Opasraportti

Faculty of Science - Geosciences 09-10 (2009 - 2010)

THE DEGREE PROGRAMME IN GEOSCIENCES

GENERAL DESCRIPTION

Bachelor of Science degree
Students can choose either geology and mineralogy or surficial geology as their major subject. Regardless of their major subject, they can also specialize in geoenvironment by choosing relevant courses from a joint programme with the Technical faculty. Geochemistry is available for all students as a minor subject.

Master of Science degree
The Degree Programme in Geosciences offers the possibility of majoring in geology and mineralogy or surficial geology
Two lines of specialisation are available:
1) Geoenvironment (majors in geology and mineralogy or surficial geology)
2) Exploration and mining (major in geology and mineralogy)
Geochemistry is available as a minor subject.

Geology and mineralogy is the study of the solid Earth, the materials of which it is made, including minerals, rocks and geological formations, and the processes acting upon them. Using field studies and geochronological tools, geologists determine and date the time sequence of events in the Earth's history, from the beginning to the present time. Important applications are geological mapping, exploration and exploitation of natural resources in bedrock and environmental questions. Mineralogy concentrates on the generation, structure, composition, occurrence and utilization of minerals and forms a foundation to geological research.

Surficial geology consists of physical geology, historical geology and palaeontology and many applications of the field (e.g. hydrogeology, environmental geology, peat geology, and ore prospecting). At the University of Oulu, the surficial geology concentrates mainly on the surface of the earth's crust, which is formed by different kinds of sediments. Due to the fact that many soil types were formed during the Quaternary period, this field is often called Quaternary geology.

The line of Geoenvironment is an interdisciplinary curriculum, which concerns geological processes and their relations with human actions. It crosses the faculty lines and includes following topics: geoenvironment and its processes; geological resources, geomaterials and recycled products; geomechanics and geostructures; environmental geological hazards and risk assessments; protection and renovation techniques of geoenvironment; geoenvironment of cold climate; hydrogeology and hydrotechnology.

Geochemistry studies the chemical composition of natural substances such as minerals, rocks and waters, in order to describe and quantify the processes which control the cycling of elements and isotopes in nature. The main applications are geochemical exploration of ores, environmental issues and determining the age and genesis of different rock types.

QUALIFICATION AWARDED

Within the degree programmes students can obtain the following degrees:

Bachelor of Science (B.Sc.) (180 credits)
In the Bachelor's degree about half of the studies are common compulsory studies for everyone. The rest are optional studies which develop a base for the upcoming specializing studies in the Master phase. Students select their optional studies according to their own interests and therefore direct their future profession profile. The degree includes a B.Sc. Thesis.
Master of Science (M.Sc.) (120 credits)
The degree consists of studies in the major subject (minimum 60 credits, including a M.Sc. Thesis 35 credits) and studies in two or more minor subjects. During the Master's phase a student can direct his/her future profession profile through the specialization program, advanced special studies, master's thesis, working experience and secondary subject studies.

Post-graduate degrees:

Licenciate of Science in Geosciences. In addition to M.Sc., 60 credits in major and minor subjects plus a Ph.Lic. Thesis (90 credits).

Doctor of Science in Geosciences. In addition to M.Sc., 60 credits in major and minor subjects (not required if Ph.Lic. is completed) plus a Ph.D. Thesis.

A student with the Master of Science degree may proceed to pursue the degree of Licenciate of Philosophy or Doctor of Philosophy provided that the grade for the major subject is high enough and that he/she presents an acceptable research plan. The Dean grants the permission to pursue postgraduate studies. The Dean's decision will be based on a statement by the Department Council on the student's previous studies in his/her major subject.

EDUCATIONAL AND PROFESSIONAL GOALS

The Degree Programme in Geosciences admits 20-30 new students annually, and ca. 13 geology students obtain the Master of Science degree every year. The degree programme in Geosciences aims at providing the student with the capacity to work as an expert of geology, geochemistry or geophysics in demanding tasks in the industry or private and public sector or NGO's. Graduates are familiar with the geological processes and they are able to apply scientific methods for locating and mapping, utilising and preserving natural resources. Field work and laboratory exercises are an essential part of the degree programme. Graduates understand the meaning of international cooperation in the field of geosciences as geological formations commonly cross-cut man-made border lines.

STRUCTURE OF THE DEGREES

The studies in geosciences consist of basic studies (code P), subject studies (code A) and advanced studies (code S). In addition, language studies and orientation studies (code Y) are part of the curriculum. The education in geology is given in the form of lecture courses, practical exercises, seminars, workshops and field courses.

Personal study plan (PSP) is made for the entire study period but it is also good to be prepared to change it when needed. Students of geosciences sketch a preliminary PSP in the first autumn during orientation and will make a more precise PSP later on in their studies. Own interests and fields that are strong should be valued. The first year studies are mainly common for all students. The major studies can be chosen during the second or third year. You can get help for your planning from e.g. amanuensis, student tutors of different subjects.

BACHELOR OF SCIENCE (B.Sc.) 180 credits

- General studies 9 credits
- Basic studies in Geosciences 28 credits
- Major subject studies (compulsory)
- Subject studies in Geosciences (optional)
- Compulsory minor studies
- Optional minor studies
- Bachelor of Science Thesis and Maturity test 9 credits

GENERAL STUDIES (9 credits)

770001Y Orientation course for new students 2 credits 1st autumn
030005Y Information Skills 1 credits 3rd spring
English 1 (Reading for Academic Purposes) 2 credits 1st spring
English 2 (Scientific Communication) 2 credits 2nd spring
Swedish 2 credits 3rd year
COMPULSORY COURSES to all students in the Degree Programme in geosciences (28 credits)
Geological processes:
771100P The Earth in Universe (2 credits) 1st autumn
771101P Endogenic processes (4 credits) 1st autumn
771109P Exogenic processes (3 credits) 1st autumn
Mineralogy:
771102P Basic Mineralogy (5 credits) 1st autumn
771110P Introduction to classifications of rocks (2 credits) 1st autumn
Geology of Finland:
771106P Introduction to bedrock geology of Finland (2 credits)
771107P Introduction to surficial geology of Finland and 1st spring
Historical geology (2 credits)
771108P Introduction to ore geology (2 credits) 1st spring
772102P Field course in bedrock geology (3 credits) 1st spring
773103P Field course in surficial geology (3 credits) 1st spring

MAJOR SUBJECT STUDIES (COMPULSORY)
Geology and mineralogy (19 credits):
771302A Digital modelling and geological information systems in geosciences
772302A Bedrock geology of Finland 5 credits
771304A Practical training 4 credits
772337A Seminar in geology and mineralogy I 5 credits
Surficial geology (17 credits):
773306A Surficial geology of Finland 5 credits
773314A Environmental Geology 3 credits
771304A Practical training 4 credits
773343A Seminar in surficial geology I 5 credits

SUBJECT STUDIES IN GEOSCIENCES (Optional min. 33 credits)
A student can choose his or her subject studies freely from the following list. It is important to notice that certain courses depending of the major subject should be completed in the M.Sc. phase at the latest.

GEOLOGY AND MINERALOGY (p = should be completed in M.Sc., (geology and mineralogy major) at the latest.
772308A Petrology 6 credits (P)
772310A General mineralogy 5 credits (P)
772316A Structural geology 5 credits (P)
772323A Petrography I 8 credits (P)
772334A Bedrock mapping 3 credits (P)
772335A Introduction to ore mineralogy 5 credits (P)
772336A Optical mineralogy 7 credits (P)
772337A Seminar in geology and mineralogy I 5 credits
772357A Technical use of rocks and minerals 4 credits
772385A Ore geology 5 credits (P)

SURFICIAL GEOLOGY (p = should be completed in M.Sc. (Surficial geology major) at the latest.
773300A Quaternary stratigraphy 5 credits (P)
773303A Basics of glacial geology 4 credits (P)
773316A Technical properties of sediments 8 credits (P)
773317A Physical sedimentology 5 credits (P)
773322A Surficial geology in ore exploration 5 credits
773324A Field mapping of Quaternary deposits 5 credits
773330A Peat geology 5 credits
773337A Biostratigraphy: Pollen course 5 credits (P)
773341A Biostratigraphy: Diatom course 5 credits (P)
773343A Seminar in surficial geology I 5 credits
GEOENVIRONMENT
488106A Basics in environmental geotechnics
773331A Hydrogeology 5 credits
488102A Hydrological processes 5 credits
774329A Introduction to environmental geochemistry 5 credits
772333A Technical mineralogy 5 credits
488103A Environmental impact assessment 5 credits

GEOCHEMISTRY
774304A Analytical methods in geochemistry 5 credits
774329A Introduction to environmental geochemistry 5 credits
774315A Geochemistry of igneous rocks 5 credits
774316A Seminar in environmental geochemistry 5 credits

MINOR SUBJECT STUDIES
The minimum of studies accepted as a minor subject is 15 credits. Often the amount of 25 credits is recommended. Minor subject studies include some compulsory studies, which could be part of the amount of 15 or 25 credits. Minor subject studies consist often one other geosciences subjects (geology and mineralogy, surficial geology) depending on the major subject of the student. Minor subject studies can also be taken from other departments or universities. The most common minor studies for geologist are chemistry, physics (geophysics), mathematics, computer sciences, biology and geography.

COMPULSORY MINOR SUBJECT STUDIES
Geology and mineralogy (major):
Surficial geology:
773306A Surficial geology of Finland 5 credits
773314A Environmental Geology 3 credits
Geochemistry:
774301A Basic course in geochemistry 5 credits
Chemistry:
Minimum 4 credits (780109P Basic Principles in Chemistry 4 credits, recommend)
Geophysics:
Minimum 4 credits
Line of Geoenvironment (major geology and mineralogy), also:
031010P Calculus I

Surficial geology (major):
Geology and mineralogy:
771302A Digital modelling and geological information systems in geosciences 5 credits
772302A Bedrock geology of Finland 5 credits
Geochemistry:
774301A Basic course in geochemistry 5 credits
Chemistry:
Minimum 4 credits (780109P Basic Principles in Chemistry 4 credits, recommend)
Geophysics:
Minimum 4 credits
Line of Geoenvironment (major surficial geology), also:
031010P Calculus I

The students who will specialise to exploration and mining can do minor at process and environmental engineering studies.

Process and Environmental Engineering studies (optional) (minimum 15 credits):
488101P Environmental legislation 5 credits
488011P Introduction to Environmental Engineering 5 credits
488106A Basics on Geoenvironmental Engineering 5 credits
477101A Fluid and Particle Engineering 1 3 credits
477611A Introduction to Process Engineering 5 credits
477702A Rock Engineering 3 credits
031010P Calculus I 5 credits

BACHELOR OF SCIENCE THESIS 9 credits

A thesis based on individual research of literature, field work or laboratory work. Before starting the thesis, students must agree upon the details of the thesis with the professor.

MATURITY TEST

After completing the Bachelor of Science and Master of Science Thesis, the student writes an essay in his/her native language on the thesis, to show a good command of the language and the topic of the thesis.

MASTER OF SCIENCE DEGREE (M.Sc.) 120 credits

• Advanced major subject studies minimum 25 credits
• Minor studies 60 credits
  o Line of Exploration and mining specialised studies minimum 40 credits
• Master of Science Thesis and Maturity test 35 credits

ADVANCED STUDIES IN GEOLOGY AND MINERALOGY

Mineralogy:
772636S Practical course in fluid inclusion 4 credits
772635S Practical course in mineral chemistry 4 credits
772601S Mineralogy - advanced course 5 credits
772619S Mineralogical instrumental analytics 4 credits
772618S Practical course in applied mineralogy 4 credits

Petrography:
772627S Petrography II 10 credits

Petrology:
772621S Geology of alkaline rocks, carbonatites and kimberlites 4 credits
772628S Geology of basic layered intrusions 5 credits
772603S Igneous petrology 6 credits
772604S Metamorphic petrology 6 credits
772606S Sedimentary petrography 4 credits

Ore geology:
772645S Regional ore geology 6 credits
772608S Mining geology 2 credits
772607S Seminar in ore geology 4 credits
772625S Ore geological field course 2 credits

Structural geology and tectonics:
772609S Structural geology workshop 6 credits
772620S Tectonics 5 credits

Regional geology:
772610S Excursion 2 credits
772612S Precambrian sedimentology 4 credits
772613S Evolution of the bedrock geology of Finland 6 credits
772626S Archaean geology 5 credits

Other advanced studies:
772658S Special issues in geology and mineralogy 5 credits
772662S Field course in bedrock geology and geophysics 3 credits
772614S Workshop in bedrock mapping 5 credits
772615S Literature study 5 credits
ADVANCED STUDIES IN SURFICIAL GEOLOGY

Glacial geology and ore exploration:
773601S Glacial geology II 5 credits
773645S Study circle of glacial geology and ore exploration 5 - 15 credits
773641S Advanced course of surficial geology in ore exploration I 5 credits
773642S Advanced course of surficial geology in ore exploration II 5 credits
773616S Aerial photo interpretation in surficial geology 5 credits (compulsory)
773610S Excursion on glacial geology of Lapland 4 credits

Environmental geology:
773621S Global environmental and climate change during the Cenozoic 4 credits
773614S Microfossil research techniques -advanced 4 credits
773622S Utilization of peat 4 credits
773638S Laboratory course in peat geology 4 credits
773602S Paleolimnology 4 credits
773673S Field course in environmental geology and geophysics 3 credits

Sedimentology:
773612S Excursion on regional surficial geology 3-6 credits
773605S Composition and characteristics of fine-grained mineral sediments 4 credits
773646S Advanced field techniques 3 credits
773643S Technical properties of sediments -advanced course 5 credits
773648S Sedimentary structures 5 credits
773647S Sedimentology 6 credits

Other advanced studies:
773618S Advances in palaeoecology 5 credits
773606S Field excursion in surficial geology 2 - 5 credits
773613S Literature essay 5 credits
773607S Literature study 5 credits
773608S Special questions on surficial 5 credits
773619S Seminar in Surficial geology 2 5 credits
773615S Studia Generalia-lectures 2 credits
773679S Courses taken at other
773657S Master's thesis (Pro gradu) 35 credits

ADVANCED STUDIES IN GEOCHEMISTRY

774635S Basic course in geothermodynamics 6 credits
774633S Hydrogeochemistry 6 credits
774636S Geochemistry of Mining Environments 5 credits
774629S Literature essay 4 credits
774634S LA-ICP-MS -analytics 4 credits
774630S Geochemistry of radiogenic isotopes 6 credits
774631S Geochemistry of stable isotopes 4 credits

ADVANCED STUDIES IN GEOENVIRONMENT

488115S Advanced Geoenvironmental Engineering 5 credits
488111S Modelling in geoenvironmental engineering 5 credits
773675S Geological methods in hydrogeology 5 credits
774633S Hydrogeochemistry 6 credits
488108S Groundwater engineering 5 credits
750616S Environmental legislation 5 credits
EXPLORATION AND MINING SPECIALISED STUDIES
A minimum 40 credits from the following course units:

488103A Environmental Impact Assessment 5 credits
477707A Mining Engineering 3 credits
477704A Principles of Mineral Processing 5 credits
555220A Basic course in industrial engineering and management 3 credits
555280A Basic course of project management 2 credits
477702A Surface Chemistry Principles of Mining 3 credits
477724S Numerical Mine Modelling 3 credits
477721S Mineral processing 7.5 credits (LTU)
477706S Geophysical Investigation Methods of Bedrock 3 credits
477705S Field Course in Economic Geology 2 credits
774636S Geochemistry of Mining Environments 5 credits

774304A Analytical methods in geochemistry 5 credits
773316A Technical properties of sediments 8 credits
773322A Surficial geology in ore exploration 5 credits

The education in exploration and mining is given in collaboration with the Department of Process and Environmental Engineering. The students can also choose some courses from the University of Luleå to their studies.

The studies specializing in exploration and mining are focused on understanding and controlling processes and operations connected to the full-scale life span of mines. Teaching in ore exploration, ore and mining geology, ore mineralogy, technical mineralogy, mineral processing, mining engineering, environmental engineering, environmental and mining legislation is central in the education.

GEOSCIENCES AS A MINOR SUBJECT

Also students studying geosciences as an optional minor subject are accepted to the courses within the resources of the department. If the number of participants of a course has to be limited, the number of minor students can be limited.

In Geosciences it is possible to complete 25 credits of minor studies, which consist of basic studies of geosciences.

EXAMINATION AND ASSESSMENT REGULATIONS

During the terms examinations are arranged twice a month on Fridays at 9.00-12.00 in room GO101 unless otherwise stated. The dates in academic year 2009-2010 are 4.9., 9.10., 6.11., 4.12., 15.1., 12.2., 12.3., 9.4 and 7.5. (surficial geology and geochemistry) 25.9., 23.10., 20.11., 18.12., 29.1., 26.2., 26.3., 23.4 and 21.5 (geology and mineralogy). The students must register for the examinations via WebOodi on the previous Monday at 12.00 at the latest. The students must register for summer examinations during May.

Grades from 1 to 5 are used, 5 being the best. For study units consisting of several subunits, the grade is the average of all courses.

CONTACTS AND STAFF:

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Tuisku Pekka, Ph.D (geology and mineralogy)
Uosukainen Harry, Ph.D (surficial geology)
Uusinoka Raimo, Ph.D (surficial geology)
Vuollo, Jouni, Ph.D (geology and mineralogy)

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

774301A: A Basic Course in Geochemistry, 6 op
772618S: A practical course in applied mineralogy, 4 op
488115S: Advanced Geoenvironmental Engineering, 5 op
773646S: Advanced field techniques, 3 op
773618S: Advances in Palaeoecology, 5 op
773616S: Aerial photo interpretation in surficial geology, 5 op
774304A: Analytical methods in geochemistry, 5 op
772626S: Archaean geology, 5 op
771303A: Bachelor of Science thesis, 9 op
774635S: Basics in geothermodynamics, 6 op
771102P: Basic course in mineralogy, 6 op
773303A: Basics of glacial geology, 4 op
772613S: Bedrock geology of Finland, 6 op
772302A: Bedrock geology of Finland, 5 op
772334A: Bedrock mapping, 3 op
773341A: Biostratigraphy: diatom analyses, 5 op
773337A: Biostratigraphy: pollen analyses, 5 op
773605S: Composition and characteristics of fine-grained mineral sediments, 4 op
771302A: Digital modelling and geological information systems in geosciences, 5 op
771101P: Endogenic processes, 4 op
773314A: Environmental Geology, 3 op
773673S: Environmental geology and geophysicfield course, 3 op
772610S: Excursion, 2 op
773606S: Excursion in surficial geology, 2 - 5 op
773610S: Excursion on glacial geology of Lapland, 4 op
773612S: Excursion on regional surficial geology, 3 - 6 op
771109P: Exogenic Processes, 3 op
772103P: Field course in bedrock geology, 3 op
772662S: Field course in bedrock geology and geophysics, 3 op
773103P: Field course in surficial geology, 3 op
773324A: Field mapping of Quaternary deposits, 5 op
772310A: General mineralogy, 5 op
774636S: Geochemistry of Mining Environment, 5 op
774315A: Geochemistry of igneous rocks, 4 op
774630S: Geochemistry of radiogenic isotopes, 6 op
774631S: Geochemistry of stable isotopes, 4 op
773675S: Geological research methods in hydrogeology, 5 op
772628S: Geology of basic layered intrusions, 5 op
772621S: Geology of alkaline rocks, carbonatites and kimberlites, 5 op
773601S: Glacial Geology II, 5 op
773621S: Global environmental and climate change during the Cenozoic, 4 op
488108S: Groundwater Engineering, 5 op
774633S: Hydrogeochemistry, 6 op
773331A: Hydrogeology, 5 op
488102A: Hydrological Processes, 5 op
772603S: Igneous petrology, 6 op
030005P: Information Skills, 1 op
774329A: Introduction to Environmental Geochemistry, 5 op
771108P: Introduction to Ore Geology, 2 op
771106P: Introduction to bedrock geology of Finland, 2 op
771110P: Introduction to classification of rocks, 2 op
771107P: Introduction to historical geology and surficial geology of Finland, 2 op
772335A: Introduction to ore mineralogy, 5 op
772335A-01: Introduction to ore mineralogy, lectures, 0 op
772335A-02: Introduction to ore mineralogy, practices, 0 op
774634S: La-ICP-MS -analytics, 4 op
773638S: Laboratory exercises on peat geology, 4 op
750616S: Legislation in environmental protection, 5 op
774629S: Literature essay, 4 - 5 op
773613S: Literature essay, 5 op
773607S: Literature study, 5 op
772615S: Literature study, 5 op
772666S: Master's thesis, 30 op
772604S: Metamorphic petrology, 6 op
773614S: Microfossil research techniques (advanced), 4 op
772619S: Mineralogical instrumental analytics, 4 op
772601S: Mineralogy - advanced course, 5 op
772608S: Mining geology, 3 op
488111S: Modelling in Geoenvironmental Engineering, 5 op
772336A: Optical mineralogy, 7 op
772625S: Ore geological field course, 2 op
772385A: Ore geology, 5 op
770001Y: Orientation course for new students, 1 op
773602S: Paleolimnology, 4 op
773330A: Peat geology, 5 op
772323A: Petrography I, 8 op
772627S: Petrography II, 10 op
772308A: Petrology, 10 op
773317A: Physical Sedimentology, 5 op
772636S: Practical course in fluid inclusion, 4 op
772635S: Practical course in mineral chemistry, 4 op
771304A: Practical training, 4 - 5 op
772612S: Precambrian sedimentology, 4 op
773657S: Pro gradu thesis, 30 op
773343A: Quaternary Geology Seminar I, 5 op
773306A: Quaternary Geology of Finland, 5 op
773300A: Quaternary Stratigraphy, 5 op
773619S: Quaternary geology seminar II, 5 op
Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

774301A: A Basic Course in Geochemistry, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Geosciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

Language of instruction:
finnish

Timing:
1st or 2nd spring

Learning outcomes:
The main objective is to provide students with the basic knowledge of various aspects of geochemistry.

Contents:
Geochemistry as a field of science; history of geochemistry; tasks and fields of geochemistry; origin of chemical elements; origins and structure of the Earth; meteorites; moon and planets; composition of earth's different spheres; geochemical differentiation; geochemical circulation; the geochemical characteristics and circulation of elements; geochemistry of disintegration and stratification; pH-Eh-diagrams; clays; carbonate sediments; geochemical processes; the main fields of geochemistry and their applications.

Learning activities and teaching methods:
32 h lectures, 12 h exercises

Recommended optional programme components:
780109P

Recommended or required reading:

Assessment methods and criteria:
examination
Grading:
1-5/fail

Person responsible:
E. Hanski

772618S: A practical course in applied mineralogy, 4 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Gehör
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning activities and teaching methods:
22 h lectures, 12 h exercises

Assessment methods and criteria:
examination
Grading:
1-5/fail

Person responsible:
S. Gehör

488115S: Advanced Geoenvironmental Engineering, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Kauko Kujala
Opintokohteen kielet: Finnish

Learning outcomes:
To familiarise the student with properties of soil, geomaterials and by-products from industry, load, design and construction of geo- and environmental structures.

Contents:

Learning activities and teaching methods:
Lectures. Calculation and design exercises

Other information:
Requirements: Laboratory and calculation exercises

773646S: Advanced field techniques, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Pekka Lunkka
Opintokohteen kielet: Finnish

ECTS Credits:
3 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
After completion students are able to use appropriate field methods and approaches to solve particular research problem in Quaternary geology.
Contents:
Planning and carrying out research in the field. An introduction to various field methods and analyzing techniques.
Grading:
pass/fail
Person responsible:
V. Peuraniemi or J. P. Lunkka

773618S: Advances in Palaeoecology, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Hicks Sheila
Opintokohteen kielet: English

ECTS Credits:
5 credits
Language of instruction:
english
Timing:
4th or 5th year
Contents:
The course will consist of 6 -8 meetings during the academic year. At each meeting a topic of significance to palaeoecological research will be discussed, the discussion being based on 2 -3 key published articles, which participants will be expected to read and analyse beforehand. All articles will be considered from two points of view, (i) their contribution to unravelling questions of climate change and/or environmental reconstruction and (ii) their format as a scientific paper. Emphasis will be on quantification, a multidisciplinary approach and the significance of different temporal and spatial scales. Where possible literature discussion meetings will be replaced by seminar discussions with visiting international researchers.
Grading:
pass/fail
773616S: Aerial photo interpretation in surficial geology, 5 op

Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Geosciences  
Arvostelu: 1 - 5, pass, fail  
Opettajat: Peuraniemi, Vesa Juhani  
Opintokohteen kielet: Finnish

ECTS Credits:  
5 credits  
Language of instruction: finnish  
Timing:  
4th or 5th year  
Learning outcomes:  
Upon completion of the course, student should be able to identify and interpret basic landforms from air photos.  
Contents:  
Basics of air photo interpretation; identifying landforms from air photos and topography maps; mapping based on air photo interpretation and the necessary field research. Students draw up a map of a small area.  
Learning activities and teaching methods:  
20 h lectures, 30 h practical exercises  
Assessment methods and criteria:  
exercises and an examination  
Grading:  
1-5/fail  
Person responsible:  
V. Peuraniemi

774304A: Analytical methods in geochemistry, 5 op

Opiskelumuoto: Intermediate Studies  
Laji: Course  
Vastuuysikkö: Department of Geosciences  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen kielet: Finnish

ECTS Credits:  
5 credits  
Language of instruction: finnish  
Timing:  
2nd or 3rd year  
Learning outcomes:  
After the course students should know which kind of sample pretreatment and analysis methods are used for geological samples.  
Contents:  
Detection limits and errors in analysis, presentation of analytical results, sampling, sample pretreatment, sample digestion (melts, solutions), silicate analysis theories and practice of different instrumental methods (AAS, XRF, ICP-AES, ICP-MS, TIMS), a visit to a geochemical laboratory.  
Learning activities and teaching methods:  
24 h lectures, 6 h exercises  
Recommended optional programme components:  
Basic course in geochemistry (774301A)  
Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
E. Hanski

772626S: Archaean geology, 5 op

Voimassaolo: 01.08.2009 - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Maier, Wolfgang Derek

Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

Language of instruction:
english

Timing:
4th or 5th year

Learning outcomes:
Students will be able to put Finnish Archean geology into a global context, enhancing understanding of Finland's geological history and mineral potential.

Contents:
Overview of geology of main Archean cratons, focusing on Karelia, Kaapvaal (South Africa), Yilgarn and Pilbara (Australia), and Superior (Canada) cratons. Processes that control mineralization in Archean terranes, notably Au, PGE-Ni-Cr-V, and diamonds.

Learning activities and teaching methods:
20 h lectures, 10 hours exercises

Recommended or required reading:
class handouts and selected readings

Assessment methods and criteria:
written report
Grading:
1-5/fail

Person responsible:
W. Maier

771303A: Bachelor of Science thesis, 9 op

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

ECTS Credits:
9 credits

Language of instruction:
finnish

Timing:
3rd year
Learning outcomes:
Students show that they have basic knowledge of the essential methods of their research field and they are able to use the scientific literature.

Contents:
A thesis based on individual research of literature, field work or laboratory work. Before starting the thesis, students must agree upon the details of the thesis with their professor.

Grading:
pass / fail

Person responsible:
professors

774635S: Basic course in geothermodynamics, 6 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski

ECTS Credits:
6 credits
Language of instruction:
finnish
Timing:
4th or 5th year

Learning outcomes:
Upon completion of the course students understand the basic thermodynamics principles and their applications in geology.

Contents:
Basic laws and concepts of thermodynamics, standard states, activities; fugacities; chemical equilibrium; Gibb`s free energy; heat capacity; chemical potential; Clausius and Clapeyron equation; calculation of reaction boundaries; activities in multicomponental ideal and real solutions, mineral-solution equilibrium, redox reactions, geothermometry and geothermobarometry; behaviour of elements in melting and crystallization.

Learning activities and teaching methods:
24 h lectures, 20 h compulsory exercises

Recommended optional programme components:
Basic course in geochemistry 774301A

Recommended or required reading:

Assessment methods and criteria:
2 examinations

Grading:
1-5/fail

Person responsible:
E. Hanski

771102P: Basic course in mineralogy, 6 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Hanna Junttila, Pekka Tuisku

Opintokohteen oppimateriaali:
Risto Piispanen ja Pekka Tuisku (http://cc.oulu.fi/~petuisku/Mineralogia/MinPer.htm, 2005

Opintokohteen kielet: Finnish
ECTS Credits:
5 credits
Language of instruction:
finnish
Timing:
1st autumn
Learning outcomes:
Students know a basic knowledge on mineralogy.
Contents:
Crystal, crystal systems, mineral, rocks. Formation of minerals in geological processes, chemical and physical properties of minerals, occurrence and utilization. Exercises are compulsory.
Learning activities and teaching methods:
20 h lectures, 16 h exercises
Recommended or required reading:
Assessment methods and criteria:
compulsory exercises , examination
Grading:
1-5/fail
Person responsible:
P. Tuisku

773303A: Basics of glacial geology, 4 op
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
finnish
Timing:
2nd or 3rd year
Learning outcomes:
Upon completion of the course, student should have acquired knowledge of theories of how glaciers were born, of glaciogenic sediment types and of morphological landforms.
Contents:
A review to history of glacial research and its methods; theories of how glaciers were born and factors that have affect on them; present-day glaciers and their research; how snow turns into ice; movement of ice; structures of glaciers; glacier types; facts and theories about the geological activities in glaciers and how glacial sediments, landforms and erosional features are formed; glaciofluvial, glaciolacustrine and glaciomarine sedimentation, glacial deposits in pre-pleistocene formations, causes of ice ages.
Learning activities and teaching methods:
26 h lectures
Recommended optional programme components:
Exogenic processes (771109P), Surficial geology in Finland (773306A)
Recommended or required reading:
Assessment methods and criteria:
examination
Grading:
1-5/fail
Person responsible:
V. Peuraniemi
**772613S: Bedrock geology of Finland, 6 op**

Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuyksikkö: Department of Geosciences  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen kielet: Finnish  

ECTS Credits:  
6 credits  
Language of instruction:  
finnish  
Timing:  
4th or 5th year  
Learning outcomes:  
After the course student should have a good overview of the Finnish bedrock and its evolution through time.  
Contents:  
The main geological units of the Finnish bedrock in the light of geological processes and as a function of geological time.  
Learning activities and teaching methods:  
40 h lectures  
Recommended or required reading:  
Assessment methods and criteria:  
examination  
Grading:  
1-5/fail  
Person responsible:  
N. N.

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**772302A: Bedrock geology of Finland, 5 op**

Voimassaolo: - 31.12.2010  
Opiskelumuoto: Intermediate Studies  
Laji: Course  
Vastuuyksikkö: Department of Geosciences  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen kielet: Finnish  

ECTS Credits:  
5 credits  
Language of instruction:  
finnish  
Timing:  
2nd or 3rd year  
Learning activities and teaching methods:  
30 h lectures  
Recommended or required reading:  
Assessment methods and criteria:  
examination  
Grading:  
1-5/fail  
Person responsible:  
S. Gehör

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**772334A: Bedrock mapping, 3 op**
773341A: Biostratigraphy: diatom analyses, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Tiina Eskola
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits
Language of instruction:
finnish / english
Timing:
2nd or 3rd year
Learning outcomes:
Upon completion of the course, student should be able to prepare diatom samples in the laboratory and identify some of the most general diatoms in Finland.
Contents:
The aim of this course is to use diatoms as an indicator for their sedimentary environment; the salinity, acidity and nutritive value. Exercises to identify the most general diatoms; manufacturing preparations; sediment analysis.
Learning activities and teaching methods:
12 h lectures, 50 h exercises
Recommended optional programme components:
Exogenic processes (771109P)
Recommended or required reading:
**Assessment methods and criteria:**
Written report and an Examination on identifying the species of diatoms.

**Grading:**
pass/fail

**Person responsible:**
T. Eskola

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**773337A: Biostratigraphy: pollen analyses, 5 op**

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuysikkö:** Department of Geosciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Tiina Eskola

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
5 credits

**Language of instruction:**
finnish / english

**Timing:**
2nd or 3rd year

**Learning outcomes:**
Upon completion of the course, student should be able to prepare pollen samples in the laboratory and identify the most general pollen types and spores in Finland.

**Contents:**
The aim of this course is to familiarize students with the analysis and methods in pollen analysis and to examine the composition of pollen in organic or mineral sediments. Exercises to identify the most general pollen types and spores; manufacturing preparations; sediment analysis.

**Learning activities and teaching methods:**
12 h lectures, 50 h exercises

**Recommended optional programme components:**
Exogenic processes (771109P)

**Recommended or required reading:**

**Assessment methods and criteria:**
Written report and an Examination on identifying the species of pollen and spores.

**Grading:**
pass/fail

**Person responsible:**
T. Eskola

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**773605S: Composition and characteristics of fine-grained mineral sediments, 4 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Geosciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Peuraniemi, Vesa Juhani

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4 credits

**Language of instruction:**
finnish
Timing:
4th or 5th year

Contents:
The weathering of rocks produces different kinds of fine-grained sediments. The mineralogical and chemical composition of fine-grained sediments; the physical properties of sediments and their practical importance.

Learning activities and teaching methods:
10 h lectures

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
V. Peuraniemi

771302A: Digital modelling and geological information systems in geosciences, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Kärki, Aulis Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

Language of instruction:
finnish

Timing:
2nd or 3rd autumn

Learning outcomes:
After the course students will have a basic knowledge on 3D-digital modeling and GIS-softwares and the opportunities what they offer in geosciences.

Contents:
The aim of this course is to give students basic knowledge on 3D- digital modelling and geographic information systems and introduce the opportunities they offer in geosciences (e.g. geological mapping and modelling, different kind of feasibility study of raw materials).

Learning activities and teaching methods:
8 h lectures, 20 h demonstrations, 50 h exercises

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
A. Kärki

771101P: Endogenic processes, 4 op

Voimassaolo: - 31.08.2011
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski
Opintokohteen oppimateriaali:
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
finnish
Timing:
1st autumn
Learning outcomes:
The student will have an understanding of the basic concepts of the geological processes affecting rocks under the earth surface. This course is intended as an introduction to the scope and methods of igneous and metamorphic petrology.
Contents:
Magmatism, tectonics, origin and crystallization of magmas, volcanism, metamorphism and formation of metamorphic rocks, plate tectonics and tectonic structures.
Learning activities and teaching methods:
24 h lectures
Target group:
all geology students
Recommended or required reading:
Assessment methods and criteria:
examination
Grading:
1-5/fail
Person responsible:
E. Hanski

773314A: Environmental Geology, 3 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:
ay773314A Environmental Geology (OPEN UNI) 3.0 op

ECTS Credits:
3 credits
Language of instruction:
finnish
Timing:
2nd or 3rd year
Learning outcomes:
Upon completion of the course, student should have acquired knowledge of basic concepts of environmental geology.
Contents:
Basic concepts of environmental geology, geological processes, landforms and risks related to geological processes, geological resources, and environmental geological aspects in planning the land usage, environmental geochemistry.
Learning activities and teaching methods:
24 h lectures
Recommended optional programme components:
Exogenic processes (771109P)

Recommended or required reading:

Assessment methods and criteria:
examination
Grading:
1-5/fail

Person responsible:
V. Peuraniemi

773673S: Environmental geology and geophysical field course, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
3 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Contents:
Course gives basic knowledge and skills for studying the Quaternary landforms, their consistency, ground water questions and environmental issues with geological and geophysical methods.
Learning activities and teaching methods:
8 h lectures, 32 h exercises
Assessment methods and criteria:
active participation
Grading:
pass/fail
Person responsible:
V. Peuraniemi

772610S: Excursion, 2 op

Voimassaolo: - 31.12.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
2 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
The objective is to widen students' field experience on the Finnish bedrock.
Contents:
Introduction to Finnish or foreign geological field targets. Students write a report on the excursion.
Recommended or required reading:
Assessment methods and criteria:
examination
Grading:
pass /fail
Person responsible:
N. N.

773606S: Excursion in surficial geology, 2 - 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
2-5 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Contents:
One to three five-day excursions in Finland or abroad during which the participants become familiar with different formations, stratigraphically good model targets, research areas and with their characteristics.
Grading:
pass/fail
Person responsible:
V. Peuraniemi

773610S: Excursion on glacial geology of Lapland, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish

773612S: Excursion on regional surficial geology, 3 - 6 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
3-6 credits
Language of instruction:
finnish
Timing:
4th or 5th year

Assessment methods and criteria:
- written report

Grading:
- pass/fail

Person responsible:
- V. Peuraniemi

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**771109P: Exogenic Processes, 3 op**

Voimassaolo: 31.07.2011

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Department of Geosciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Peuraniemi, Vesa Juhani

Opintokohteen kiele: Finnish

ECTS Credits:
- 3 credits

Language of instruction:
- finnish

Timing:
- 1st autumn

Learning outcomes:
Upon completion of the course, student should have acquired knowledge of basic concepts and processes of surficial geology. Student should also be able to identify basic sediment types and soils.

Contents:
- Basic concepts of surficial physical geology, weathering, erosion, sedimentation, sediment types, soils.

Learning activities and teaching methods:
- 16 h lectures, 6 h exercises

Recommended or required reading:

Assessment methods and criteria:
- compulsory exercises, examination

Grading:
- 1-5/fail

Person responsible:
- V. Peuraniemi

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**772103P: Field course in bedrock geology, 3 op**

Voimassaolo: 01.08.2006 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Department of Geosciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Kärki, Aulis Juhani

Opintokohteen kiele: Finnish

ECTS Credits:
- 5 credits

Language of instruction:
- finnish / english

Timing:
- 1st spring
Learning outcomes:
Upon completion of the course, student should be able to identify rocks and minerals in the field and know the basics of bedrock mapping.

Contents:
Introduction to bedrock mapping as part of field work. Map material (geological maps, topographic maps) and geologist's tools. Review to identification of rocks and minerals in the field.

Learning activities and teaching methods:
8 h lectures, 32 h demonstrations

Recommended optional programme components:
basic studies in geosciences

Assessment methods and criteria:
active participation, written work report

Grading:
pass/fail

Person responsible:
A. Kärki

Other information:
The course consists of two parts (772301A and 773302A), which are compulsory for all geology students.

772662S: Field course in bedrock geology and geophysics, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Kärki, Aulis Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
3 credits

Language of instruction:
finnish / english

Timing:
4th or 5th year

Contents:
Application of geophysical and geological methods to bedrock mapping, ore research and structures of bedrock.

Learning activities and teaching methods:
8 h lectures, a field course with 32 h of demonstrations, 20 h independent exercises and a written report.

Assessment methods and criteria:
Active participation, a written work report.

Grading:
pass /fail

Person responsible:
A Kärki

773103P: Field course in surficial geology, 3 op

Voimassaolo: 01.01.2006 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
3 credits

Language of instruction:
Timing: 
1st spring

Learning outcomes: 
Upon completion of the course, student should be able to identify the most important sediment types and. Student should also be able to observe ice flow directions.

Contents: 
During this field course students will be introduced with the most important sediment types and the methods of their study and determination and with different glacial landforms. Lectures on the different sediment types and their characteristics in Finland.

Learning activities and teaching methods: 
8 h lectures, 32 h exercises

Recommended optional programme components: 
basic studies in geoscience

Assessment methods and criteria: 
compulsory exercises

Grading: 
pass/fail

Person responsible: 
V. Peuraniemi

Other information: 
The course consists of two parts (772301A and 773302A), which are compulsory for all geology students.

773324A: Field mapping of Quaternary deposits, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikko: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Pekka Lunkka

Opintokohteen kielet: Finnish

ECTS Credits: 
5 credits

Language of instruction: 
finnish

Timing: 
2nd or 3rd year

Learning outcomes: 
To learn the basic methods in mapping of Quaternary deposits.

Contents: 
A field course that introduces techniques used in the mapping of Quaternary deposits. In the field students are reconstructing a 1: 20 000 scale Quaternary map from pre-selected mapping area.

Learning activities and teaching methods: 
40 h lectures and exercises in the field

Assessment methods and criteria: 
examination

Grading: 
1-5/fail

Person responsible: 
J.P. Lunkka

772310A: General mineralogy, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikko: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
**Opettajat:** Pekka Tuisku  
**Opintokohteen kielet:** Finnish

**ECTS Credits:**  
5 credits  
**Language of instruction:**  
finnish  
**Timing:**  
2nd or 3rd year  
**Learning outcomes:**  
The student will deepen their basic knowledge of mineralogy.

**Contents:**  
Research history and research methods of mineralogy. Classification of minerals, crystal chemical structures, chemical compositions, the most important properties and occurrence of minerals in rocks.

**Learning activities and teaching methods:**  
26 h lectures  
**Recommended optional programme components:**  
Basic Mineralogy 771102P  
**Recommended or required reading:**  

**Assessment methods and criteria:**  
examination  
**Grading:**  
1-5/fail  
**Person responsible:**  
P. Tuisku

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**774636S: Geochemistry of Mining Environment, 5 op**

**Opiskelumuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuyksikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opintokohteen kielet:** Finnish

**ECTS Credits:**  
5 credits  
**Language of instruction:**  
finnish  
**Timing:**  
4th or 5th year  
**Learning outcomes:**  
After the course students are able to understand geochemical processes related to the mining environment.

**Contents:**  
Oxidation of sulfide minerals, water chemistry in a mining environment, acid neutralization capacity of rocks, acid mining drainage (AMD) and its prevention.

**Learning activities and teaching methods:**  
28 h lectures  
**Recommended optional programme components:**  
Basic course in geochemistry 774301A and Introduction to environmental geochemistry 77439A  
**Recommended or required reading:**  

**Assessment methods and criteria:**  
examination/essay  
**Grading:**  
1-5/fail  
**Person responsible:**  
E. Hanski
774315A: Geochemistry of igneous rocks, 4 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
finnish
Timing:
2nd or 3rd year
Learning outcomes:
Upon completion of the course students are able to classify igneous rocks and make conclusions on their genesis on the basis of their geochemical composition.
Contents:
Manipulation and graphical presentation of geochemical data, geochemical classification of magmas, normative mineral compositions, mobility of elements, geochemistry of volcanics in different geotectonic environments, the behavior and modeling of trace elements in magmas.
Learning activities and teaching methods:
26 h lectures, 20 h computer exercises
Recommended optional programme components:
Basic course in geochemistry (774301A) and petrology (772308A)
Recommended or required reading:
Assessment methods and criteria:
written work report
Grading:
1-5/fail
Person responsible:
E. Hanski

774630S: Geochemistry of radiogenic isotopes, 6 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski
Opintokohteen kielet: Finnish

ECTS Credits:
6 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
To be able to read geological literature containing isotope data and evaluate the possibilities of utilizing isotopes in solving geological problems.
Contents:
Mechanisms of radioactive disintegration; mass spectrometry; Rb-Sr-, Sm-Nd-, K-Ar-, Ar-Ar-, Re-Os-, Lu-Hf-, Sm-Nd- and U-Pb-methods, isotope geochemistry of lead; fission track and uranium-thorium disequilibrium method; cosmogenics and short-lived isotopes.
Learning activities and teaching methods:
32 h lectures, 20 h computer exercises

Recommended optional programme components:
Basic course in geochemistry 774301A

Recommended or required reading:

Assessment methods and criteria:
2 examinations
Grading:
1-5/fail

Person responsible:
E. Hanski

774631S: Geochemistry of stable isotopes, 4 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning outcomes:
After the course students should have basic knowledge on the behavior of stable isotopes in nature and their application in geological and environmental research.

Contents:
Principles of fractionation of stable isotopes; mass spectrometry; standards; geothermometry; paleoclimatology; geochemistry of commonly used stable isotopes (O, H, C, N & S); stable isotopes in environmental studies; heavy stable isotopes.

Learning activities and teaching methods:
24 h lectures

Recommended optional programme components:
Basic course in geochemistry 774301A

Recommended or required reading:

Assessment methods and criteria:
examination
Grading:
1-5/fail

Person responsible:
E. Hanski

773675S: Geological research methods in hydrogeology, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Pekka Lunkka
ECTS Credits: 5 credits

Language of instruction: english

Timing: 4th or 5th year

Learning outcomes:
By the end of this course, students should be able to understand which kind of processes result in the formation of layered intrusions and their internal structures and ore deposits.

Contents:
Layered intrusions in space and time and the mineralogy, petrology, stratigraphy and ore-forming processes in layered intrusions.

Learning activities and teaching methods:
36 h lectures

Recommended or required reading:

Assessment methods and criteria:
examination

Grading: 1-5/fail

Person responsible:
W. Maier

772621S: Geology of alkaline rocks, carbonatites and kimberlites, 5 op

Opiskelumuoto: Advanced Studies
**Course: Glacial Geology II, 5 op**

**Opiskelumuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Juha Pekka Lunkka

**ECTS Credits:** 5 credits  
**Language of instruction:** finnish  
**Timing:** 4th or 5th year  
**Learning outcomes:** After completion students will be able to understand physical properties of glaciers and the genesis of glacial sediments and glacial landforms.  
**Contents:** Dynamics and hydrology of glaciers; erosion and sedimentation processes in glacial environment; basics of glaciology; subglacial, englacial and supraglacial processes. Origin of different glacigenic sediments and landforms and modelling of paleo-ice-sheets.  
**Learning activities and teaching methods:** 30 h lectures  
**Recommended or required reading:** Glaciers & Glaciation. Benn, D. I. & Evans, D. J. A. Arnold. 1998.  
**Assessment methods and criteria:** examination  
**Grading:** 1-5/fail  
**Person responsible:** S. Gehör
773621S: Global environmental and climate change during the Cenozoic, 4 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Pekka Lunkka
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning outcomes:
After completion students will be able to understand the mechanisms behind the natural climate and environmental change and relate that to the ongoing changes in climate and environment.

Contents:
Mechanisms and rates of the environmental and climate change during the past 100 million. The course introduces, for example the influence of orbital cycles, tectonics, ocean currents and ice sheets on the environmental and climate change during the deep past.

Learning activities and teaching methods:
24 h lectures

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
J. P. Lunkka

488108S: Groundwater Engineering, 5 op

Voimassaolo: - 31.07.2017
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Björn Klöve, Anna-Kaisa Ronkanen
Opintokohteen kielet: English
Leikkaavudet:
480122A Groundwater Technology 5.0 op

Ei opintojaksokuvauksia.

774633S: Hydrogeochemistry, 6 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Elective course: Vastakyky: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettaja: Eero Hanski
Opintokohteen kielet: Finnish

ECTS Credits:
6 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning outcomes:
After the course students have knowledge on the chemical composition of natural waters and the chemical reactions that affects it.

Contents:
Geochemistry of natural waters; solubility of elements; the contents of elements in surface water and ground water; minerals of soil and their chemical properties; sorption and ion change reactions; electrochemistry and kinetic; non-organic and organic contaminants.

Learning activities and teaching methods:
32 h lectures, 20 h computer exercises

Recommended optional programme components:
Basic course in geochemistry 774301A and Introduction to environmental geochemistry 77439A

Recommended or required reading:

Assessment methods and criteria:
2 examinations

Grading:
1-5/fail

Person responsible:
E. Hanski

773331A: Hydrogeology, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettaja: Juha Pekka Lunkka
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

Language of instruction:
finnish

Timing:
2nd or 3rd year

Learning outcomes:
To learn basic concepts in hydrogeology and to introduce hydrogeological research methods.

Contents:
Hydrological cycle, especially phases of earth water and ground water, origin of ground water and its occurrence in Finnish soil and bedrock and in other sediment, karst and volcanic formations; examples from Finland and elsewhere; ground water on climatic peripheries; flow of ground water and well hydraulics; ground water research, geological geophysical methods; stable and radioactive isotopes; principles of hydrochemistry; quality of ground water; deep ground water research; mineral waters and thermal waters; artificial ground waters; contaminating of ground water and its protection.

Learning activities and teaching methods:
30 h lectures and exercises

Recommended or required reading:

Assessment methods and criteria:
examination
Grading:
1-5/fail
Person responsible:
J. P. Lunkka

488102A: Hydrological Processes, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:
ay488102A  Hydrological Processes (OPEN UNI)  5.0 op
480207A  Hydraulics and Hydrology  5.0 op

Learning outcomes:
To provide a basic understanding of water flow and storage processes involved in the hydrological cycle and provide an introduction to engineering computational methods used to manage water resources in natural and man made environments.

Contents:
Hydrological cycle, physical properties of water, distribution of water resources, water balance, precipitation, evapotranspiration, soil and ground water, infiltration, runoff, snow hydrology, hydrometry, water quality, rivers and lakes.

Learning activities and teaching methods:
Lectures and Exercises

Recommended optional programme components:
Material and Energy Balances (recommended).

Recommended or required reading:
Lecture notes

772603S: Igneous petrology, 6 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Maier, Wolfgang Derek, Eero Hanski
Opintokohteen kielet: Finnish

ECTS Credits:
6 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
By the end of this course, students should be able to understand the use of phase diagrams in the interpretation of the genesis of igneous rocks and the diversity of magmas in different tectonic environments.
Contents:
Basic concepts of the petrology of igneous rocks; experimental petrology and phase diagrams; genesis and differentiation of magmas; variation diagrams; occurrence and genesis of the most important associations of igneous rocks.

Learning activities and teaching methods:
20 h lectures, seminar presentations

Recommended optional programme components:
Petrology (772308A)

Recommended or required reading:

Assessment methods and criteria:
examination
Grading:
1-5/fail

Person responsible:
E. Hanski

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuysikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opettajat: Sassali, Jani Henrik, Koivuniemi, Mirja-Liisa
Opintokohteen kielet: Finnish

Leikkaavuudet:
030004P Introduction to Information Retrieval 0.0 op

Language of instruction:
English

Learning outcomes:
Students know the different phases of information retrieval process and basic techniques of scientific information retrieval. They will find the most important reference databases of their discipline and know how to evaluate information sources and retrieval results.

Contents:
Retrieval of scientific information, the retrieval process, key databases of the discipline, and evaluation of information retrieval and information sources.

Learning activities and teaching methods:
The course involves training sessions (8h), web-based learning materials, exercises in the Optima learning environment and a final assignment on a topic of the student's own choice.

Recommended or required reading:
Web-based learning material (http://www.kirjasto.oulu.fi/index.php?id=822)

Assessment methods and criteria:
Passing the course requires participation in the training sessions and successful completion of the course assignments.

Grading:
pass/fail

Person responsible:

774329A: Introduction to Environmental Geochemistry, 5 op

Voimassaolo: 01.01.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
ECTS Credits:
5 credits

Language of instruction:
finnish

Timing:
2nd or 3rd year

Learning outcomes:
After the course students should have basic knowledge on the reactions that affect the behavior of harmful (mainly inorganic) substances in the environment.

Contents:
Concepts of the environment and environmental geochemistry; solution, hydrolysis and redox reactions of minerals, sorption and related geochemical processes, topical environmental problems (acid rain, decrease of ozone, greenhouse phenomenon, heavy metal fallout) from the viewpoint of geochemistry; buffer systems of nature; heavy metals in environment; acid mine drainage.

Learning activities and teaching methods:
30 h lectures, 12 h computer exercises

Recommended optional programme components:
Basic course in geochemistry (774301A)

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
E. Hanski

771108P: Introduction to Ore Geology, 2 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Geosciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

ECTS Credits:
2 credits

Language of instruction:
finnish

Timing:
1st spring

Learning outcomes:
Students will a general view on the raw materials, their environmental impacts and exploration.

Contents:
Aspects of mineral economy, environmental impacts of raw material production and use, classification of ores and ore-forming processes, examples of ore types of abundant and scarce elements, methods of ore exploration, mining legislation.

Learning activities and teaching methods:
14 h lectures

Target group:
all geology students

Recommended or required reading:
771106P: Introduction to bedrock geology of Finland, 2 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Department of Geosciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Kärki, Aulis Juhani

Opintokohteen kielet: Finnish

ECTS Credits:
2 credits

Language of instruction:
finnish

Timing:
1st spring

Learning outcomes:
After the course students know main geological features of bedrock of Finland.

Contents:
The main geological features of the bedrock of Finland including its structure, age and orogenic evolution.

Learning activities and teaching methods:
10 h lectures

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
A. Kärki

771110P: Introduction to classification of rocks, 2 op

Voimassaolo: - 31.07.2011

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Department of Geosciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Hanna Juntila

Opintokohteen oppimateriaali:
Martti Lehtinen, Pekka Nurminen ja Tapani Rämö, , 1998

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
2 credits

Language of instruction:
finnish / english
Timing:
1st autumn

Learning outcomes:
After this course student will possess the naming and classification of rock types and is able to identify the most important rock types macroscopically.

Contents:
The origin of rock types, macroscopic identification and description of origin, structure and mineralogical composition of the most important rock types.

Learning activities and teaching methods:
6 h lectures, 6 h exercises

Recommended optional programme components:
preliminary data: Basic Mineralogy

Recommended or required reading:

Assessment methods and criteria:
lectures, practical exercises, identification exam and lecture diary

Grading:
pass/fail

Person responsible:
H. Juntila

771107P: Introduction to historical geology and surficial geology of Finland, 2 op

Opiskelumuoto: Basic Studies

Vastuuysikkö: Department of Geosciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Peuraniemi, Vesa Juhani

Opintokohteen kielet: Finnish

ECTS Credits:
2 credits

Language of instruction:
finnish

Timing:
1st spring

Learning outcomes:
Upon completion of the course, student should have acquired knowledge of the main features of the Finnish preglacial and Quaternary deposits and the main features of the history of life and geological time table.

Contents:
Main features and origin of the Finnish preglacial and Quaternary deposits. Historical geology: Geological time table, main features of the history of life, mass extinctions.

Learning activities and teaching methods:
10 h lectures

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
V. Peuraniemi

772335A: Introduction to ore mineralogy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course
ECTS Credits: 5 credits

Language of instruction: English

Timing: 2nd or 3rd year

Learning outcomes:
Students will obtain basic knowledge on ore minerals and their mode of occurrence and learn to recognize the most common ore minerals under the ore-microscope.

Contents:
Division and structure of ore minerals, composition and texture, phase diagrams and their applications. Ore microscope and how it is used, microscopic properties of ore minerals. Ore mineral assemblages and their occurrence.

Learning activities and teaching methods:
22 h lectures, 12 h exercises

Target group:
Students specializing in geology and mineralogy

Recommended optional programme components:
Introduction to ore geology (771108P), Basic mineralogy (771102P)

Recommended or required reading:

Assessment methods and criteria:
written examination and a practical test on ore microscopy

Grading: 1-5/fail

Person responsible:
W. Maier

772335A-01: Introduction to ore mineralogy, lectures, 0 op

772335A-02: Introduction to ore mineralogy, practices, 0 op
### 774634S: La-ICP-MS -analytics, 4 op

**Opiskelumuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Seppo Gehör  
**Opintokohteen kielet:** Finnish

**ECTS Credits:**  
4 credits  
**Language of instruction:** finnish  
**Timing:** 4th or 5th year  
**Learning outcomes:**  
After the course the student will be able to work independently (under the control) in the geochemical laboratory.

**Contents:**  
The theoretical base and the use of laser ablation inductively coupled plasma mass spectrometry (La-ICP-MS). How to express the results, limits, accuracies and how to prepare the samples.

**Learning activities and teaching methods:**  
20 h lectures, 20 h exercises

**Recommended or required reading:**  

**Assessment methods and criteria:**  
examination  
**Grading:** 1-5/fail  
**Person responsible:**  
S. Gehör

### 773638S: Laboratory exercises on peat geology, 4 op

**Voimassaolo:** 01.08.2009 -  
**Opiskelumuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Holappa, Kauko Einari  
**Opintokohteen kielet:** Finnish  
**Voidaan suorittaa useasti:** Kyllä

**ECTS Credits:**  
4 credits  
**Language of instruction:** finnish  
**Timing:** 4th or 5th year
Learning outcomes:
A student is able to use different peat research methods on field and in laboratory work.

Contents:
Taking peat samples; preparation and laboratory techniques; definition of the physical and chemical properties of peat; definition of the quality of fuel and growth peat.

Learning activities and teaching methods:
10 demonstrations, 50 h exercises

Recommended or required reading:

Grading:
pass/fail

Person responsible:
K. Holappa

750616S: Legislation in environmental protection, 5 op

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

Opintokohteen oppimateriaali:
Hollo, Erkki J. , , 2001

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr.

Language of instruction:
Finnish.

Timing:
B.Sc. 3rd or M.Sc. 1st autumn - spring. Every second year.

Learning outcomes:
To familiarise students with environmental legislation in European Union with regard to environmental protection and natural resources. Student is able to apply his knowledge to different environmental questions and analyze the needed means. Student knows the environmental administration and organisations in environmental protection and natural resources.

Contents:
Environmental protection and natural resources legislation in Finland and in Europe. Environmental administration and organisations, use and protection of natural resources, prevention of environmental destruction, assessment of environmental effect as well as principles of environmental legislation and main international conventions, environmental issues in UNEP and OECD are covered.

Learning activities and teaching methods:
24 h lectures, 18 h exercises including demonstrations, literature, and final exam.

Target group:
Compulsory to students who are doing the environmental protection 25 cr study module.

Recommended or required reading:

Assessment methods and criteria:
Final exam.

Grading:
1-5 / Fail.

Person responsible:
Prof. Satu Huttunen.

Other information:
The course will take place if sufficient resources are available. Also the environmental legislation course that Faculty of technology arranges is accepted.
774629S: Literature essay, 4 - 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski
Opintokohteen kiele: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits: 4 credits
Language of instruction: finnish
Timing: 4th or 5th year
Learning outcomes: Students acquire deep knowledge on a particular geochemical topic.
Contents: Independent literature search and construction of an essay on a given theme.
Learning activities and teaching methods: see above
Recommended optional programme components: Basic course in geochemistry (774301A) and one of the other geochemistry courses
Recommended or required reading: Will be informed separately.
Assessment methods and criteria: essay
Grading: pass/fail
Person responsible: E. Hanski

773613S: Literature essay, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kiele: Finnish

Ei opintojaksojukuvaisia.

773607S: Literature study, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kiele: Finnish

ECTS Credits: 5 credits
Language of instruction: finnish
Timing: 4th or 5th year
Learning outcomes: Students acquire deep knowledge on a particular surficial geology topic.
Contents: Independent literature search and construction of a report on a given theme.
Learning activities and teaching methods: see above
Recommended optional programme components: Basic course in geochemistry (774301A) and one of the other geochemistry courses
Recommended or required reading: Will be informed separately.
Assessment methods and criteria: a report
Grading: pass/fail
Person responsible: V. Peuraniemi

772615S: Literature study, 5 op
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski
Opintokohteen kielet: Finnish

ECTS Credits: 4 credits
Language of instruction: finnish
Timing: 4th or 5th year
Learning outcomes: Students acquire deep knowledge on a particular geology and mineralogy topic.
Contents: Independent literature search and construction of a report on a given theme.
Learning activities and teaching methods: see above
Recommended or required reading: Will be informed separately.
Assessment methods and criteria: a report
Grading: pass /fail
Person responsible: professors

772666S: Master’s thesis, 30 op
Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuysikkö: Department of Geosciences
Arvostelu: A,B,N,C,M,EX,L
Opintokohteen kielet: Finnish
ECTS Credits:
35 credits

Language of instruction:
finnish / english

Timing:
5th year

Contents:
A thesis based on individual research of literature, field work or laboratory work. Before starting the thesis, students must agree upon the details of the thesis with their professor.

Person responsible:
professors

772604S: Metamorphic petrology, 6 op

Voimassaalo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
6 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning outcomes:
Students will be able to determine histories of metamorphic rocks based on textures and phase equilibria.

Contents:
The basic concepts of the petrology of metamorphic rocks; phase diagrams; Eskola's metamorphic facies concept; metamorphic reactions and changes in mineral suites; defining metamorphic grade and isogrades; metamorphism and deformation; anatexis and migmatites. metamorphic fluids and metasomatosis.

Learning activities and teaching methods:
30 h lectures

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
N. N.

773614S: Microfossil research techiques (advanced), 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Geosciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Tiina Eskola

Opintokohteen kielet: Finnish

ECTS Credits:
4 credits

Language of instruction:
finnish
Timing:
4th or 5th year

Learning outcomes:
Upon completion of the course, student should have acquired knowledge of various microfossils.

Contents:
Use of various microfossils as indicators of ecological changes.

Learning activities and teaching methods:
10 h demonstrations, 40 h exercises

Recommended optional programme components:
Biostratigraphy: pollen course (773337A), Biostratigraphy: diatom course (773341A)

Recommended or required reading:
class handouts

Assessment methods and criteria:
examination

Grading:
pass/fail

Person responsible:
T. Eskola

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772619S: Mineralogical instrumental analytics, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Gehör

Opintokohteen kielet: Finnish

ECTS Credits:
4 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning activities and teaching methods:
26 h lectures, 16 h exercises and a practice work

Recommended or required reading:
Class handouts and selected readings

Person responsible:
S. Gehör

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772601S: Mineralogy - advanced course, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Contents:
Profound survey to the mineralogy and mineralogical research. Mineral chemistry; crystal structures; stability of minerals.

**Learning activities and teaching methods:**

lectures

**Recommended optional programme components:**

Basic Mineralogy (771102P)

**Recommended or required reading:**


**Assessment methods and criteria:**

examination

**Grading:**

5-1/fail

**Person responsible:**

P. Tuisku

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772608S: Mining geology, 3 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Geosciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Maier, Wolfgang Derek, Eero Hanski

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

ay772608S Mining geology (OPEN UNI) 3.0 op

**ECTS Credits:**

2 credits

**Language of instruction:**

finnish

**Timing:**

4th or 5th year

**Learning outcomes:**

Students learn practical aspects of the work of mining geologists.

**Contents:**

Lectures of rock mechanical and rock technical geology and geologic mapping inside a mine.

**Learning activities and teaching methods:**

8 h lectures, 32 h exercises

**Recommended optional programme components:**

Ore geology (772385A)

**Recommended or required reading:**

Will be given on site.

**Grading:**

pass / fail

**Person responsible:**

E. Hanski

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488111S: Modelling in Geoenvironmental Engineering, 5 op

**Voimassaolo:** 01.08.2005 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Process and Environmental Engineering

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

Leikkaavuudet:
Learning outcomes:
To provide the student with the use of models and computational programs used in design and sizing of geoenvironmental materials and geostructures

Contents:

Learning activities and teaching methods:
Examination. Design and modelling exercises. Seminar work.

Recommended optional programme components:
Course Basics in Geoenvironmental Engineering recommended beforehand

Recommended or required reading:
Lecture handout and material given during the course.

772336A: Optical mineralogy, 7 op

Voimassaolo: - 31.07.2014
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Tuisku
Opintokohteen kielet: Finnish

ECTS Credits: 7 credits

Language of instruction: finnish

Timing: 2nd 3rd year

Learning outcomes:
After the course students are able to identify most common minerals from thin sections under the microscope.

Contents:
The basics of crystal optics. Research of the properties of minerals, identifying minerals from thin sections, usage of stereographic projector and basics of the universal stage method.

Learning activities and teaching methods:
40 h lectures, 68 h exercises

Recommended optional programme components:
771102P Basic Mineralogy

Recommended or required reading:

Assessment methods and criteria:
examination

Grading: 1-5/fail

Person responsible:
P. Tuisku

772625S: Ore geological field course, 2 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Advanced Studies
772385A: Ore geology, 5 op

ECTS Credits: 5 credits
Language of instruction: english
Timing: 2nd or 3rd year
Learning outcomes: Upon completion of the course, students should have basic knowledge on the classification of ore deposits and have understanding of various ore-forming processes.
Contents: The ore-forming processes of orthomagmatic, hydrothermal and sedimentary mineral deposits, and examples of different ore types.
Learning activities and teaching methods: 30 h lectures
Recommended or required reading:
Laurence Robb 2008: Introduction to Ore-Forming Processes (Blackwell) and Ed. Chusi Li, Edward M. Ripley (Geological Publishing House, Beijing): New Developments in Magmatic Ni-Cu and PGE Deposits
Assessment methods and criteria: examination
Grading: 1-5/fail
Person responsible: W. Maier

770001Y: Orientation course for new students, 1 op

ECTS Credits: 2 credits
Language of instruction: finnish
Timing: 1st autumn
Learning outcomes:
After this course the student is familiar with the Department of Geosciences and the University and planning his/her studies.

Contents:
The aim of the course is to introduce a student to the University, academic studies, the department and the studies of geology.

Learning activities and teaching methods:
18 h lectures

Assessment methods and criteria:
active participation

Grading:
pass/fail

Person responsible:
amanuensis

773602S: Paleolimnology, 4 op

Voi massaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani, Tiina Eskola
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning outcomes:
Upon completion of the course, student should have acquired knowledge of lake sediment sampling techniques. Student should also be able to prepare the sample in the laboratory.

Contents:
Lakes as sedimentation environments. Lake sediment types. Use of lake sediments in environmental and paleoclimate research. Sampling techniques of lake sediments.

Learning activities and teaching methods:
10 h lectures, 16 h field and laboratory demonstrations

Recommended or required reading:
class handouts

Assessment methods and criteria:
examination

Grading:
pass/fail

Person responsible:
V. Peuraniemi, T. Eskola

773330A: Peat geology, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Holappa, Kauko Einari
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits
Language of instruction: finnish
Timing: 2nd or 3rd year
Learning outcomes: After the course students know the basics of mire ecology, the fields and structure of mires, classification and properties of peats.
Learning activities and teaching methods: 30 h lectures
Assessment methods and criteria: examination
Grading: 1-5/fail
Person responsible: K. Holappa

772323A: Petrography I, 8 op

Voimassaolo: - 31.12.2010
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Tuisku
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits: 8 credits
Language of instruction: finnish
Timing: 2nd or 3rd year
Learning outcomes: After the course students are able to classify different rocks and make individual thin section microscopy research.
Contents: Microscopic research and description of the most usual minerals and textures of different rocks. Introduction to classifying rocks and e.g. petrography. Additionally, lectures concerning structures, terminology and classification of rocks. The exam is to evaluate student's skills in thin section microscopy and the second is a literature and lecture Examination.
Learning activities and teaching methods: 26 h lectures, 120 h exercises
Recommended optional programme components: Optical mineralogy 772336A, Basic Mineralogy 771102P
Assessment methods and criteria: examination
Grading: 1-5/fail
Person responsible: P. Tuisku
**772627S: Petrography II, 10 op**

Voimassaolo: 01.01.2006 - 31.07.2010  
Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Geosciences  
Arvostelu: 1 - 5, pass, fail  
Opettajat: Pekka Tuisku  
Opintokohteen kielet: Finnish

**ECTS Credits:**  
10 credits  
**Language of instruction:**  
finnish  
**Timing:**  
4th or 5th year  
**Learning outcomes:**  
By the end of this course, students should be able to research igneous-, metamorphic- and sedimentary rocks under the microscope.  
**Contents:**  
Microscopic research and description of the most usual minerals and textures of different rocks, classifying rocks and e.g. petrography. Additionally, lectures concerning structures, terminology and classification of rocks.  
**Learning activities and teaching methods:**  
200 h exercises  
**Recommended optional programme components:**  
Basic mineralogy (771102P), Optical mineralogy (772336A) and Petrography I (772323A)  
**Assessment methods and criteria:**  
examination  
**Grading:**  
1-5/fail  
**Person responsible:**  
P. Tuisku

**772308A: Petrology, 10 op**

Opiskelumuoto: Intermediate Studies  
Laji: Course  
Vastuuysikkö: Department of Geosciences  
Arvostelu: 1 - 5, pass, fail  
Opettajat: Pekka Tuisku  
Opintokohteen kielet: Finnish

**ECTS Credits:**  
6 credits  
**Language of instruction:**  
finnish  
**Timing:**  
2nd or 3rd year  
**Learning outcomes:**  
The student will acquire basic knowledge of different rock types, their classification and origin.  
**Part 1:** Igneous rocks 3 credits  
**Contents:** Basic concepts of the petrology of igneous rocks; phase diagrams; genesis and differentiation of magmas; variation diagrams; occurrence, classification and genesis of the most important associations of igneous rocks.  
**Working methods:** 10 h lectures  
**Part 2:** Sedimentary rocks 1 credit  
**Contents:** Properties, classification and occurrence of sedimentary rocks.  
**Working methods:** 5 h lectures
Part 3: Metamorphic rocks 2 credits  
**Contents:** The basic concepts of the petrology of metamorphic rocks; phase diagrams; occurrence and textures of metamorphic rocks.  
**Working methods:** 10 h lectures  
**Recommended or required reading:**  
**Assessment methods and criteria:**  
examination  
**Grading:**  
1-5/fail  
**Person responsible:**  
N.N.

773317A: Physical Sedimentology, 5 op  
**Opiskeluonmuoto:** Intermediate Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Juha Pekka Lunkka  
**Opintokohteen kielet:** Finnish  

**ECTS Credits:**  
5 credits  
**Language of instruction:**  
finnish  
**Timing:**  
2nd or 3rd year  
**Learning outcomes:**  
To learn the basic concepts in sedimentology.  
**Contents:**  
The aim of the lecture course is to give geological and physical background of the exogenic processes that operate in terrestrial and marine sedimentary environments. The lecture course also introduces the basic methods and concepts used in physical sedimentology. The topics discusses are related to modern and ancient sedimentary environments and processes including themes such as weathering, soils and palaeosoils, mass movement mechanisms, water and ice flow dynamics, erosion and sedimentation processes and products.  
**Learning activities and teaching methods:**  
30 h lectures  
**Recommended optional programme components:**  
The course is a prerequisite for other courses in the field of surficial geology.  
**Recommended or required reading:**  
**Assessment methods and criteria:**  
examination  
**Grading:**  
1-5/fail  
**Person responsible:**  
J. P. Lunkka

772636S: Practical course in fluid inclusion, 4 op  
**Opiskeluonmuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Seppo Gehör
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Contents:
Introduction to the basics of fluid inclusion research. What is a fluid inclusion, where and how are they formed and how they are studied.
Learning activities and teaching methods:
6 h lectures, 80 h exercises
Recommended or required reading:
Assessment methods and criteria:
examination
Person responsible:
S. Gehör

772635S: Practical course in mineral chemistry, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Kaukonen, Risto Johan
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
Students will be able to utilize the electron microanalyzer in their future thesis work or research.
Contents:
Analyzing of different minerals with an electron microprobe. Processing of the analyzed results with a computer and Examination of errors.
Learning activities and teaching methods:
4 h demonstrations and 76 h independent work
Assessment methods and criteria:
written work report
Grading:
pass / fail
Person responsible:
E. Hanski and R. Kaukonen

771304A: Practical training, 4 - 5 op

Opiskelumuoto: Intermediate Studies
Laji: Practical training
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits  
**Language of instruction:**  
finnish  
**Timing:**  
2nd or 3rd summer  
**Learning outcomes:**  
To get familiar with geologist's work in real life.  
**Contents:**  
Practical training accomplished under the direction of a qualified geologist. Before the training, students must in advance agree upon the details of the field work with their professor such as the work place, time, instructor and the supervisor.  
**Target group:**  
all geology students  
**Assessment methods and criteria:**  
a written report on the training work  
**Grading:**  
pass/fail  
**Person responsible:**  
professors  
**Other information:**  
compulsory to the Bachelor’s degree

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**772612S: Precambrian sedimentology, 4 op**

**Opiskelumuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuyksikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Kari Strand  
**Opintokohteen kielet:** Finnish

**ECTS Credits:**  
4 credits  
**Language of instruction:**  
finnish  
**Timing:**  
4th or 5th year  
**Learning outcomes:**  
Students will get familiar with sedimentological research in metamorphosed and deformed shield areas. They will be able to apply sequence stratigraphy in stratigraphic research and make basin reconstructions in different tectonic environments.  
**Contents:**  
The course covers topics like the sequence stratigraphy, Precambrian evolution, origin of the atmosphere, glaciations, plate tectonics, sedimentary ore deposits in different shield areas and global correlation of Precambrian sedimentary sequences and geological events.  
**Learning activities and teaching methods:**  
40 h lectures  
**Recommended optional programme components:**  
Physical sedimentology (773317A), sedimentary petrology (772606S) and sedimentary structures (773648S)  
**Recommended or required reading:**  
**Assessment methods and criteria:**  
examination  
**Grading:**  
1-5/fail  
**Person responsible:**  
K. Strand

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**773657S: Pro gradu thesis, 30 op**
Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits: 35 credits
Language of instruction: finnish
Timing: 5th year
Contents: A thesis based on individual research of literature, field work or laboratory work. Before starting the thesis, students must agree upon the details of the thesis with their professor.
Person responsible: professors

773343A: Quaternary Geology Seminar I, 5 op
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Pekka Lunkka
Opintokohteen kielet: Finnish

ECTS Credits: 5 credits
Language of instruction: finnish
Timing: 2nd or 3rd year
Learning outcomes: The objective is to enhance students' ability to construct and give a scientific presentation on a subject of their field.
Contents: Students prepare and give an oral presentation (about 30 minutes) on a subject that has required independent work and judgement. Each participant acts once as an opponent. Active class participation required.
Assessment methods and criteria: oral presentation and acting as an opponent
Grading: pass/fail
Person responsible: J. P. Lunkka

773306A: Quaternary Geology of Finland, 5 op
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

**Language of instruction:**
finnish

**Timing:**
2nd or 3rd year

**Learning outcomes:**
Upon completion of the course, student should have acquired knowledge of the Finnish glacial landforms and deglaciation in Finland.

**Contents:**
The pre-Quaternary landform of Finland; thermomers and cryomers during Pleistocene period; Finnish glacial landforms and their regional division; occurrence of landforms and their combinations as seen in aerial photos; deglaciation; the highest shoreline and its meaning; water-laid deposits; eolian deposits; land uplift; evolutionary phases of lakes; evolution of organic environment.

**Learning activities and teaching methods:**
30 h lectures

**Recommended optional programme components:**
Exogenic processes (771109P)

**Recommended or required reading:**
Koivisto M. 2004: Jääkaudet. WSOY, Helsinki, 233s.

**Assessment methods and criteria:**
examination

**Grading:**
1-5/fail

**Person responsible:**
V. Peuraniemi

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**773300A: Quaternary Stratigraphy, 5 op**

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuysikkö:** Department of Geosciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Juha Pekka Lunkka

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
5 credits

**Language of instruction:**
finnish

**Timing:**
2nd or 3rd year

**Learning outcomes:**
To learn basic concepts of stratigraphy, and Earth's Quaternary history. Students will also be acquainted with research methods applied in Quaternary Geology.

**Contents:**
The last period of the history of Earth is called the Quaternary. The course focuses on Quaternary history and stratigraphy of the Earth. The course consists of the following topics: basic concepts of stratigraphy including litho-, bio-, and chronostratigraphy, geochronology and other types of stratigraphical practices; stratigraphical methods; absolute and relative dating methods; marine and terrestrial sediments as stratigraphical archives; classical and modern stratigraphical models; climate change.

**Learning activities and teaching methods:**
30 h lectures

**Recommended or required reading:**

**Assessment methods and criteria:**
examination

**Grading:**
1-5/fail

**Person responsible:**
773619S: Quaternary geology seminar II, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Pekka Lunkka
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
The objective is to enhance students' ability to construct and give a scientific presentation on a subject of their field.
Contents:
Students prepare and give an oral presentation (about 30 minutes) on a subject that has required independent work and judgement. Each participant acts once as an opponent. Active class participation required.
Assessment methods and criteria:
oral presentation and acting as an opponent
Grading:
pass/fail
Person responsible:
J. P. Lunkka or V. Peuraniemi

772645S: Regional ore geology, 6 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski, Maier, Wolfgang Derek
Opintokohteen kielet: Finnish

ECTS Credits:
6 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
After the course students should have a view on the occurrence of ore deposits in different geotectonic environments and time periods in Earth's history.
Contents:
Factors that control occurrences of ores, changes in ore formation processes, mineral deposits in Archean, Proterozoic and Phanerozoic areas.
Learning activities and teaching methods:
40 h lectures
Recommended optional programme components:
Ore geology (772385A)
Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
E. Hanski

773648S: Sedimentary Structures, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Pekka Lunkka
Opintokohteen kielet: English

ECTS Credits:
5 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
After completion students are able to identify various sedimentary structures and facies associations and use them for palaeoenvironmental reconstructions.
Contents:
The most general sedimentary structures and their occurrence; exercises to identify different structures.
Learning activities and teaching methods:
26 h lectures, 29 h exercises
Recommended or required reading:
topical publications
Assessment methods and criteria:
examination
Grading:
1-5/fail
Person responsible:
J. P. Lunkka

772606S: Sedimentary petrology, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
After successful completion of the course students have gained and deep understanding of depositional processes and environments and interpretation of ancient sedimentary rocks.
Contents:
Properties, classification and occurrence of sedimentary rocks and the processes that form them.

Learning activities and teaching methods:
24 h lectures

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
N. N.

773647S: Sedimentology, 6 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Pekka Lunkka
Opintokohteen kielet: Finnish

ECTS Credits:
6 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning outcomes:
To provide a complete picture on sedimentological processes and products.

Contents:
sedimentary environments, processes and products

Learning activities and teaching methods:
30 h lectures

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
J. P. Lunkka

774316A: Seminar in environmental geochemistry, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

Language of instruction:
finnish
Timing:
2nd or 3rd year

Learning outcomes:
After the course, students will understand more about the behavior of certain harmful compounds in the environment.

Contents:
Abundances and behaviour of environmentally important elements, such as heavy metals, and their compounds in geomaterials.

Learning activities and teaching methods:
Students prepare and give an oral presentation (about 30 minutes) on a subject that has required independent work and judgement. Each participant acts once as an opponent.

Recommended optional programme components:
Basic course in geochemistry (774301A) and Introduction to environmental geochemistry (774329A)

Recommended or required reading:
Will be informed upon starting the course.

Person responsible:
E. Hanski

772624S: Seminar in geology and mineralogy 2, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning outcomes:
The objective is to enhance students' ability to construct and give a scientific presentation on a subject of their field.

Contents:
Students prepare and give an oral presentation (about 30 minutes) on a subject that has required independent work and judgement. Each participant acts once as an opponent.

Learning activities and teaching methods:
see above

Recommended or required reading:
Will be informed upon starting the course.

Assessment methods and criteria:
oral presentation and acting as an opponent

Grading:
1-5/fail

Person responsible:
professors

772337A: Seminar in geology and mineralogy I, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski
Opintokohteen kielet: Finnish
ECTS Credits: 5 credits  
Language of instruction: finnish  
Timing: 2nd or 3rd year  
Learning outcomes: The objective is to enhance students' ability to construct and give a scientific presentation on a subject of their field.  
Contents: Students prepare and give an oral presentation (about 30 minutes) on a subject that has required independent work and judgement. Each participant acts once as an opponent.  
Learning activities and teaching methods: see above  
Recommended or required reading: Will be informed upon starting the course.  
Assessment methods and criteria: oral presentation and acting as an opponent  
Grading: 1-5/fail  
Person responsible: E. Hanski

772607S: Seminar in ore geology, 4 op  
Voimassaolo: - 31.07.2010  
Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Geosciences  
Arvostelu: 1 - 5, pass, fail  
Opettajat: Maier, Wolfgang Derek, Eero Hanski  
Opintokohteen kielet: Finnish

ECTS Credits: 4 credits  
Language of instruction: english  
Timing: 4th or 5th year  
Learning outcomes: The course will enhance students' ability to construct and deliver a scientific presentation and deepen their knowledge on different ore types.  
Contents: Students write a 20-page paper on a subject in the field of ore geology. The paper is presented in a seminar meeting with someone acting as an opponent. Each student acts as an opponent to a paper in their turn.  
Learning activities and teaching methods: 20 h seminars  
Recommended optional programme components: Ore geology (772385A)  
Assessment methods and criteria: oral presentation and acting as an opponent  
Grading: pass /fail  
Person responsible: W. Maier

772658S: Special issues in geology and mineralogy, 1 - 9 op  
Opiskelumuoto: Advanced Studies
773608S: Special questions in Quaternary geology, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
1-9 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
The objective of the course is to provide the student's with knowledge on the current developments in a special topic in geology and mineralogy.
Contents:
A course on a current topic given by a staff member or outside lecturer.
Learning activities and teaching methods:
30 h lectures
Recommended or required reading:
Will be informed separately.
Assessment methods and criteria:
examination
Grading:
1-5/fail
Person responsible:
N. N.

772316A: Structural geology, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits
Language of instruction:
finnish
Timing:
2nd or 3rd year
Learning outcomes:
This course familiarizes the students with the basic reasons for deformation: stress theory and strain theory.
Contents:
The origin and characteristic features of deformation structures like folds, faults, foliations, lineations, fractures and polyphase deformation are handled in detail.

**Learning activities and teaching methods:**
- 24 h lectures

**Recommended or required reading:**

**Assessment methods and criteria:**
- examination
- Grading:
  - 1-5/fail

**Person responsible:**
- A. Kärki

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### 772609S: Structural geology workshop, 6 op

**Opiskelumuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Kärki, Aulis Juhani  
**Opintokohteen kielet:** Finnish

**ECTS Credits:**  
6 credits

**Language of instruction:**  
finnish / english

**Timing:**  
4th or 5th year

**Contents:**  
Geometric analysis and identification of different structural elements in the field. Structural synthesis and modelling the regional structure of bedrock that is based on information collected from field observations and geophysical data maps. Maps of structural geology, profiles, sector diagrams and projections. Statistical methods and GIS-applications in the data processing.

**Learning activities and teaching methods:**  
- 16 h lectures, 32 h modelling demonstrations and 40 h exercises, a written report

**Recommended optional programme components:**  
- Structural geology (772316A). Digital modeling and geological information systems in geosciences (771302A)

**Recommended or required reading:**  

**Assessment methods and criteria:**  
- examination
- Grading:
  - 1-5/fail

**Person responsible:**  
- A. Kärki

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### 773615S: Studia Generalia -lectures, 2 op

**Opiskelumuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Seija Roman  
**Opintokohteen kielet:** Finnish

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773679S: Studies in other universities, 0 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Contents:
Courses taken in international exchange programs (Erasmus, Nordplus) or courses taken in other Finnish universities.

Person responsible:
V. Peuraniemi

772690S: Studies in other universities and colleges, 0 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: teachers

Voidaan suorittaa useasti: Kyllä

Contents:
Courses taken in international exchange programs (Erasmus, Nordplus) or courses taken in other Finnish universities.

773645S: Study circle of glacial geology and ore exploration, 5 - 15 op

Voimassaolo: - 31.07.2007
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
5-15 credits
Language of instruction: finnish
Timing:
4th or 5th year
Learning outcomes:
Upon completion of the course, student has a good knowledge on the use of different surficial deposits in ore exploration.

Contents:
Glacial processes, glaciogenic sediments and landforms and ore exploration studied in group work. Group work in field and laboratory, seminars and lectures on current issues. Contents, extent and used material changes every year.

Learning activities and teaching methods:
lectures, field- and laboratory works

Recommended optional programme components:
Surficial geology in ore exploration (773322A)

Recommended or required reading:

Assessment methods and criteria:
examination
Grading:
1-5/fail

Person responsible:
V. Peuraniemi

773322A: Surficial geology in ore exploration, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peuraniemi, Vesa Juhani
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

Language of instruction:
finnish

Timing:
2nd or 3rd year

Learning outcomes:
Upon completion of the course, student should have a basic knowledge of the dispersal of ore boulders, tracing them and of the use of till geochemistry in ore exploration.

Contents:
This course provides practical skills for performing surficial geological ore prospecting in glaciated areas. Boulder prospecting; glaciogenic and geochemical dispersion in different landforms; different modes of occurrence of element. Methods: digging, boring, grain analyses, separations and applications.

Learning activities and teaching methods:
30 h lectures

Recommended optional programme components:
Exogenic processes (771109P), Surficial geology in Finland (773306A), Basics of glacial geology (773303A)

Recommended or required reading:

Assessment methods and criteria:
examination
Grading:
1-5/fail

Person responsible:
V. Peuraniemi

773641S: Surficial geology in ore exploration, advanced course 1, 5 op

Opiskelumuoto: Advanced Studies
Laji
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
ECTS Credits:
5 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning outcomes:
Upon completion of the course, student has the knowledge of the mode of occurrence of elements in surficial deposits and of their research methods and of the use heavy minerals in ore exploration.

Contents:
Mode of occurrence of elements in surficial deposits; research methods of occurrence of elements; using partial extraction methods; separating different fractions from a sample; heavy mineral prospecting; mineral determinations and analysis; defining mechanisms of dispersion.

Learning activities and teaching methods:
30 h lectures

Recommended optional programme components:
Surficial geology in ore exploration (773322A)

Recommended or required reading:

Assessment methods and criteria:
examination

Grading:
1-5/fail

Person responsible:
V. Peuraniemi

773642S: Surficial geology in ore exploration, advanced course 2, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuksikkö: Department of Geosciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Peuraniemi, Vesa Juhani

Opintokohteen kielet: Finnish

ECTS Credits:
5 credits

Language of instruction:
finnish

Timing:
4th or 5th year

Learning outcomes:
Upon completion of the course student has a knowledge on the use of organic sediments, waters, snow and air in ore exploration.

Contents:
Dispersion in organic material, waters, snow and in air and there use in ore exploration.

Learning activities and teaching methods:
30 h lectures

Recommended optional programme components:
Advanced course of surficial geology in ore exploration I (773641S)

Recommended or required reading:
Selected articles

Assessment methods and criteria:
examination

Grading:
1-5/fail
773316A: Technical Properties of Sediments, 8 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Holappa, Kauko Einari
Opintokohteen kielet: Finnish

ECTS Credits:
8 credits
Language of instruction:
finnish
Timing:
2nd or 3rd year
Learning outcomes:
Upon completion of the course, student should have acquired knowledge of specify the physical and geotechnical qualities of sediments.
Contents:
Introduction to different boring methods; taking samples of fine-grained sediments. Laboratory work: defining consistency and structure of different sediments; defining different mechanical and thermal properties of sediments.
Learning activities and teaching methods:
45 h demonstrations, 135 h practical exercises, written report
Recommended optional programme components:
Exogenic processes (771109P), Field course in surficial geology (773302A), Surficial geology of Finland (773306A)
Recommended or required reading:
Assessment methods and criteria:
written reports and an examination
Grading:
1-5/fail
Person responsible:
T. Eskola and K. Holappa

772333A: Technical mineralogy, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Gehör
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits
Language of instruction:
finnish
Timing:
2nd or 3rd year
Contents:
Occurrence and properties of non-metallic recourses; mineralogy of technical mass-productions (ceramics, glass, cement, calc, zeolite, bentonite), mineralogy of progressive ceramic products; Properties and technical use of clayminerals and their sorption, modification and use in environmental technical applications. Reactive materials and their use in environmental technical applications.

**Learning activities and teaching methods:**
26 h lectures and 10 h exercises lectures

**Assessment methods and criteria:**
examination

**Grading:**
1-5/fail

**Person responsible:**
S. Gehör and K. Kujala

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**773643S: Technical properties of sediments - advanced course, 5 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Geosciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Holappa, Kauko Einar

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
5 credits

**Language of instruction:**
finnish

**Timing:**
4th or 5th year

**Learning outcomes:**
Upon completion of the course, student should have acquired knowledge of mechanical and physical properties of sediments.

**Contents:**
Advanced course on the mechanical and physical properties of sediments, studied by geotechnical methods.

**Learning activities and teaching methods:**
30 h demonstrations, 60 h exercises

**Recommended optional programme components:**
Technical properties of sediments 773316A, Technical use of rocks and minerals 772357A

**Recommended or required reading:**

**Assessment methods and criteria:**
written reports and an examination

**Grading:**
1-5/fail

**Person responsible:**
K. Holappa, T. Eskola

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**772357A: Technical use of rocks and minerals, 4 op**

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuysikkö:** Department of Geosciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Kärki, Aulis Juhani

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4 credits  
**Language of instruction:** finnish  
**Timing:** 2nd or 3rd year  
**Contents:**  
Usage of rock varieties and minerals in industry and in construction. Required qualifications for using rock varieties and minerals. Occurrences of Finnish building rocks, industrial rocks and industrial minerals; exploration of these occurrences and research methods; required qualifications of road surface materials.  
**Learning activities and teaching methods:**  
20 h lectures and a literature work  
**Assessment methods and criteria:** examination  
**Grading:** 1-5/fail  
**Person responsible:** A. Kärki  

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**772620S: Tectonics, 5 op**  
**Opiskelumuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuyksikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Kärki, Aulis Juhani  
**Opintokohteen kielet:** Finnish  
**ECTS Credits:** 5 credits  
**Language of instruction:** finnish  
**Timing:** 4th or 5th year  
**Contents:**  
The structure of Earth's crust. The tectonic features of Archaean, Proterozoic and Phanerozoic periods. Detailed presentation of the tectonic-magmatic activation and development of shield areas and plate tectonics in different geotectonic environments.  
**Learning activities and teaching methods:**  
24 h lectures  
**Recommended optional programme components:** basics studies of geosciences  
**Recommended or required reading:**  
**Assessment methods and criteria:** examination  
**Grading:** 1-5/fail  
**Person responsible:** A. Kärki  

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**771100P: The Earth in Universe, 2 op**  
**Voimassaolo:** - 31.07.2012  
**Opiskelumuoto:** Basic Studies  
**Laji:** Course  
**Vastuuyksikkö:** Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Gehör
Opintokohteen kielet: Finnish

ECTS Credits:
2 credits
Language of instruction:
finnish
Timing:
1st autumn
Contents:
origin of elements, solar system, history of evolution, structure and composition of the Earth
Learning activities and teaching methods:
12 h lectures
Assessment methods and criteria:
examination
Grading:
1-5/fail
Person responsible:
S. Gehör

773622S: Utilization of peat, 4 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Holappa, Kauko Einari
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
4 credits
Language of instruction:
finnish
Timing:
4th or 5th year
Learning outcomes:
After the course students knows the methods of peat inventory, peat production and different peat utilization, environmental impacts.
Contents:
Peat resources; classification and making an inventory; peat production; different utilization methods and improvement of peat. Introduction to peat production and utilization in different establishments. A field trip to a peat production area or peat refining or utilizing plant.
Learning activities and teaching methods:
20 h lectures, 20 h exercises
Recommended or required reading:
Assessment methods and criteria:
examination
Grading:
5-1/fail
Person responsible:
K. Holappa
773345A: Work practice 2, 4 - 5 op

Opiskelumuoto: Intermediate Studies
Laji: Practical training
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
finnish
Timing:
2nd or 3rd year
Learning outcomes:
To get familiar with geologists's field work in practice.
Contents:
Practical training accomplished under the direction of a qualified geologist. Before the training, students must in advance agree upon the details of the field work with their professor such as the work place, time, instructor and the supervisor.
Learning activities and teaching methods:
practical work over a period of three months
Assessment methods and criteria:
a written report on the work
Grading:
pass/fail
Person responsible:
professor

772338A: Work practice II, 4 - 5 op

Opiskelumuoto: Intermediate Studies
Laji: Practical training
Vastuuysikkö: Department of Geosciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Eero Hanski
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
finnish
Timing:
2nd or 3rd year
Learning outcomes:
To get familiar with geologists's field work in practice.
Contents:
Practical training accomplished under the direction of a qualified geologist. Before the training, students must in advance agree upon the details of the field work with their professor such as the work place, time, instructor and the supervisor.
Learning activities and teaching methods:
practical work over a period of three months
Assessment methods and criteria:
a written report on the work
Grading:
pass/fail
Person responsible:
professor
**772614S: Workshop in bedrock mapping, 5 op**

**Opiskelumuoto:** Advanced Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Geosciences  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Kärki, Aulis Juhani  
**Opintokohteen kielet:** Finnish

**ECTS Credits:**  
5 credits  
**Language of instruction:**  
finnish  
**Timing:**  
4th or 5th year  
**Learning activities and teaching methods:**  
12 h lectures, a field course with 48 h of demonstrations, 20 h independent exercises and a written  
**Assessment methods and criteria:**  
Active participation, a written work report.  
**Grading:**  
pass /fail  
**Person responsible:**  
professors