaavuudet:

750347A Ecological methods I 6.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3rd autumn, ECOGEN 1st 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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures, seminar, exercises and exam.
Target group:
Compulsory to ECO.
Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
Exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.

Person responsible:
Doc. Kari Koivula and Doc. Seppo Rytkönen.
Working life cooperation:
No.
Other information:
-

755329A: Methods in ecology II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Rytkönen

Opintokohteen kielet: Finnish

Leikkaavuudet:

750647S Methods in ecology II 7.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Lectures Finnish / English, exercises also in English.
Timing:
Finnish B.Sc. 3rd spring, ECOGEN ECO 1st spring.
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 5cr (755325A, 755625S). 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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures 8 h, 40 h exercises, independent work and exam.
Target group:
ECOGEN ECO compulsory.
Prerequisites and co-requisites:
Course Ecological methods I 5 cr (755325A). Recommended: Introduction to Statistics 5 cr (806118P) and A second course in statistics 5 cr (806119P).
Recommended optional programme components:
-
Recommended or required reading:
Reading package at course wiki-pages.
Assessment methods and criteria:
Exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Doc. Seppo Rytkönen and Doc. Kari Koivula.
Working life cooperation:
No.
Other information:
-

757620S: Methods in genomics and genomics evolution, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Savolainen Outi
Opintokohteen kielet: Finnish
Leikkaavuudet:

753612S Methods in genomics and genomics evolution 6.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1st autumn.
Learning outcomes:
Student knows focal features of genome structure, evolution and research methods.
Contents:
Genome structure, composition, comparative genomics, recombination and evolutionary factors affecting genome composition. Theory and methods.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
24 h lectures, 24 h seminars, independent work 83 h, exam, reports.
Target group:
BSg.
Prerequisites and co-requisites:
Concepts of genetics 5 cr (757109P), Experimental course in general genetics 5 cr (757110P) and Basics in population genetics 5 cr (757313A).
Recommended optional programme components:
-
Recommended or required reading:
Recent review articles.
Assessment methods and criteria:
Reports and exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen.
Working life cooperation:
No.
Other information:
-

761618S: Molecular quantum mechanics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Perttu Lantto
Opintokohteen kielet: Finnish, English

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
English
Timing:
Every second year (even year), spring
Learning outcomes:
After passing the course, the students can routinely apply the formalism of quantum mechanics and group theory to molecular problems, understand the basic features of the electronic structure of atoms and molecules, and know about the methods of electronic structure calculation.
Contents:
The course will provide the necessary background for students interested in molecular spectroscopy and/or the electronic structure calculations of molecules, materials and nanostructures. Subject matters: rotational motion and hydrogenic atoms, angular momentum, group theory, perturbation theory, variation theory, molecular electronic structure, computation of molecular electronic structure (quantum chemistry).
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 28 h, demonstrations 14 h, self-study 91 h
Target group:
Advanced undergraduate and beginning graduate students of physics, chemistry and materials sciences. Also for the other students of the University of Oulu. Teacher students.
Prerequisites and co-requisites:
Atomic physics 1 and Quantum mechanics 1, or the corresponding knowledge.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
P.W. Atkins and R.S. Friedman, "Molecular Quantum Mechanics", 5th edition, Chapters 3 - 9, Oxford University Press, 2011.
Assessment methods and criteria:
Final examination. Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 - 5, where 0 = fail
Person responsible:
Perttu Lantto
Working life cooperation:
No work placement period
Other information:
Course website

761652S: NMR Imaging, 10 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Ville-Veikko Telkki

Opintokohteen kielet: Finnish, English

ECTS Credits:
10 ECTS credits / 266 hours of work
Language of instruction:
English
Timing:
Every second year (odd year), autumn
Learning outcomes:
After completion, student understands the principles of the imaging methods based on nuclear magnetic resonance (NMR) and how NMR imaging can be used to characterize physical properties of various materials.
Contents:

Topics include one-dimensional Fourier imaging, k space, gradient echoes, multidimensional Fourier imaging, continuous and discrete Fourier transform, sampling, folding, filtering, resolution, and contrast.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 44 h, exercises 20 h, self-study 149 h
Target group:
Primarily for the students of the degree programmes in physics and chemistry. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
761663S NMR spectroscopy is helpful, but not necessary.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Textbooks: E. M. Haake, R. W. Brown, M. R. Thompson and R. Venkatesan, Magnetic Resonance Imaging. Physical Principles and Sequence Design., John Wiley & Sons, Inc., 1999 (in part), B. Blümich, NMR Imaging of Materials, Clarendon Press, 2000 (in part).
Assessment methods and criteria:
One written examination.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Ville-Veikko Telkki
Working life cooperation:
No work placement period
Other information:
Course website

761688S: NMR spectroscopy in solids, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Anu Kantola

Opintokohteen kielet: English, Finnish

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
English
Timing:
Not lectured every year
Learning outcomes:
The student can explain the basic principles and methods of nuclear magnetic resonance spectroscopy (NMR spectroscopy) in the solid state and can derive their consequences in the extent and level of the lectures (see Contents). In addition, he/she can solve problems which require profound understanding of the essential contents of the course.
Contents:
The course deals, e.g., basic NMR concepts for solids (nuclear spin magnetization, nuclear shielding, dipolar coupling, quadrupolar coupling, magic-angle spinning, relaxation, cross-polarization), practical considerations on solid state methods of spin-1/2 nuclei and quantum mechanics of solid-state NMR.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 28 h, excercises and demonstrations 14 h, self-study 91 h
Target group:
Primarily for the students of the degree programmes in physics and chemistry. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:

Quantum mechanics 1. NMR spectroscopy and pectroscopic methods are helpful, but not necessary.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Apperley, Harris and Hodgkinson, "Solid-state NMR, Basic principles & practice" Momentum Press, 2012 (partly). Material also from the lectures and/or web pages of the course.
Assessment methods and criteria:
One written examination
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Anu Kantola
Working life cooperation:
No work placement period
Other information:
Course website: https://wiki.oulu.fi/pages/viewpage.action?pageId=71894264

802665S: Numerical Analysis, 5 op

Voimassaolo: 01.06.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits
Language of instruction:
English
Timing:
4th or 5th year of studies
Learning outcomes:
On successful completion of this course, the student will be able to choose proper numerical methods for solving basic mathematical problems and approximate the errors of numerical results.
Contents:
The lecture course is focused to numerical methods for solving the most common basic problems in mathematics. For the methods, convergence, stability and suitability for computer arithmetic are considered. The course contains numerical solution methods for the following basic problems: systems of nonlinear equations, systems of linear equations, interpolation, integration, derivation and differential equations.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 28 h and exercises 14 h
Target group:
Major and minor students
Prerequisites and co-requisites:
Bachelor's degree in mathematics or equivalent studies
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
Lecture notes Ward Cheney, David Kincaid: Numerical Mathematics and Computing
Assessment methods and criteria:
Final exam
Grading:
Fail, 1-5
Person responsible:
Erkki Laitinen
Working life cooperation:
No
Other information:

-

802660S: Operator theory and integral equations, 10 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Valeriy Serov
Opintokohteen kielet: English

ECTS Credits:
10 ECTS cr
Language of instruction:
English
Timing:
The course is held in the whole autumn semester 2014/2015, during periods I and II. It is recommended to complete the course at the end of autumn semester.
Learning outcomes:

Upon completion the student should be able to:
- Operate with self-adjoint operators in the Hilbert spaces.

- Operate with compact operators in the Hilbert spaces.

- Operator with one-dimensional integral equations of the first and second order.

Contents:
1. Inner product spaces and Hilbert spaces.
2. Symmetric operators in the Hilbert space. J. von Neumann's theorems about symmetric operators. Basic criterion of self-adjointness.
3. Orthogonal projection operators. J. von Neumann's spectral theorem.
4. Spectrum of self-adjoint operator.
5. Riesz theory of compact operators.
6. Quadratic forms. Friedrichs extension of symmetric operators.
7. Elliptic differential operators in bounded domains.
8. Spectral function of self - adjoint operators. Green's function.
9. Integral operators with weak singularities. Integral equations of the first and second kind.
10. Volterra integral equations.
11. Singular integral equations.
12. Nyström's method for equation of second kind.
13. The Galerkin method for integral equations.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 56 h / Group work 24 h / Self-study 24 h. The exercises are completed as group work. (N.B. This must show all the course hours, which means that total 104 hours = 10 ECTS credits).
Target group:
Major students in mathematics, physics and engineering.
Prerequisites and co-requisites:
The required (or recommended) prerequisite is the completion of the following courses prior to enrolling for the course: Linear Algebra, Ordinary differential equations (I), Complex analysis (I), Analysis (I) and (II).
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
They following books are recommended (the course based on these books):
1) R. Kress, Linear integral equations, Springer-Verlag New York, 1999.
2) F. Riesz and B. Sz-Nagy, Functional analysis, Ungar, 1978.
3) A.N. Kolmogorov and S.V. Fomin, Elements of the theory of functions and functional analysis, DaverPublications, 1999.
Assessment methods and criteria:

The assessment criteria are based on the learning outcomes of the course. The final exam is required only.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Valery Serov
Working life cooperation:
-

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

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Taulavuori

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2-6 ECTS credits / 53-160 hours of work. About 100 pages / 1 ECTS credit.
Language of instruction:
Most books are in English.
Timing:
B.Sc. or M.Sc. degree.
Learning outcomes:
To understand environmental protection in global context.
Contents:
Depends on the book.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Three times per both semesters in university exam days. Exam days are announced in WebOodi.
Target group:
Biology, geography, geology, environmental engineering , exchange students.
Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
Recommended or required reading:
Gaston & Spicer (2004) Biodiversity – an introduction. Blackwell Publishing, 191p; Lockwood et al. (2007) Ivasion Ecology, Blackwell Publishing, 304 p; ACIA (2005) Arctic Climate Impact Assessment, Cambridge University Press, 1042 p.; Dincer et al. (2013) Causes, Impacts and Solutions to Global Warming, Springer, 1183 p.
Assessment methods and criteria:
Exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Doc. Kari Taulavuori.
Working life cooperation:
No.
Other information:
Student has to consult about the selected literature before exam.

791635A: Physical Geography of Fennoscandia, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Alahuhta

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay791635A	Physical Geography of Fennoscandia (OPEN UNI)	5.0 op

ECTS Credits:
5 ECTS
Language of instruction:
Finnish and English
Timing:
2nd or 3rd year, 1st or 2nd semester.
Learning outcomes:
Course familiarizes students to the geography of the Fennoscadia. When the student has passed the written exam, he/she can define the special characters of the physical geography of Fennoscandia
Contents:
Physical geography of the Fennoscandia.
Mode of delivery:
Book exam.
Learning activities and teaching methods:
Book exam.
Target group:
Obligatory for teachers, others voluntary.
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is part of minor studies of Geography.
Recommended or required reading:

- Seppälä, Matti (ed.) (2005). Physical Geography of Fennoscandia, 1st ed. 432 p. Oxford University Press.

Assessment methods and criteria:
Exam on examinarium.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Janne Alahuhta
Working life cooperation:
No.

765684S: Physics of the Solar System I, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Jürgen Schmidt

Opintokohteen kielet: English

Leikkaavuudet:

767604S	Solar System Physics	5.0 op
767304A	Solar System Physics	5.0 op
765384A	Physics of the solar system I	5.0 op
765659S	Physics of the Solar System I	7.0 op
765359A	Physics of the Solar System I	7.0 op

Ei opintojaksokuvauksia.

765384A: Physics of the solar system I, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jürgen Schmidt
Opintokohteen kielet: English
Leikkaavuudet:

767304A	Solar System Physics	5.0 op
767604S	Solar System Physics	5.0 op
765684S	Physics of the Solar System I	5.0 op
765359A	Physics of the Solar System I	7.0 op
765659S	Physics of the Solar System I	7.0 op

Ei opintojaksokuvauksia.

756615S: Physiology of forest trees, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Häggman, Hely Margaretha
Opintokohteen kielet: Finnish

ECTS Credits:
4 ECTS credits / 107 hours of work.
Language of instruction:
Finnish / English.
Timing:
M.Sc. 1 st or 2 nd spring, (arranged if resources allow).
Learning outcomes:
The student is able to assess the specific features of forest tree physiology and from this basis can judge the effect of climate change to forestry.
Contents:
Trees are long-living, often wind-pollinated, tall organisms. The juvenile phase may be long and the adult phase is characterized by both reproductive and vegetative growth which causes competition on both carbohydrates and nutrients. Cold- and drought resistance, water relations, carbon allocation and mineral nutrition will be discussed. Partly due to forest tree's economic importance biotechnological applications have been developed e.g. for the 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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Seminar, learning diary, essay.
Target group:
-
Prerequisites and co-requisites:
Lectures of Basics of plant biology (756346A) helps the following of the course.
Recommended optional programme components:
-
Recommended or required reading:
Literature announced in seminar.

Assessment methods and criteria:
Learning diary, essay.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Prof. Hely Häggman and Doc. Anna Maria Pirttilä.
Working life cooperation:
No.
Other information:
-

756344A: Plant ecology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Taulavuori, Annamari Markkola

Opintokohteen kielet: Finnish

Leikkaavuudet:

752300A Plant ecology 7.0 op

ECTS Credits:
5 cr / 133 hours of work.
Language of instruction:
Lectures Finnish, Exercises Finnish / English.
Timing:
B.Sc. 2nd autumn. ECOGEN 1st autumn.
Learning outcomes:
Student will get basic knowledge how plants adapt to different environmental factors.
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?
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
(1) Book exam. **(2)** 10 h seminars on the literature of plant ecology; **(3)** 30 h demonstrations and exercises in field and laboratory (basic methods in plant ecology and laboratory work) and 4 h final seminars. International students will compensate lectures by reading book Ridge, I. 2002: Plants, Oxford Univ. Press.
Target group:
Compulsory to ECO.
Prerequisites and co-requisites:
Basics of ecology (750124P) and Plant ecology field course (756343A) or equivalent knowledge.
Recommended optional programme components:
-
Recommended or required reading:
Ridge, I. 2002: Plants, Oxford Univ. Press..
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Lecture Book exam (final grade), laboratory diary and seminar presentation (both accepted/rejected).
Read more about assessment criteria at the University of Oulu webpage.

Grading:
1-5 / Fail.
Person responsible:
Doc. Kari Taulavuori (lectures), doc. Kari Taulavuori and doc. Annamari Markkola (exercises).
Working life cooperation:
No.
Other information:
-

756604S: Plant ecophysiology in changing environments, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Taulavuori

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits / 133 hours of work.
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, CO2, 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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
20 h lectures and demonstrations, 35 h exercises, exam and report.

Target group:
ECOb, BSb, Ph.D. students.
Prerequisites and co-requisites:
No.
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 2008: Plant Physiological Ecology. Springer Verlag. 540 s. Second edition.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Seminar and report.
Read more about assessment criteria at the University of Oulu webpage.
Grading:

1-5 / Fail.
Person responsible:
Doc. Kari Taulavuori.
Working life cooperation:
No.
Other information:
-

761653S: Plasma physics, 8 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
8 credits
Language of instruction:
English (or finnish depending on participants)
Timing:
Not lectured every year.
Learning outcomes:
The course begins with the introduction of the basic plasma theories: the kinetic theory and magnetohydrodynamics. After passing the course the student is able to explain the physical content of these theories, and is able to apply the theories to basic plasma problems. The student is also able to linearize partial differential equations related to these theories, transforming complicated differential equations into a solvable form. The student is able to apply these methods to study basic plasma wave modes and the most important plasma instabilities.
Contents:
Most normal matter in the universe is in plasma state, i.e., consists of charged particles interacting electromagnetically. Plasma physics studies what kind of phenomena appear in such a system. Plasma physics is the most important theory of space physics, which is applied to describe, e.g., ionospheric, magnetospheric, solar and heliospheric phenomena. This course gives a profound treatment of plasma theories and plasma phenomena, such as plasma waves.
Contents briefly: Kinetic theory of plasma, magnetohydrodynamic theory, linearization of differential equations, MHD waves, waves in cold plasma, kinetic theory of plasma waves, Landau damping, instabilities.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
44 h lectures, 20 h calculational exercises, 149 h independent studying
Target group:
This is an optional course for physics students at an advanced level on plasma physics. Recommended for students of space physics, astronomy and theoretical physics. Gives important background especially for all other space physics courses.
Prerequisites and co-requisites:
Intermediate level electromagnetism is recommended as background.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lecture notes: T. Asikainen: Plasma physics. Parts from books: Baumjohann-Treumann: Basic Space Plasma Physics, Imperial College Press, 1997; Treumann- Baumjohann: Advanced Space Plasma Physics, Imperial College Press, 1997; H. Koskinen, Johdatus plasmafysiikkaan ja sen avaruussovellutuksiin. Limes, 2001; F.F. Chen: Plasma Physics and Controlled Fusion, 2nd ed., Vol. 1, Plasma Physics, Plenum Press; J. A. Bittencourt: Fundamentals of plasma physics, Pergamon Press, 1986.
Assessment methods and criteria:
One written examination
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Timo Asikainen

791613S: Position based analyses and services in geography, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Geography
Arvostelu: 1 - 5, pass, fail
Opettajat: Rusanen Jarmo Juhani, Ossi Kotavaara
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS
Language of instruction:
Finnish and also English at need
Timing:
1st or 2nd MSc-year, 2nd semester.
Learning outcomes:
The objective is that the student understands basics of GPS positioning, can use GPS devices, can collect location based data by GPS and positioning in research.
Contents:
Basics of GPS and hand held devices, collecting location based geographical information by GPS, GPS data transformations with GIS, research by using GPS data. Location based services (LBS).
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
20 h lectures, reading circle, exercises, demonstrations and field working. Integrating GPS and LBS data with GIS and research in theory and practice. Written report and seminar.
Target group:
Especially students of GIS.
Prerequisites and co-requisites:
GIS bacis and cartography and Advanced course of GIS have to be done.
Recommended or required reading:
NOPPA Study Portal
Assessment methods and criteria:
Written report and seminar.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Jarmo Rusanen, Ossi Kotavaara
Working life cooperation:
No.

800683S: Project in mathematics, 10 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Esa Järvenpää
Opintokohteen kielet: Finnish, English

ECTS Credits:
10 ECTS credits / 266 hours of work
Language of instruction:
Finnish or English

Timing:
4th or 5th year
Contents:
The course starts with presentations of mathematics research groups. Students are divided into research groups and they make a small thesis under the supervision of a research group. The thesis is presented in a talk to other students.
Mode of delivery:
Face-to-face teaching and independent work.
Learning activities and teaching methods:
Seminars and own work
Target group:
Major's in pure mathematics
Prerequisites and co-requisites:
Bachelor's degree in mathematics
Recommended optional programme components:
Independent course
Recommended or required reading:
-
Assessment methods and criteria:
Thesis and talk
Grading:
1-5
Person responsible:
Esa Järvenpää
Working life cooperation:
-

763312A: Quantum mechanics I, 10 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

763612S Quantum mechanics I 10.0 op

ECTS Credits:
10 credits
Language of instruction:
Finnish / English depending on the audience
Timing:
3rd autumn
Learning outcomes:
The most important goal of the course is the development of a quantum mechanical frame-of-mind. After the course, the student knows the postulates of quantum mechanics and can solve the Schrödinger equation in such one- and three-dimensional problems that have important applications in condensed matter physics and in atomic, nuclear and molecular physics. The student will also learn to derive the uncertainty principle and use it to interpret what happens in a quantum mechanical measurement.
Contents:
Quantum mechanics, together with the general theory of relativity, lays the foundation for the modern scientific understanding of the nature. Recent developments in nanotechnology has also brought quantum-based applications into our everyday lives. However, the greatest influence quantum mechanics brings is on how we understand and interpret the behavior of the basic building blocks of nature. One of the interesting results of quantum mechanics is the uncertainty principle which means, for example, that a particle does not possess well defined position and velocity at a given time. This has far-reaching consequences in our understanding of the structure of matter, and even of the present amount and distribution of galaxies in the known universe. The inherent indeterminacy in the classical state of the particles implies that the microscopic particles have to be described with the so-called wave function, which determines the probability density of finding the particle at an arbitrary location. The course begins with the introduction of the basic principles and postulates of quantum mechanics. As an example, several one-dimensional problems for the time-evolution of the wave function are

solved. The uncertainty principle is derived in its general form, and applied to the simultaneous measurement of position and velocity. In three-dimensional problems, spherical symmetry is connected with the angular momentum. The corresponding operators and quantum numbers are derived. As an example, the quantized energy states of hydrogen atom are solved. The general formulation of quantum mechanics in terms of abstract Hilbert space and its linear transformations is presented, and shown to be equivalent with the wave function formalism. The properties of the general theory are illustrated in terms of the two quantum paradigms: the two-level system and the harmonic oscillator.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 50 h, 12 exercises (á 3 h), self-study and examination 184 h
Target group:
Compulsory for theoretical physicists and physicists. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Atomic physics (766326A) and knowledge of linear algebra and differential equations.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
J. Tuorila: Kvanttimekaniikka I (2013, in Finnish). D. Griffiths: Introduction to Quantum Mechanics (2005).
Course material availability can be checked here.
Assessment methods and criteria:
Two written intermediate examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Matti Alatalo
Working life cooperation:
No work placement period
Other information:
Course website

763612S: Quantum mechanics I, 10 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

763312A	Quantum mechanics I	10.0 op

ECTS Credits:
10 credits
Language of instruction:
Finnish / English depending on the audience
Timing:
3rd autumn
Learning outcomes:
The most important goal of the course is the development of a quantum mechanical frame-of-mind. After the course, the student knows the postulates of quantum mechanics and can solve the Schrödinger equation in such one- and three-dimensional problems that have important applications in condensed matter physics and in atomic, nuclear and molecular physics. The student will also learn to derive the uncertainty principle and use it to interpret what happens in a quantum mechanical measurements.
Contents:
Quantum mechanics, together with the general theory of relativity, lays the foundation for the modern scientific understanding of the nature. Recent developments in nanotechnology has also brought quantum-based applications into our everyday lives. However, the greatest influence quantum mechanics brings is on how we understand and interpret the behavior of the basic building blocks of nature. One of the interesting results of quantum mechanics is the uncertainty principle which means, for example, that a particle does not possess well defined position and velocity at a given time. This has far-reaching consequences in our understanding of the

structure of matter, and even of the present amount and distribution of galaxies in the known universe. The inherent indeterminacy in the classical state of the particles implies that the microscopic particles have to be described with the so-called wave function, which determines the probability density of finding the particle at an arbitrary location. The course begins with the introduction of the basic principles and postulates of quantum mechanics. As an example, several one-dimensional problems for the time-evolution of the wave function are solved. The uncertainty principle is derived in its general form, and applied to the simultaneous measurement of position and velocity. In three-dimensional problems, spherical symmetry is connected with the angular momentum. The corresponding operators and quantum numbers are derived. As an example, the quantized energy states of hydrogen atom are solved. The general formulation of quantum mechanics in terms of abstract Hilbert space and its linear transformations is presented, and shown to be equivalent with the wave function formalism. The properties of the general theory are illustrated in terms of the two quantum paradigms: the two-level system and the
harmonic oscillator.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 50 h, 12 exercises (á 3 h), self-study and examination 184 h
Target group:
Compulsory for theoretical physicists and physicists. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Atomic physics (766326A) and knowledge of linear algebra and differential equations.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
J. Tuorila: Kvanttimekaniikka I (2013, in Finnish). D. Griffiths: Introduction to Quantum Mechanics (2005).
Assessment methods and criteria:
Two written intermediate examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Matti Alatalo
Working life cooperation:
No work placement period
Other information:
Course website

763613S: Quantum mechanics II, 10 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

763313A Quantum mechanics II 10.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
10 ECTS cr
Language of instruction:
English (or Finnish, depending on the participants)
Timing:
3rd spring
Learning outcomes:
Course continues the development of the quantum mechanical frame-of-mind. After the course, the student can solve different physical eigenvalue problems by using matrices, can calculate the quantum numbers of the system, and can estimate the effect of a perturbation. The student can also solve problems that arise in low-energy scattering.
Contents:

Quantum mechanics of two and many particle systems is discussed in the context of, e.g.the periodic table of elements and the band structure of solids. For atomic, molecular and nuclear physics, the essential quantity in classifying states is the angular momentum, which we study in detail including the particle spin. Effects of weak perturbations are studied in terms of time-independent and time-dependent perturbation theory. As an example, we calculate fine-structure corrections to hydrogen atom, Zeeman effect, and the bound states of ionic Hydrogen molecule and He-atom. We derive the Fermi golden rule to calculate radiation induced transition rates between eigenstates. Finally we study interactions between particles using scattering theory. Concepts such as cross section, phase shift, scattering amplitude and Green's function are introduced.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 50 h, 12 exercises, self-study and examination 184 h
Target group:
For all interested in modern, quantum phenomena, compulsory for theoretical physicists (with A-code). Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Quantum Mechanics I (763312A).
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
J. Tuorila: Kvanttimekaniikka II (2014, in Finnish). D. Griffiths: Introduction to Quantum Mechanics (2005).
Assessment methods and criteria:
Two written intermediate examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Matti Alatalo
Working life cooperation:
No work placement period
Other information:
Course website

763313A: Quantum mechanics II, 10 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

763613S Quantum mechanics II 10.0 op

ECTS Credits:
10 ECTS cr
Language of instruction:
English (or Finnish, depending on the participants)
Timing:
3rd spring
Learning outcomes:
Course continues the development of the quantum mechanical frame-of-mind. After the course, the student can solve different physical eigenvalue problems by using matrices, can calculate the quantum numbers of the system, and can estimate the effect of a perturbation. The student can also solve problems that arise in low-energy scattering.
Contents:
Quantum mechanics of two and many particle systems is discussed in the context of, e.g.the periodic table of elements and the band structure of solids. For atomic, molecular and nuclear physics, the essential quantity in classifying states is the angular momentum, which we study in detail including the particle spin. Effects of weak perturbations are studied in terms of time-independent and time-dependent perturbation theory. As an example, we calculate fine-structure corrections to hydrogen atom, Zeeman effect, and the bound states of ionic Hydrogen molecule and He-atom. We derive the Fermi golden rule to calculate radiation induced transition rates between

eigenstates. Finally we study interactions between particles using scattering theory. Concepts such as cross section, phase shift, scattering amplitude and Green's function are introduced.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 50 h, 12 exercises, self-study and examination 184 h
Target group:
For all interested in modern, quantum phenomena, compulsory for theoretical physicists. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Quantum Mechanics I (763312A).
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
J. Tuorila: Kvanttimekaniikka II (2014, in Finnish). D. Griffiths: Introduction to Quantum Mechanics (2005).
Course material availability can be checked here.
Assessment methods and criteria:
Two written intermediate examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Matti Alatalo
Working life cooperation:
No work placement period
Other information:
Course website

763693S: Quantum optics in electric circuits, 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

763634S Quantum devices 5.0 op

ECTS Credits:
6 ECTS cr
Language of instruction:
English (or Finnish, depending on the participants)
Timing:
3. - 5. year
Learning outcomes:
To solve time-dependent quantum mechanical problems in harmonic oscillator, two-state system and free electrons that involve damping and noise.
Contents:
With present nanofabrication methods it is possible to make such small electric circuits that quantum effects become essential. The circuits behave like artificial atoms and the methods to deal with them resemble those used in quantum optics and NMR rather than traditionally used by electrical engineers. One major topic is how to include dissipation into quantum mechanics. This will be answered by deriving a master equation, and applying it to a harmonic oscillator and to a two-level system. The realization of the two-level system requires a nonlinear element, for which superconducting Josephson junctions are used. Another theme is different types of noise (thermal, shot, quantum). These can be derived by applying scattering formalism which considers electrons in a conductor like waves in a transmission line. We try to answer, among other things, if noise is present at zero temperature, is current flow noisy, and can zero-point fluctuations be measured.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 26 h, 11 exercise sessions, self-study 112 h

Target group:
For all interested in time-dependent quantum phenomena.
Prerequisites and co-requisites:
Recommended prerequisites Quantum mechanics I and II and Analytical mechanics.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
E. Thuneberg, Quantum optics in electric circuits (lecture notes)
Assessment methods and criteria:
One written examination
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Erkki Thuneberg
Working life cooperation:
No work placement period
Other information:
Course website

790106A: Region, culture and society, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Paasi Anssi

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS
Language of instruction:
English and Finnish
Timing:
2nd year, 1st semester.
Learning outcomes:
A student can explain and represent the main ideas of regional geography, theoretical and practical meanings of concept 'region' and the role of region in order to manage society and culture.
Contents:
Development of (contemporary) regional geography, theoretical meanings of concept 'region', region and power. Lecture serves different fields of specialization.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
16 h lectures and an exam (lectures and literature)
Target group:
Common course to all students of Geography.
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is part of minor studies of Geography.
Recommended or required reading:
Material will be delivered during the course.
Assessment methods and criteria:
Exam on exam day.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Anssi Paasi.
Working life cooperation:
No.

792319A: Regional politics, policy and development: Northern Europe, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Heikki Sirviö

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS
Language of instruction:
Finnish.and English. English speaking students should contact the teacher before the course.
Timing:
2nd year, 1st semester
Learning outcomes:
The student can categorise and assort basic theories, concepts and models in regional development and regional policy. He/she is able to discuss based on theories, concepts and models, and he/she is able to recognise those from scientific readings. The student also recognises the challenges and special characters of regional development and regional policy in Northern Europe.
Contents:
Theories, concepts and models of regional development and regional policy and their relation to practical actions, challenges and decision making.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
Scientific essay and 12 hrs reading circle.
Target group:
Obligatory for the students of regional development and regional policy, others voluntary.
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is part of minor studies of regional development and regional policy.
Recommended or required reading:
To be announced later (book and articles).

Assessment methods and criteria:
scientific essay and reading circle (obligatory participation).
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Joni Vainikka
Working life cooperation:
No.
Other information:
Exchange students are asked to contact Joni Vainikka before taking this course.

765307A: Research Project of Astronomy I, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Heikki Salo

Opintokohteen kielet: Finnish

Leikkaavuudet:

765332A Study project in astronomy 1 5.0 op
765332A-01 Data processing in astronomy 0.0 op
765332A-02 Study project 0.0 op
765135P Data processing in astronomy 2.0 op

Ei opintojaksokuvauksia.

Compulsory

765307A-01: Research Project of Astronomy I: Data processing in astronomy, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

765332A-02 Study project 0.0 op
765332A Study project in astronomy 1 5.0 op
765332A-01 Data processing in astronomy 0.0 op
765135P Data processing in astronomy 2.0 op

Ei opintojaksokuvauksia.

765307A-02: Research Project of Astronomy I: Study project, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

765332A-01 Data processing in astronomy 0.0 op
765332A-02 Study project 0.0 op
765332A Study project in astronomy 1 5.0 op

Ei opintojaksokuvauksia.

791627S: Research in regional geography, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Geography
Arvostelu: 1 - 5, pass, fail
Opettajat: Paasi Anssi
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS
Language of instruction:

Finnish and/or English.
Timing:
1st or 2nd MSc-year, 2nd semester.
Learning outcomes:
The student can interpret the latest discourse of the regional geography and participate to it by connecting his/her own study to the discussed issues.

Contents:
The course focuses on the contemporary issues of new regional geography.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
Study circle, presentations, book exam.
Target group:
Students in Human and Cultural Geography.
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Cresswell Tim (2014) Place. 2nd edition. Wiley-Blackwell
Assessment methods and criteria:
Exam on exam day.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5.
Person responsible:
Anssi Paasi.
Working life cooperation:
No.
Other information:
Course is organized on every other year, next on spring 2018.

766676S: Research project in physics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English, Finnish

Ei opintojaksokuvauksia.

750613S: Research training, 2 - 15 op

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

ECTS Credits:
1-14 ECTS credits / 27-405 hours of work.
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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
The topic and the study plan have to be agreed on in advance (registration form). The student has to keep diary and prepare a report on the work.
Target group:
-
Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
Report.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / Fail.
Person responsible:
Doc. Seppo Rytkönen ja Doc. Annamari Markkola (ECO), Prof. Outi Savolainen and Prof. Hely Häggman (BS).
Working life cooperation:
Yes. Participating to biology project gives working life skills.
Other information:
-

755632S: Restoration ecology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Tolvanen, Anne Kristiina, Annamari Markkola

Opintokohteen kielet: Finnish

Leikkaavuudet:

756607S	Restoration ecology	2.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Finnish / English.
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.
Mode of delivery:

Face-to-face teaching.
Learning activities and teaching methods:
24 h lectures, exercises and an excursion.
Target group:
ECO.
Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
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.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
-
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Prof. Anne Tolvanen.
Working life cooperation:
No.
Other information:
-

750654S: Special lecture in biology, 2 - 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

752667S	Special topics in plant ecology	2.0 op
751690S	Lectures on special topics in zoology	2.0 op

ECTS Credits:
2-5 ECTS credits / 53-133 hours of work.
Language of instruction:
Finnish / English.
Timing:
M.Sc. or Ph.D. degree. Arranged if resourses allow
Learning outcomes:
Students will be acquainted to current issues in biology.
Contents:
Seminars on current issues in biology.
Mode of delivery:
Varying.
Learning activities and teaching methods:
Varying.
Target group:
Biology students.
Prerequisites and co-requisites:
Varying.
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:

Varying.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail or Pass / Fail.
Person responsible:
Prof. Timo Muotka, Prof. Jari Oksanen, Prof. Outi Savolainen and Prof. Hely Häggman.
Working life cooperation:
No.
Other information:
-

790350A: Special themes in Regional Development and Regional Policy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Jonne Hytönen

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS
Language of instruction:
Finnish and English
Timing:
2nd or 3rd year, 1st or 2nd semesters (autumn or spring semesters)
Learning outcomes:
Student understands theories and conceptual challenges of planning in relation to complex and uncertain society. Student acquaint her/hisself with theoretical background of planning and the ways it is interwined with practices of planning. Besides that, student also learn to interpret how theory and practice of planning appear in regional development and regional policy.

Contents:
Theory and practice of planning as a part of regional development and regional policy.
Mode of delivery:
Book exam.
Learning activities and teaching methods:
Book exam.

Target group:
Students specializing in Regional Development and Policy, voluntary for others.
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:

- Hillier J & P Healey (2010) (eds.) The Ashgate research companion to planning theory: conceptual challenges for spatial planning. The test does not include the following chapters: 3, 8, 10, 12, 14 and 16. All the other content will be included in the test.

Assessment methods and criteria:
Exam on examinarium.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Jonne Hytönen
Working life cooperation:
No.
Other information:
Exchange students are asked to contact the teacher before registration.

790346A: Substituting written exam (Phy.g), 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Geography
Arvostelu: 1 - 5, pass, fail
Opettajat: Marja Lindholm
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS
Language of instruction:
Finnish and English
Timing:
2nd or 3rd year, 1st or 2nd semester.
Learning outcomes:
Student is able to define and apply the most essential concepts of the discipline from the view point of Physical Geography.
Contents:
The student deepen his/her geographical way of thinking according to his/her interest by reading the material of Physical Geography and thus substitutes the course "Special themes in Physical Geography" (790303A).
Mode of delivery:
Book exam.
Learning activities and teaching methods:
Book exam.
Target group:
Volyntary, substitutes the course "Special themes in Physical Geography" (790303A).
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Material for the exam
Autio, J. & O. Heikkinen (2002). The climate of northern Finland. *Fennia* 180, 61#66.
Bonan, G.B. & H.H. Shugart (1989). Environmental Factors and Ecological Processes in Boreal Forests. *Annual Review of Ecology and Systematics* 20, 1#28.
Foley, A.M. (2010). Uncertainty in regional climate modelling: A review. *Progress in Physical Geography* 34, 647#670.
Gaston, K.J. & R.A. Fuller (2007). Biodiversity and extinction: losing the common and the widespread. *Progress in Physical Geography* 31, 213#225.
Harsch, M.A., P.E. Hulme, M.S. McGlone & R.P. Duncan (2009). Are treelines advancing? A global meta-analysis of treeline response to climate warming. *Ecology Letters* 12, 1040–1049.
Heino, J., A.S. Melo, T. Siqueira, J. Soininen, S. Valanko & L.M. Bini (2015). Metacommunity organisation, spatial extent and dispersal in aquatic systems: patterns, processes and prospects. *Freshwater Biology* 60, 845–869.
Hjort, J., J.E. Gordon, M. Gray & M.L. Hunter Jr. (2015). Why geodiversity matters in valuing nature's stage. *Conservation Biology* 29, 630–639.
Mace, G.M., K. Norris & A.H. Fitter (2012). Biodiversity and ecosystem services: a multilayered relationship. *Trends in Ecology and Evolution* 27, 19 # 26.
Memon R.A., D.Y.C. Leung & C. Liu (2008). A review on the generation, determination and mitigation of Urban Heat Island. *Journal of Environmental Sciences* 20, 120#128.
Murray, G. (2008). Geodiversity: developing the paradigm. *Proceedings of the Geologists' Association* 119, 287#298.
Science for Environment Policy (2015). *Ecosystem Services and the Environment*. In-depth Report 11 produced for the European Commission, DG Environment by the Science Communication Unit, UWE, Bristol.
Seppälä, M. (2011). Synthesis of studies of palsa formation underlining the importance of local environmental and physical characteristics. *Quaternary Research* 75, 366#370.
Streletskiy, D., O. Anisimov & A. Vasiliev (2015). Chapter 10 – Permafrost Degradation. *Teoksessa* Haeberli, W., C. Whiteman & J. F. Shroder Jr. (toim.): *Snow and Ice-Related Hazards, Risks, and Disasters*, 303#344. Academic Press, Boston.

Assessment methods and criteria:

Exam on examinarium.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5.
Person responsible:
Marja Lindholm
Working life cooperation:
No.

791632S: Sustainable development and global tourism, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Roger Norum

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS
Language of instruction:
Finnish and English.
Timing:
1 MSc-year, 2nd semester.
Learning outcomes:
Following completion of the course the learner will be able to: know the definitions, origins and evolution of globalisation and sustainable development; apply the principles and theories which underpin the different forms of tourism, globalisation and sustainability; demonstrate an understanding of the complex relations between tourism and sustainable development in global contexts; explain the role played by international, national and regional tourism organisations in the global tourism development; evaluate the role and impacts of tourism in local-global nexus; compare the role and importance of tourism in developed and developing countries, urban and rural settings and nature-based and cultural tourism; critique the major global forces that are shaping future tourism and its relation sustainability; and demonstrate competencies in oral and written presentations and ability to critically evaluate others' viewpoints.
Contents:
Definitions and key concepts and ideas of tourism, globalisation and sustainable development and their relations; theories of development/under-development and globalisation; political economy of global tourism and sustainability; local-global nexus and globalisation from below; international, regional and national tourism organizations; global tourism; regional structures and development; impacts of tourism in local-global nexus and different socio-spatial contexts; and tourism-globalisation-sustainability: case studies focusing north and south.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
20 hrs lectures, written report and presentation.
Target group:
Especially students in Tourism Geography, and Human Geography and teachers.
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Literature:
- Mowforth, M. ja I. Munt (2009). Tourism and Sustainability.
- Selection of articles: (to be announced during the course)

Other readings:
- Butler, R. ja T. Hinch (toim.) (2007). Tourism and Indigenous Peoples;
- Holden, A. (2008). Environment and tourism;
- Saarinen, J., Becker, F., Manwa, H. ja D. Wilson (toim.) (2009). Sustainable Tourism and Southern Africa;
- Sharpley, R. ja D.J. Telfer (2002). Tourism and Development;
- Saarinen, J. Rogerson, C, ja H. Manwa (toim.) (2012). Tourism and Millennium Development Goals.

Assessment methods and criteria:
Written report and exam on exam day.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5.
Person responsible:
Roger Norum
Working life cooperation:
No.
Other information:
-

755322A: Terrestrial animals field course, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Rytkönen

Opintokohteen kielet: Finnish

Leikkaavuudet:

751306A Field course in terrestrial animals 4.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Finnish / English.
Timing:
B.Sc. - 1st summer. ECOGEN 1st summer.
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 course is hold at the Oulanka Research Station, Kuusamo, and 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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Part 1. (Oulu): 2 h demontration, independent studying. Part 2. (Oulanka): 49 h demonstrations and practicals, one species and theory exam, seminar.
Target group:
Compulsory (5 cr) to ECO. TEAeco: either Aquatic animals field course 5 cr (755321A) or Terrestrial animals field course 5 cr (755322A) is compulsory for biology major, the other field course can be included to the ecology minor. TEAbs, alternatively compulsory to TEAbs either Aquatic animals field course 5 cr or Terrestrial animals field course 5 cr. TEA: at least 10 cr compulsory, two field courses, one animal and other Plant ecology field course (756343A).
Prerequisites and co-requisites:
Basic identification of animals (755333A) or equivalent knowledge.
Recommended optional programme components:
This course is a prerequisite to course Winter ecology and physiology (750377A).
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) Pentinsaari, M. ym. 2015: Eläinten lajintuntemus, selkärangattomat. Oulun yliopisto, Oulu. Insect book recommended: Chinery, M. 1988 Pohjois-Euroopan hyönteisheimojen määritysopas, Tammi, Helsinki, 2. painos.

The availability of the literature can be checked from this link.
Assessment methods and criteria:
Theory exam, species identification exam, seminar presentation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
1-5 / Fail.
Person responsible:
Doc. Seppo Rytkönen.
Working life cooperation:
No.
Other information:
Binoculars, bird identification book, suitable outfit. Preparation knife, preparation scissors and sharp cusp tweezers.

750618S: Thursday seminar in biology, 2 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kuittinen, Helmi Helena

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2 ECTS credits / 53 hours of work.
Language of instruction:
English.
Timing:
M.Sc. 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 from Finland and abroad.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Guest lectures on Thursdays 12 am-1 pm. See seminar programme: https://noppa.oulu.fi/noppa/kurssi/750618s/etusivu
Target group:
Undergraduate and postgraduate students.
Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
10 participations and 10 one page long reports. You can combine lectures from different academic terms to make the needed 10 essays.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / Fail.
Person responsible:
Doc. Helmi Kuittinen.
Working life cooperation:
No.
Other information:
-

767301A: Time Series Analysis in Astronomy, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Vitaly Neustroev
Opintokohteen kielet: Finnish, English
Leikkaavuudet:

767601S	Time Series Analysis in Astronomy	5.0 op
765368A	Time Series Analysis in Astronomy	6.0 op
765668S	Time Series Analysis in Astronomy	6.0 op

Ei opintojaksokuvauksia.

767601S: Time Series Analysis in Astronomy, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Vitaly Neustroev
Opintokohteen kielet: English, Finnish
Leikkaavuudet:

767301A	Time Series Analysis in Astronomy	5.0 op
765368A	Time Series Analysis in Astronomy	6.0 op
765668S	Time Series Analysis in Astronomy	6.0 op

Ei opintojaksokuvauksia.

790620S: Tourism planning and development, 5 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Geography
Arvostelu: 1 - 5, pass, fail
Opettajat: Kaarina Tervo-Kankare
Opintokohteen kielet: English

ECTS Credits:
5 ECTS
Language of instruction:
English.
Timing:
1st MSc-year, 2nd semester.
Learning outcomes:

After this course, student understands the relationship between tourism planning and regional development and he /she knows the most central models of planning and development in local-global nexus. Student knows the starting points of the tourism policy in different scales, the background aspects of the tourism policy and current trends in regional, national and transnational tourism development and management thinking.
Contents:
Concepts and theories of the tourism development and tourism planning, economic and policy connections and impacts in regional level and basic aspects of the tourism policy and regional tourism strategies.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
18 hrs lectures, written seminar work and presentation, exam.
Target group:
Students doing the Tourism Geographies Double Degree (DD). Other students based on pre-agreement.
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is part of the Tourism Geographies Double Degree (DD).
Recommended or required reading:

- Hall, C.M. (2000). Tourism Planning: Policies, Processes and Relationships. 236 s. Prentice Hall, Harlow.
- Fennel, David A. (1999 or later version). Ecotourism – an introduction (partly).
- Article material (agreed during the course)

Assessment methods and criteria:
Exam on exam day.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Kaarina Tervo-Kankare
Working life cooperation:
No
Other information:
Exam, written seminar work and presentations are in English. If needed and possible, this course can be organised as written exam and report based on pre-agreement.

790320A: Tourism planning and development, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Kaarina Tervo-Kankare

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay790320A	Tourism planning and development (OPEN UNI)	5.0 op

ECTS Credits:
5 ECTS
Language of instruction:
Finnish and English.
Timing:
3 year, 2nd semester.
Learning outcomes:
After this course, student understands the relationship between tourism planning and regional development and he /she knows the most central models of planning and development in local, regional and national level. He/she knows the starting points of the tourism policy in local and European level, the background aspects of the tourism policy.
Contents:
Concepts and theories of the tourism development and tourism planning, economic impacts in regional level and basic aspects of the tourism policy and regional tourism strategies.
Mode of delivery:

Face-to-face learning.
Learning activities and teaching methods:
16 hrs lectures, written seminar work and presentation, exam.
Target group:
Students who're specialising to Tourism Geography. Course is part of minor studies tourism geography.
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is part of minor studies tourism geography.
Recommended or required reading:
- Hall, C.M. (2000). Tourism Planning: Policies, Processes and Relationships. 236 s. Prentice Hall, Harlow.
- Fennel, David A. (1999 or later version). Ecotourism – an introduction (partly).

Assessment methods and criteria:
Exam on exam day.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Kaarina Tervo-Kankare
Working life cooperation:
No.
Other information:
Written exam can be written also in Finnish. Written seminar work and presentation is in English. If needed, this course can be organised as written exam and practical's.

790161A: Tourism, sustainability and environment, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Kaarina Tervo-Kankare

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay790161A	Tourism, sustainability and environment (OPEN UNI)	4.0 op

ECTS Credits:
5 ECTS
Language of instruction:
English
Timing:
2nd year, 1st semester
Learning outcomes:
After the course, the student understands and can apply the principles of sustainable tourism in different contexts; he/she understands the importance of sustainable development in tourism in different contexts and from different viewpoints (spatial, stakeholder, sector). Student acknowledges the utilization of tourism for diverse development purposes and has basic understanding about its potential pitfalls, especially in the Global South framework. The student can analyse and compare the impacts and meaning of different tourism activities to sustainable development.
Contents:
The course focuses on the idea of sustainable tourism and sustainable development with emphasis on tourism in Global South. The course examines the conceptual and practical dimensions of sustainable tourism, its relationship with sustainable development in general and the applicability and problems associated with it. The course's basic concepts include the following: tourism and sustainable development, sustainable tourism, tourism impacts and sustainability at different scales (local-global) and environments, the roles of different actors (stakeholders) in sustainable tourism, tourism development plans and policies, methods to measure sustainability in tourism and tourism development, the role of sustainable tourist.

These concepts will be discussed both theoretically and in practice, highlighting their relevance in the Global South dimension and utilizing examples in different contexts. Some topical issues relating with the main theme sustainable tourism, such as pro-poor tourism and climate change will be covered in the Global South contexts. In addition, the student chooses one relevant topic to which she/he familiarizes.
Increase knowledge about the role and meaning of tourism in relation to development at different scales, and in different contexts, in the sustainability framework. Sustainability will be examined throughout the tourism system, at different scales and in diverse environments, with central focus on the development issues in the Global South.
Mode of delivery:
Virtual lectures/ppts, reader, short weekly learning diaries, group discussions, and a final assignment, which is also peer-evaluated.
Learning activities and teaching methods:
Lectures, self study, group work, web-based work, essay. To be confirmed at the first lecture.
Target group:
Students of geography who will specialize to Tourism Geography.
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is part of minor studies tourism geography.
Recommended or required reading:
Scientific articles, textbook chapters, development and other documents. Most of the course material will be provided via the course's Optima-environment.
Assessment methods and criteria:
Evaluation will be based on the learning diaries and the final assignment, which is also evaluated by peers.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
PhD Kaarina Tervo-Kankare
Working life cooperation:
No.

791629S: Traditions and current issues in tourism research, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Kaarina Tervo-Kankare

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay791629S	Traditions and current issues in tourism research (OPEN UNI)	5.0 op

ECTS Credits:
5 ECTS
Language of instruction:
Finnish/English
Timing:
1st or 2nd MSc-year, 2nd semester.
Learning outcomes:
Following the completion of the course the learner has deepened her/his knowledge on the research traditions and current issues in tourism geographies.
The course is structured around lectures and studies based on the department's researchers' and/or visiting scholars' and PhD students' demonstrations, and will provide insights to students on timely issues in tourism research, development, planning and/or management.
After the course the student will be able to: know and describe the basic concepts and theories of lecture/course subjects; evaluate the importance of lecture/course subjects; contextualise and integrate lecture/course subjects to Finnish or other specific regional context. In addition he/she will demonstrate competencies in oral and written presentations, teamwork and ability to critically evaluate others' viewpoints.
Contents:
Key theories, concepts and perspectives introduced during the course and based on the introduced cases studies.

Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
16 hrs lectures, group work, written and oral assignments, and exam or report.
Target group:
Especially students of Tourism Geography.
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Will be announced when the course starts.
Assessment methods and criteria:
Written exam on exam day and assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5.
Person responsible:
Kaarina Tervo-Kankare
Working life cooperation:
No.
Other information:
This course will be organized uneven years. Next time this course will be in semester 2, 2017 (or, if possible in every year). Alternatively, this course may be performed by case study based on recent literary and its written and oral presentation.

761310A: Wave motion and optics, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Alanko

Opintokohteen kielet: Finnish

Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
Finnish. The course material and exercises are available in English.
Timing:
First spring
Learning outcomes:
The student is able to treat different types of waves by methods of general theory of wave motion. The student is also able to solve problems related to basic optics and apply her/his knowledge to teaching and research in physics.
Contents:
General principles of wave motion, sound, electromagnetic waves, propagation of light, image formation in mirrors and lenses, optical instruments, interference, Fraunhofer diffraction, diffraction grating, laser principles.
Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 28 h, exercises 14 h, 2 laboratory exercises (3 hours/exercise), self-study 90 h
Target group:
No specific target qroup
Prerequisites and co-requisites:
Basic skills in mathematics
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
H. D. Young and R. A. Freedman, University Physics, Addison-Wesley, 2000 ja 2004, F. L. Pedrotti ja L. S. Pedrotti, Introduction to optics, Prentice-Hall, 2. ed., 1993 ja E. Hecht, Optics, (3rd ed.), Addison Wesley Longman, 1998.
Assessment methods and criteria:
Two written intermediate examinations or one final examination
Grading:
Numerical grading scale 0 – 5, where 0 is fail
Person responsible:
Seppo Alanko
Working life cooperation:
No work placement period

Compulsory

761310A-01: Wave motion and optics, lectures and exam, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

Ei opintojaksokuvauksia.

761310A-02: Wave motion and optics, lab. exercises, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op

766329A Wave motion and optics 6.0 op
761104P Wave Motion 3.0 op

Ei opintojaksokuvauksia.

755328A: Wildlife management and game animal ecology, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Biology
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Koivula, Jouni Aspi
Opintokohteen kielet: Finnish
Leikkaavuudet:

751368A Wildlife management and game animal ecology 6.0 op

ECTS Credits:
5 cr / 133 hours of work.
Language of instruction:
Finnish / English.
Timing:
B.Sc. 3rd autumn or M.Sc. 1st autumn.
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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
24 h lectures, one-day excursion to a game breeding area, seminar with written reports and exam.
Target group:
-
Prerequisites and co-requisites:
No.
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
Seminar with report and exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Prof. Jouni Aspi ja Doc. Kari Koivula.
Working life cooperation:
Yes.
Other information:
-

750377A: Winter ecology and physiology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Taulavuori

Opintokohteen kielet: Finnish

Leikkaavuudet:

750325A Winter ecology and physiology 3.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
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:
Two independent units: 1) 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); 2) Book exam on a common exam day 2 cr: Marchand, P. J. 1996: Life in the cold. An introduction to winter ecology.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures, exercises, report and seminar presentation.
Target group:
Biology students.
Prerequisites and co-requisites:
Courses Basics of ecology (750124P), Cell biology (750121P), Terrestrial animals field course (755322A), Aquatic ecology field course (755321A), Plant ecology field course (756343A) and Basics of plant biology, lectures (756346A) or equivalent knowledge.
Recommended optional programme components:
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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.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Seminar presentation and book exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Course + seminar: Pass / Fail, book exam: 1-5 / Fail.
Person responsible:
Doc. Kari Taulavuori.
Working life cooperation:
No.
Other information:
-

790349A: World regional geography, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Geography

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Alahuhta

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay790349A World regional geography (OPEN UNI) 5.0 op

ECTS Credits:
5 ECTS
Language of instruction:
Finnish and English.
Timing:
2nd or 3rd year, 1st or 2nd semester.
Learning outcomes:
After the course, the student can define and interpret different regional phenomena and processes in the global level.
Contents:
Regional phenomena of the world and their role in Physical Geography.
Mode of delivery:
Book exam.
Learning activities and teaching methods:
Book exam.
Target group:
Obligatory to the teachers, other voluntary.
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is part of the minor studies of geography.
Recommended or required reading:

- Hobbs, Joseph J. (2013): Fundamentals of World Regional Geography, 3. painos. Brooks/Cole Cengage Learning, 443 s.

Assessment methods and criteria:
Exam on examinarium.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5.
Person responsible:
Janne Alahuhta
Working life cooperation:
No.